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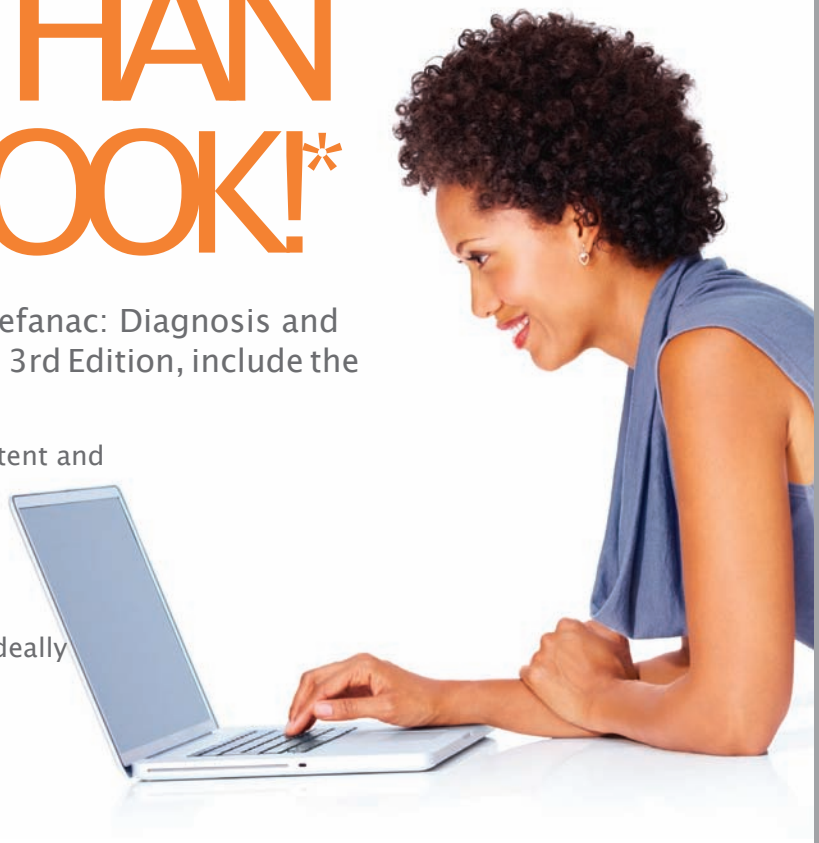

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# DIAGNOSIS AND TREATMENT PLANNING IN Dentistry

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# DIAGNOSIS AND TREATMENT PLANNING IN Dentistry

3RD EDITION

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*To our wives and families for their love and support.*

*And to our students—past, present, and future—who have been the real inspiration for this work.*

# PREFACE

The third edition of this text is a significant expansion from the prior two editions. Now titled *Diagnosis and Treatment Planning in Dentistry*, we have added two new chapters *Common Diagnoses in Dentistry* and *Interprofessional Treatment Planning*. The first pertains to diagnosis, the bedrock from which all treatment decisions are made. The focus of this chapter is the range of patient diagnoses commonly encountered in dental practice. Second, because dentists are partners with other health professionals, we anticipate that dental treatment will increasingly be delivered in a collaborative, interdisciplinary setting where patients and providers will both benefit from a team approach to oral and general healthcare delivery.

The purpose of this book is to provide the reader with the fundamental knowledge needed to create treatment plans for adolescent and adult patients. To assist practitioners at all levels of experience, we present strategies for bridging the gap between the real or perceived divide between "ideal" and "practical" dental treatment planning. We continue to emphasize the central role of the patient, whose needs and informed choices should drive the treatment planning process.

This edition is organized into four sections. Section 1 presents an overview of patient examination and diagnosis. This includes the collection of patient information, its evaluation, and the development of diagnosis and problem lists for patients. The comprehensive patient diagnosis serves as the foundation for the construction of the treatment plan.

Section 2 covers the treatment planning process. The important concepts of risk assessment, prognosis, and treatment outcomes are also presented with continued emphasis on evidence-based dentistry. A key chapter follows, outlining the development of the treatment plan in the context of patient and dentist considerations and treatment objectives. The rationale for phasing and sequencing the plan of care is described in detail, and guidelines are offered for organizing the plan into phases and properly sequencing the steps in the plan. The new chapter on interprofessional treatment planning introduces shared decision making and communication with other health professionals and presents examples of conditions that are best managed by an interprofessional team. The section concludes with a chapter that addresses the ethical and legal issues surrounding the planning and execution of dental treatment. Particular attention is focused on the doctor-patient relationship, obtaining informed consent from patients, maintaining the dental record, and professional liability. Ethical considerations in treatment planning are now more heavily emphasized in this chapter.

Section 3 covers, in detail, the five phases of the treatment plan. We believe the concept of phasing treatment is critical to managing patient care, especially for patients with complex needs. Managing the patient's general physical health before and during treatment represents the *systemic phase* of treatment. The chapter on the *acute phase* presents a discussion of the diagnosis and management of frequently encountered urgent treatment needs. The *disease control phase* focuses on the management of dental caries, initial therapy for periodontal disease, and the resolution of other oral infections and pathologies. The chapter discussing the *definitive phase,* often the core of the treatment plan, includes discussions of orthodontic care, advanced periodontal treatment, single tooth restorations, and replacement of missing teeth. Implant-based treatment has become a mainstay in contemporary dental practice and is an important focus in this chapter. Finally, in the chapter on the *maintenance phase,* developing a long-term relationship with the patient to promote and preserve oral health after completion of active therapy is discussed.

Section 4, Planning Treatment for Unique Patient Populations, offers chapters written by experts on the oral health care of each group. These seven chapters provide the student and general dentist with specialized guidance in assessing and planning for the oral health of individuals in these groups. The chapter on Patients with Special Needs is placed strategically at the beginning of the section. It provides detailed insight into the management of patients with complex general and oral health problems, and serves as an introduction to the chapters that follow. We have updated the remaining chapters that address the unique requirements of patients who are substance dependent, are anxious or fearful, have psychological disorders, are an adolescent or older adult, and are motivationally compromised or financially limited. To successfully treat patients in these groups, the dentist often must make modifications in the planning and delivery of dental care.

For the third edition, we have included certain features that should be of value to the dental student, the recent dental graduate, and members of the dental team, as well as the practicing general dentist and others who are interested in the subject of dental treatment planning.

These features include the following:

- The textbook is now in full color with more images to illustrate and support important concepts. While still available in both hard copy and electronic versions, the electronic version seamlessly links with additional figures, tables, and other resources.
- We now have additional electronic content accessible through the Evolve website that includes case studies and videos.
- *In Clinical Practice* boxes distill information in terms of specific clinical situations faced by the practicing dentist, providing concrete illustrations in a format that can be easily and quickly reviewed when planning treatment.
- The *What's the Evidence?* boxes link clinical decision-making and treatment planning strategies to current research. This feature provides a lively and broadly informative approach to the topics discussed and includes citations to relevant articles in the literature.

- The *Ethics in Dentistry* boxes in some chapters focus the reader on clinical situations where ethical decision making is required.
- *Suggested Readings* can be found at the end of many chapters, and these provide a bibliography of authoritative texts and links to relevant manuscripts, monographs, and other resources.
- *Review Questions* and *Suggested Projects* can be used by students and instructors to summarize and reinforce important concepts presented in the book. They provide thought-provoking and clinically useful exercises for the student or recent graduate.
- Key terms are set in boldface at their first appearance in the text and are listed and defined in the *Glossary* located at the back of the book.

Throughout the book, we have focused on the treatment planning process rather than its details, avoiding comprehensive discussions of such topics as oral diagnosis and medicine, oral maxillofacial pathology and radiology, and specific surgical and restorative techniques. As was true in the first and second editions, there is an intentional emphasis on a generalist rather than a specialist-driven mode of treatment planning. Treatment modalities are generally discussed in the context of related clinical conditions and problems—rather than the context of a particular dental specialty. We believe that this taxonomy is clinically relevant and realistic in the contemporary practice of general dentistry and should be appropriate for dental students who are training or who have been trained in comprehensive care–based academic curriculums. We continue our focus in the third edition of a universal and world-centered view of treatment planning.

We recommend that the student or entry-level practitioner begin their perusal of the text with Sections 1 and 2—to help grasp key treatment planning concepts and to appreciate the information that is essential to have in place before treatment planning can begin. Section 2 should be useful to both the novice and the experienced practitioner—providing guidance on how to design, phase, and sequence a plan—and the necessary components to do so. Section 3 provides essential tools for the student and the novice regarding the five phases of treatment planning. It may serve as a framework for the experienced practitioner to "recalibrate" their treatment planning process, and it can provide useful information on how to manage patients with acute or active oral health problems—such as the patient with active caries and high caries risk. The individual chapters in Section 4 should be especially helpful to the experienced practitioner as he or she tries to make sense of selected patient problems or specific treatment planning challenges. In time, any and all of the chapters in Section 4 may be relevant to each reader.

However you choose to approach this text, the authors invite you to share in their enthusiasm and the deep sense of professional accomplishment that comes with successful treatment planning. Putting together the puzzle—finding the best way to treat a patient with complex medical, dental, psychosocial, and financial needs—can be an immensely complicated and immensely rewarding undertaking at the same time. Putting together these pieces—merging of the art, the science, and the patient care of dentistry—into the shape of a treatment plan can sometimes seem to be a mystical process. The mission of this text is to demystify that process. Enjoy the journey!

**Stephen J. Stefanac**
**Samuel P. Nesbit**

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- Obtaining Informed Consent for a Treatment Plan, Chapter 4
- Interview of a Patient in Pain, Chapter 8
- Tooth Vitality Testing, Chapter 8
- Demonstration of Oral Hygiene Instructions, Chapter 9
- Tour of an Operatory for Special Needs Patients, Chapter 12
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- Interview of an Anxious Patient, Chapter 14
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**Case studies –** Each case has a chief concern, narrative patient history, radiographs, clinical findings, periodontal charting, risk assessment, and a diagnosis list. Armed with this information, the reader is challenged to develop a comprehensive and ideally sequenced treatment plan.

# ACKNOWLEDGMENTS

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SECTION 1

# Patient Examination and Diagnosis

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# Patient Evaluation and Assessment

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http://evolve.elsevier.com/Stefanac/diagnosis/

## OUTLINE

**Overview of the Diagnostic Process**
**Information Gathering**
Patient History
Clinical Examination
Radiographic Examination
Other Diagnostic Aids
Documentation

Accurate diagnostic information forms the foundation of any treatment plan. This information comes from several sources: the patient history and physical examination, the clinical and radiographic examination, and other diagnostic sources. The dentist must critically analyze the information before recommending treatment options to the patient. The goal of this chapter is to discuss both the types of data that the dentist in general practice typically collects and the ways in which the dentist evaluates and documents this information in preparation for creating a treatment plan. There are several types of examinations (Box 1-1), and the focus of this chapter is on the comprehensive assessment of a patient.

## OVERVIEW OF THE DIAGNOSTIC PROCESS

The diagnostic process is begun by gathering information about the patient and creating a **patient database** that will serve as the basis for all future patient care decisions. Although the components of each patient's database vary, each includes pieces of relatively standard information, or **findings,** that come from asking questions, reviewing information on forms, observing and examining structures, performing diagnostic tests, and consulting with physicians and other dentists.

Findings fall into several categories. **Signs** are findings discovered by the dentist during an examination. For instance, the practitioner may observe that a patient has swollen ankles and difficulty in breathing when reclined, signs suggestive of congestive heart failure. Findings verbally revealed by the patients themselves, usually because they are causing problems, are referred to as **symptoms**. Patients may report such common symptoms as pain, swelling, broken teeth, loose teeth, bleeding gums, or esthetic concerns. When a symptom becomes the motivating factor for a patient to seek dental treatment, it is referred to as the chief complaint or chief concern. Patients who are new to a practice or presenting for emergency dental care often have one or more chief concerns (Figure 1-1).

The clinician must evaluate findings individually and in conjunction with other findings to determine whether the finding is significant. For example, the finding that a patient is being treated for hypertension may be not be significant alone, but when accompanied by another finding of blood pressure measuring 180/110 mm Hg, the level of importance of the first finding increases. Questions arise as to whether the patient's hypertension is being managed appropriately or whether the patient is even taking the prescribed medication regularly. Obviously, further questioning of the patient is in order, generating even more findings to evaluate for significance. The process of differentiating *significant* from *insignificant* findings can be challenging for dental students and recent graduates. For example, a student may believe a dark spot on the occlusal surface of a tooth to be significant, whereas a faculty member might discard the finding as simply stained fissure, not requiring treatment. Thankfully, this differentiation and selection process becomes easier as the clinician gains experience from examining and treating more and more patients.

The process of discovering significant findings leads to a list of **diagnoses** and **patient problems**, and a comprehensive patient diagnosis, that ultimately forms the basis for creating a treatment plan (Figure 1-2). Diagnoses are precise terms that identify a particular disease or problem from signs or symptoms. Examples include diabetes, caries, periodontitis, malocclusion. Problems can defy a precise diagnosis but are important issues to be addressed when planning treatment. Examples include pain, swelling, difficulty chewing, or dissatisfaction with appearance. Additional examples of common diagnoses and problems are discussed in Chapter 2.

Experienced practitioners may not always evaluate patients in a linear, sequential fashion. Instead, they move back and forth between discovering findings, evaluating

**BOX 1-1 Common Types of Examinations**

The dentist should be able to provide several types of examinations for adolescent and adult patients. Most new patients to a dental office without urgent concerns will require a **comprehensive examination** before beginning treatment. A comprehensive examination includes a review and analysis of the patient's health history and chief concerns, radiographic examination of the teeth and surrounding tissues, and clinical evaluation of the intraoral and extraoral hard and soft tissues. A **periodic examination** is performed at regular intervals, commonly during recall visits, for patients who have had a comprehensive or prior periodic examination. Activities include updating general and oral health histories and examination of extraoral hard and soft tissues. A **problem-focused examination** is limited to evaluating a specific problem or concern presented by the patient—for example, the evaluation of pain, swelling, broken teeth, or damaged restorations.

**FIG 1-1** This patient reported symptoms of tooth pain and bleeding gums. Many signs—dark teeth, receding gingival tissue, and poor oral hygiene—suggest serious dental problems.

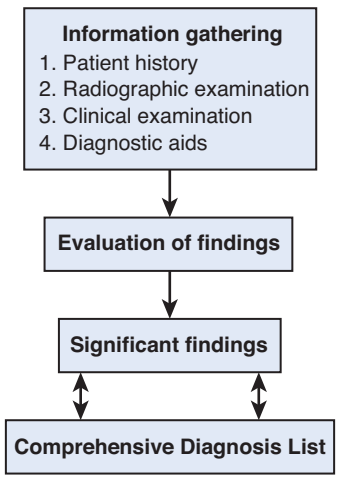


**FIG 1-2** The pathway to reaching a diagnosis.

for significance, and making a diagnosis, and they may begin to think about treatment options before gathering all the data. Despite this normal process, the novice practitioner (and even the experienced one) is *highly* advised against proposing treatment recommendations to patients before creating and analyzing the entire patient database. Typically, the patient initiates the discussion during the examination process. For example, examination of a sensitive tooth may elicit a query from the patient as to whether it can be saved and at what cost. Saying "yes" and "in two appointments" may prove embarrassing when subsequent radiographs reveal extensive decay and the need to extract the tooth. To prevent such errors, the inquisitive patient should be gently reminded that the examination is not yet complete and that, as more information is gathered, it will be possible to answer questions more completely.

Gathering and recording information about the patient often requires more time and attention than any other aspect of treatment planning. To prevent missing important findings, the dentist should gather data in an organized, systematic manner. Each practitioner must develop a consistent and standardized method for gathering historical information about the patient, obtaining radiographs, and performing the clinical examination. It is essential that any data gathered be both *complete* and *accurate*. If deficiencies occur in either completeness or accuracy, the validity of the final treatment plan may be suspect.

The sheer number of findings that arise when evaluating a patient with many dental problems or a complicated health history can overwhelm the beginning practitioner. Staying focused on each stage of information gathering and being careful to record information in an organized and systematic fashion for later analysis help to prevent confusion. This section discusses the four major categories of information required to begin developing a treatment plan: the patient history, clinical examination, radiographic examination, and other diagnostic aids.

## INFORMATION GATHERING

### Patient History

The distinguished Canadian physician Sir William Osler wrote, "Never treat a stranger."[1] His words underscore the need for a thorough patient history; experienced dentists learn everything they can about their patients *before* beginning treatment. Obtaining a complete and accurate patient history is part of the art of being a doctor. It takes considerable practice and self-study to become a talented investigator. No set amount of historical information is required for each patient. The volume of information collected and the complexity of the data collection process naturally depend on the severity of the patient's problems. As more information comes to light, additional diagnostic techniques may need to be used.

In dental offices, persons other than the dentist have access to patient information. The entire office staff should be

aware of the confidential nature of patient information and cautioned about discussing any patient's general or oral health history other than for treatment purposes. The author is reminded of an example of a lapse in confidentiality. When updating the health history, a staff member learned that a patient had recently become pregnant. Later in the day, the patient's mother was in the office, and another staff member congratulated her on her daughter's pregnancy. At first the mother was elated, but later was hurt that her daughter had not told her herself. The incident provided an uncomfortable reminder of the importance of keeping patient information confidential both inside and outside the office.

In the United States, the Health Insurance Portability and Accountability Act of 1996, **HIPAA,** requires practitioners and healthcare organizations to prevent unnecessary use and release of **protected health information** (**PHI**). Patient PHI includes medical findings, diagnoses and treatment notes, and any demographic data that could identify the patient, such as an address, phone number, or personal identification number. HIPAA permits the use of a patient's PHI for treatment purposes, obtaining payment for services, and other organizational requirements, such as quality assurance activities or assisting legal authorities. Patients must be given, and sign, an acknowledgment that they have received information about how the practitioner or organization will use the PHI and whom they can contact if they believe their health information has been inappropriately used or released. Under HIPAA, the patient also has the right to inspect, and even amend, his or her medical records.

## Techniques for Obtaining a Patient History

The two primary methods for obtaining the patient history are (1) questionnaires and forms and (2) patient interviews. A secondary method involves requesting information from another healthcare practitioner.

***Questionnaires and forms.*** The use of questionnaires and forms during the examination process offers several advantages. Questionnaires save time, do not require any special skills to administer, and provide a standardized method for obtaining information from a variety of patients. Many types of forms are available commercially, or the practitioner can create his or her own.

Unfortunately, using a form to gather information has several disadvantages. The dentist only gets answers to the questions asked on the form, and important findings may be missed. The severity of a condition may not be reflected in a simple positive response. Patients may misinterpret questions, resulting in incorrect answers. It may be necessary to have the forms printed in other languages to facilitate information gathering. The more comprehensive the questionnaire is, the longer it must be, which can be frustrating to patients. Many dental clinics have implemented **electronic health records** (**EHR**), and patients may now enter their health information directly into electronic forms. One advantage of using this method is that the initial questionnaire can be brief, with the patient being prompted for more information if there is a positive response to a higher-level question. This individualized approach to delving into the positive responses would be difficult to duplicate efficiently with a paper form. Finally, with a questionnaire or form, patients can more easily falsify or fail to completely reveal important information than when confronted directly in an interview.

***Patient interviews.*** A major advantage to interviewing patients is that the practitioner can tailor questions to the individual patient. The patient interview serves a problem-solving function and develops quite differently from a personal conversation. There is a level of formality to the discussion, which centers on the patient's health and oral care needs, problems, and desires. To obtain accurate information and avoid influencing the responses, the dentist must be a systematic and unbiased information gatherer and must have excellent communication skills. The clinician must adapt these skills to interact with patients from varying cultural, gender, and socioeconomic backgrounds. Being a good listener is key to facilitating information flow from the patient. The desired outcome of the interviewing process is the development of a good rapport with the patient by establishing a cooperative and harmonious interaction.

If the interviewer does not speak the patient's language, it may be necessary to have translation services available. A sign language translator may be also required if the patient is hearing impaired. Older patients may require more time for interviewing, particularly if their health histories are complex.[2]

The dentist can ask two general types of questions when interviewing: open and closed. **Open questions** cannot be answered with a simple response, such as "yes" or "no." Instead, open questions get the patient involved and generate reflection by asking for opinions, past experiences, feelings, or desires. Open questions usually begin with "what" or "how" and should avoid leading the patient to a specific answer.

Examples:

- How may I help you?
- What do you think is your biggest dental problem?
- Tell me about your past dental care.
- Tell me more about your heart problems.

**Closed questions,** on the other hand, are usually simple to answer with one or two words. They permit specific facts to be obtained or clarified but do not give insight into patient beliefs, attitudes, or feelings.

Examples:

- Do any of your teeth hurt?
- Which tooth is sensitive to cold?
- How long has it been since your teeth were last examined?
- Do you have a heart problem?

In general, the examiner should use open questions when beginning to inquire about a problem. Later, closed questions can be asked to obtain answers to specific questions. The skilled clinician knows when to use each type of question during the interview. Examples are presented in the following sections. The *In Clinical Practice* box features tips on how to be an effective interviewer.

## IN CLINICAL PRACTICE

**Principles for Effective Interviewing**

- Eye contact is important, so position the dental chair upright and sit facing the patient. Raise or lower the operator's stool so that your eyes are at the same level as the patient's.
- Use open-ended questions when seeking further information about positive responses to items on the health questionnaire.
- If the patient is hesitant or doesn't answer, explain why you are asking the question.
- Be an objective, unbiased interviewer. Avoid adding personal feelings. The primary goals during the interview are to accumulate and assess the facts, not to influence them.
- Be an attentive, active listener. The "golden rule" of interviewing is to listen more than speak.
- Use verbal facilitators like "yes" and "uh huh" to encourage patients to share information.
- Be aware of the patient's nonverbal communication, such as crossing arms or legs or avoiding making eye contact.
- At the conclusion of the interview, summarize what you've learned from the patient to confirm accuracy.
- See Video 1-1 Effective and Ineffective Interviewing on Evolve.

### Components of a Patient History

***Demographic data.*** Demographic data includes basic information, such as the patient's name, address, phone number, physician's name and phone, third party (insurance) information, national identification information, and so on. Demographic data, like any other historical information, must be accurate, complete, and current. Errors in recording insurance information, such as an incorrect policy number or failure to clarify who is responsible for payment, can be costly to a dental practice.

Useful additional information includes work, mobile, and evening telephone numbers, and seasonal and electronic mail addresses. The patient reports most of this information on demographic questionnaires and forms at the first visit (Figure 1-3). The office staff may also interview the patient if additional information is required or if information requires updating. Although commercial forms can be used to record and organize demographic information, many practices have designed their own. Dental practices that use an electronic health record instead of a paper record may scan paper forms or have the patient enter information into a computer or hand held device that is linked directly to the clinic information system.

***Chief concern or complaint and history.*** The **chief complaint** or **chief concern** is the primary reason, or reasons, that the patient has presented for treatment. For most patients, the chief complaint is usually a symptom or a request. Any complaints are best obtained by asking the patient an open-ended question, such as, "What brought you to see me today?" or "Is there anything in particular you are hoping I can do for you?" This is more effective than limiting the patient's response by asking a closed question, such as: "Is anything bothering you right now?" or "Has it been a long time since you've seen a dentist?" Record chief complaints in quotes to signify that the patient's own words are used. Careful attention to the chief complaint should alert the practitioner to important diagnoses and provide an appreciation for the patient's perception of his or her problems, including level of knowledge about dentistry.

The **history of present illness (HPI)** is the history of the chief complaint, which the patient usually supplies with a little prompting. When possible, the dentist should keep the questioning open, although specific (closed) questions help clarify details.

Example 1:

Chief complaint

"My tooth hurts." *(a symptom)*

HPI: The patient has had a dull ache in the lower right quadrant that has been increasing in intensity for the past 4 days. The pain is worse with hot stimuli and chewing and is not relieved by aspirin.

Example 2:

Chief complaint

"I lost a filling and need my teeth checked." *(a symptom and a request)*

HPI: The patient lost a restoration from an upper right molar 2 days ago. The tooth is asymptomatic. Her last dental examination and prophylaxis were 2 years ago.

Resolving the patient's chief complaint as soon as possible represents a "golden rule" of treatment planning. When a new patient presents in pain, the dentist may need to suspend the comprehensive examination process and instead focus on the specific problem, make a diagnosis and, quite possibly, begin treatment.

At times, the chief complaint may be very general, such as, "I need to chew better," or "I don't like the appearance of my teeth." In such instances, the practitioner must carefully dissect the issues of concern to the patient. Often, what initially appears to be the problem may be a more complex issue that will be difficult to manage until later in the treatment plan. During the course of treatment, the dentist should advise the patient as to what progress is being made toward resolving the initial chief complaint.

***General health history.*** The dentist must obtain a health history from each patient and regularly update this information in the record. A comprehensive health history contains a review of all of the patient's past and present physical illnesses and psychiatric disorders. Information about a patient's health history can prevent or help manage an emergency. Some systemic diseases may affect the oral cavity and the patient's response to dental treatment, including delaying healing or increasing the chance for infection. Conversely, some oral diseases can affect the patient's general health. Because many patients see their dentist more frequently than they see their physician, the dentist should use the patient's general health history and physical examination to screen for significant systemic diseases, such as hypertension and diabetes.

Most dental practices screen for potential health problems by asking all new patients to complete a health questionnaire (Figure 1-4). When reviewing the health questionnaire, the

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UNIVERSITY OF MICHIGAN

**Patient Registration Information – Please Print using black or blue ink**

| Title | Patient's Last Name | First Name | Middle | Preferred | Gender |
|---|---|---|---|---|---|
| Date of Birth | Social Security No. | Marital Status | Email Address | | |
| Home Address | Apt or Box No. | City | State | Zip Code | |
| Home Phone Number | Daytime Phone Number | Cell Phone Number | Preferred Contact Number | | |
| Emergency Contact – Name | Relation | Daytime Phone No. | Address (Street, City, State, Zip) | | |

Race/Ethnicity (optional)
Black/African American ☐ American Indian/Alaska Native ☐ Asian ☐ Native Hawaiian/Pacific Islander ☐ White ☐
Hispanic / Latin / Spanish Yes ☐ No ☐

**Guarantor/Guardian Information**

| Title | Last Name | First Name | Middle | Relation | Gender |
|---|---|---|---|---|---|
| Date of Birth | Social Security No. | Marital Status | | | |
| Home Address | Apt or Box No. | City | State | Zip Code | Email Address |
| Home Phone Number | Daytime Phone Number | Cell Phone Number | Preferred Contact Number | | |

**Patient's Primary Dental Insurance Information**

| Subscriber's Name | Subscriber's ID | Subscriber's DOB | Insurance Co. | Group No. |
|---|---|---|---|---|
| Employer | Address of Employer | | Subscriber's Relationship to Patient | |

**Patient's Secondary Dental Insurance Information**

| Subscriber's Name | Subscriber's ID | Subscriber's DOB | Insurance Co. | Group No. |
|---|---|---|---|---|
| Employer | Address of Employer | | Subscriber's Relationship to Patient | |

**Assignment of Benefits and Release of Information**

I authorize the University of Michigan School of Dentistry (UMSD) or the Dental Faculty Associates (DFA) to release any and all information contained in my dental/medical records to (a) any third party payer, insurance agencies or carriers or their agents which may be responsible in whole or in part for paying any expenses associated with my treatment; (b) any health care facility or provider for the purpose of facilitation continuing care and treatment; (c) attorneys or agencies representing the UMSD or the DFA in connection with collection actions against insurers, benefit plan, or the patient, or estate; and (d) any federal or state agency as required by law.

I assign and authorize direct payment of all health care benefits and other forms of payment of any kind which relate to the care provided to me at the UMSD, the DFA or its offsite clinics for application to my bill(s). I assign to the UMSD or the DFA all claims benefits or any related rights or claims I may have under the Employment Retirement Income Security Act (ERISA) or other applicable law, against any insurer, employee, trustee, fiduciary, employee welfare plan, employee benefit association, or other person who may be liable to pay charges due to the UMSD or the DFA for my care, and agree that the UMSD or the DFA may pursue any claim to these benefits, whether or not I choose to pursue that claim. I guarantee full financial responsibility for payment of all expenses associated with my care and treatment, including any portion of any charges not paid by insurance, including motor vehicle insurance, worker's compensation or social agencies and agree to pay the same at the time of delivery of service, discharge from treatment, or on any interim basis. These expenses will include but are not limited to deductibles, co-insurance, non-covered benefits services, and services requiring prior authorization which were not authorized

**Signature of Patient, Parent, or Guardian** _____ Date _____ **Relationship to Patient** _____

**Witness Signature** _____ Date _____

Revised 6/2013

**FIG 1-3** Form for recording demographic data. (Courtesy the University of Michigan School of Dentistry, Ann Arbor, MI.)

# Health History Form

ADA American Dental Association®
America's leading advocate for oral health

Email: Today's Date:

As required by law, our office adheres to written policies and procedures to protect the privacy of information about you that we create, receive or maintain. Your answers are for our records only and will be kept confidential subject to applicable laws. Please note that you will be asked some questions about your responses to this questionnaire and there may be additional questions concerning your health. This information is vital to allow us to provide appropriate care for you. This office does not use this information to discriminate.

Name: *Last* *First* *Middle*
Home Phone: *Include area code* ( )
Business/Cell Phone: *Include area code* ( )
Address: *Mailing address*
City: State: Zip:
Occupation: Height: Weight: Date of Birth: Sex: M F
SS# or Patient ID: Emergency Contact: Relationship: Home Phone: *Include area code* ( ) Cell Phone: *Include area code* ( )
If you are completing this form for another person, what is your relationship to that person?
*Your Name* *Relationship*

**Do you have any of the following diseases or problems:** *(Check DK if you Don't Know the answer to the the question)*

| | Yes | No | DK |
|---|---|---|---|
| Active Tuberculosis | ☐ | ☐ | ☐ |
| Persistent cough greater than a 3 week duration | ☐ | ☐ | ☐ |
| Cough that produces blood | ☐ | ☐ | ☐ |
| Been exposed to anyone with tuberculosis | ☐ | ☐ | ☐ |

***If you answer yes to any of the 4 items above, please stop and return this form to the receptionist.***

## Dental Information *For the following questions, please mark (X) your responses to the following questions.*

| | Yes | No | DK |
|---|---|---|---|
| Do your gums bleed when you brush or floss? | ☐ | ☐ | ☐ |
| Are your teeth sensitive to cold, hot, sweets or pressure? | ☐ | ☐ | ☐ |
| Is your mouth dry? | ☐ | ☐ | ☐ |
| Have you had any periodontal (gum) treatments? | ☐ | ☐ | ☐ |
| Have you ever had orthodontic (braces) treatment? | ☐ | ☐ | ☐ |
| Have you had any problems associated with previous dental treatment? | ☐ | ☐ | ☐ |
| Is your home water supply fluoridated? | ☐ | ☐ | ☐ |
| Do you drink bottled or filtered water? | ☐ | ☐ | ☐ |
| If yes, how often? *Circle one:* DAILY / WEEKLY / OCCASIONALLY | | | |
| Are you currently experiencing dental pain or discomfort? | ☐ | ☐ | ☐ |

| | Yes | No | DK |
|---|---|---|---|
| Do you have earaches or neck pains? | ☐ | ☐ | ☐ |
| Do you have any clicking, popping or discomfort in the jaw? | ☐ | ☐ | ☐ |
| Do you brux or grind your teeth? | ☐ | ☐ | ☐ |
| Do you have sores or ulcers in your mouth? | ☐ | ☐ | ☐ |
| Do you wear dentures or partials? | ☐ | ☐ | ☐ |
| Do you participate in active recreational activities? | ☐ | ☐ | ☐ |
| Have you ever had a serious injury to your head or mouth? | ☐ | ☐ | ☐ |

Date of your last dental exam:
What was done at that time?
Date of last dental x-rays:

What is the reason for your dental visit today?
How do you feel about your smile?

## Medical Information *Please mark (X) your response to indicate if you have or have not had any of the following diseases or problems.*

| | Yes | No | DK |
|---|---|---|---|
| Are you now under the care of a physician? | ☐ | ☐ | ☐ |
| Physician Name: Phone: *Include area code* ( ) | | | |
| Address/City/State/Zip: | | | |
| Are you in good health? | ☐ | ☐ | ☐ |
| Has there been any change in your general health within the past year? | ☐ | ☐ | ☐ |
| If yes, what condition is being treated? | | | |
| Date of last physical exam: | | | |

| | Yes | No | DK |
|---|---|---|---|
| Have you had a serious illness, operation or been hospitalized in the past 5 years? | ☐ | ☐ | ☐ |
| If yes, what was the illness or problem? | | | |
| Are you taking or have you recently taken any prescription or over the counter medicine(s)? | ☐ | ☐ | ☐ |
| If so, please list all, including vitamins, natural or herbal preparations and/or dietary supplements: | | | |

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Form S500

**FIG 1-4 A,** Health history form, front side.

*Continued*

## Medical Information *Please mark (X) your response to indicate if you have or have not had any of the following diseases or problems.*

| *(Check DK if you Don't Know the answer to the question)* | Yes | No | DK |
|---|---|---|---|
| Do you wear contact lenses? | ☐ | ☐ | ☐ |
| **Joint Replacement.** Have you had an orthopedic total joint (hip, knee, elbow, finger) replacement? | ☐ | ☐ | ☐ |
| Date: _____ If yes, have you had any complications? _____ | | | |
| Are you taking or scheduled to begin taking an antiresorptive agent (like Fosamax®, Actonel®, Atelvia, Boniva®, Reclast, Prolia) for osteoporosis or Paget's disease? | ☐ | ☐ | ☐ |
| Since 2001, were you treated or are you presently scheduled to begin treatment with an antiresorptive agent (like Aredia®, Zometa®, XGEVA) for bone pain, hypercalcemia or skeletal complications resulting from Paget's disease, multiple myeloma or metastatic cancer? | ☐ | ☐ | ☐ |
| Date Treatment began: _____ | | | |

| | Yes | No | DK |
|---|---|---|---|
| Do you use controlled substances (drugs)? | ☐ | ☐ | ☐ |
| Do you use tobacco (smoking, snuff, chew, bidis)? | ☐ | ☐ | ☐ |
| If so, how interested are you in stopping? *Circle one:* VERY / SOMEWHAT / NOT INTERESTED | | | |
| Do you drink alcoholic beverages? | ☐ | ☐ | ☐ |
| If yes, how much alcohol did you drink in the last 24 hours? _____ | | | |
| If yes, how much do you typically drink i n a week? _____ | | | |
| **WOMEN ONLY** Are you: | | | |
| Pregnant? | ☐ | ☐ | ☐ |
| Number of weeks: _____ | | | |
| Taking birth control pills or hormonal replacement? | ☐ | ☐ | ☐ |
| Nursing? | ☐ | ☐ | ☐ |

**Allergies.** Are you allergic to or have you had a reaction to:
To all **yes** responses, specify type of reaction.

| | Yes | No | DK |
|---|---|---|---|
| Local anesthetics _____ | ☐ | ☐ | ☐ |
| Aspirin _____ | ☐ | ☐ | ☐ |
| Penicillin or other antibiotics _____ | ☐ | ☐ | ☐ |
| Barbiturates, sedatives, or sleeping pills _____ | ☐ | ☐ | ☐ |
| Sulfa drugs _____ | ☐ | ☐ | ☐ |
| Codeine or other narcotics _____ | ☐ | ☐ | ☐ |
| Metals _____ | ☐ | ☐ | ☐ |
| Latex (rubber) _____ | ☐ | ☐ | ☐ |
| Iodine _____ | ☐ | ☐ | ☐ |
| Hay fever/seasonal _____ | ☐ | ☐ | ☐ |
| Animals _____ | ☐ | ☐ | ☐ |
| Food _____ | ☐ | ☐ | ☐ |
| Other _____ | ☐ | ☐ | ☐ |

***Please mark (X) your response to indicate if you have or have not had any of the following diseases or problems.***

| | Yes | No | DK |
|---|---|---|---|
| Artificial (prosthetic) heart valve | ☐ | ☐ | ☐ |
| Previous infective endocarditis | ☐ | ☐ | ☐ |
| Damaged valves in transplanted heart | ☐ | ☐ | ☐ |
| Congenital heart disease (CHD) | | | |
| Unrepaired, cyanotic CHD | ☐ | ☐ | ☐ |
| Repaired (completely) in last 6 months | ☐ | ☐ | ☐ |
| Repaired CHD with residual defects | ☐ | ☐ | ☐ |

*Except for the conditions listed above, antibiotic prophylaxis is no longer recommended for any other form of CHD.*

| | Yes | No | DK |
|---|---|---|---|
| Cardiovascular disease | ☐ | ☐ | ☐ |
| Angina | ☐ | ☐ | ☐ |
| Arteriosclerosis | ☐ | ☐ | ☐ |
| Congestive heart failure | ☐ | ☐ | ☐ |
| Damaged heart valves | ☐ | ☐ | ☐ |
| Heart attack | ☐ | ☐ | ☐ |
| Heart murmur | ☐ | ☐ | ☐ |
| Low blood pressure | ☐ | ☐ | ☐ |
| High blood pressure | ☐ | ☐ | ☐ |
| Other congenital heart defects | ☐ | ☐ | ☐ |
| Mitral valve prolapse | ☐ | ☐ | ☐ |
| Pacemaker | ☐ | ☐ | ☐ |
| Rheumatic fever | ☐ | ☐ | ☐ |
| Rheumatic heart disease | ☐ | ☐ | ☐ |
| Abnormal bleeding | ☐ | ☐ | ☐ |
| Anemia | ☐ | ☐ | ☐ |
| Blood transfusion If yes, date: _____ | ☐ | ☐ | ☐ |
| Hemophilia | ☐ | ☐ | ☐ |
| AIDS or HIV infection | ☐ | ☐ | ☐ |
| Arthritis | ☐ | ☐ | ☐ |

| | Yes | No | DK |
|---|---|---|---|
| Autoimmune disease | ☐ | ☐ | ☐ |
| Rheumatoid arthritis | ☐ | ☐ | ☐ |
| Systemic lupus erythematosus | ☐ | ☐ | ☐ |
| Asthma | ☐ | ☐ | ☐ |
| Bronchitis | ☐ | ☐ | ☐ |
| Emphysema | ☐ | ☐ | ☐ |
| Sinus trouble | ☐ | ☐ | ☐ |
| Tuberculosis | ☐ | ☐ | ☐ |
| Cancer/Chemotherapy/ Radiation Treatment | ☐ | ☐ | ☐ |
| Chest pain upon exertion | ☐ | ☐ | ☐ |
| Chronic pain | ☐ | ☐ | ☐ |
| Diabetes Type I or II | ☐ | ☐ | ☐ |
| Eating disorder | ☐ | ☐ | ☐ |
| Malnutrition | ☐ | ☐ | ☐ |
| Gastrointestinal disease | ☐ | ☐ | ☐ |
| G.E. Reflux/persistent heartburn | ☐ | ☐ | ☐ |
| Ulcers | ☐ | ☐ | ☐ |
| Thyroid problems | ☐ | ☐ | ☐ |
| Stroke | ☐ | ☐ | ☐ |

| | Yes | No | DK |
|---|---|---|---|
| Glaucoma | ☐ | ☐ | ☐ |
| Hepatitis, jaundice or liver disease | ☐ | ☐ | ☐ |
| Epilepsy | ☐ | ☐ | ☐ |
| Fainting spells or seizures | ☐ | ☐ | ☐ |
| Neurological disorders If yes, specify: _____ | ☐ | ☐ | ☐ |
| Sleep disorder | ☐ | ☐ | ☐ |
| Do you snore? | ☐ | ☐ | ☐ |
| Mental health disorders Specify: _____ | ☐ | ☐ | ☐ |
| Recurrent Infections Type of infection: _____ | ☐ | ☐ | ☐ |
| Kidney problems | ☐ | ☐ | ☐ |
| Night sweats | ☐ | ☐ | ☐ |
| Osteoporosis | ☐ | ☐ | ☐ |
| Persistent swollen glands in neck | ☐ | ☐ | ☐ |
| Severe headaches/ migraines | ☐ | ☐ | ☐ |
| Severe or rapid weight loss | ☐ | ☐ | ☐ |
| Sexually transmitted disease | ☐ | ☐ | ☐ |
| Excessive urination | ☐ | ☐ | ☐ |

| | Yes | No | DK |
|---|---|---|---|
| Has a physician or previous dentist recommended that you take antibiotics prior to your dental treatment? | ☐ | ☐ | ☐ |

Name of physician or dentist making recommendation: Phone: *Include area code* ( )

| | Yes | No | DK |
|---|---|---|---|
| Do you have any disease, condition, or problem not listed above that you think I should know about? Please explain: | ☐ | ☐ | ☐ |

**NOTE: Both doctor and patient are encouraged to discuss any and all relevant patient health issues prior to treatment.**
I certify that I have read and understand the above and that the information given on this form is accurate. I understand the importance of a truthful health history and that my dentist and his/her staff will rely on this information for treating me. I acknowledge that my questions, if any, about inquiries set forth above have been answered to my satisfaction. I will not hold my dentist, or any other member of his/her staff, responsible for any action they take or do not take because of errors or omissions that I may have made in the completion of this form.

Signature of Patient/Legal Guardian: Date:

Signature of Dentist: Date:

**FOR COMPLETION BY DENTIST**

Comments:

**FIG 1-4, cont'd B,** Health history form, back side. (Copyright © 2015 American Dental Association. All rights reserved. Reprinted with permission.)

dentist must look for conditions that may affect head and neck findings, treatment, patient management, or treatment outcomes. Interviewing the patient, first with open-ended questions about the problem and later with closed questions, usually clarifies positive responses to the questionnaire. Although it is beyond the scope of this book to present all the systemic conditions that can affect dental treatment, several are discussed in Chapter 7, including guidelines for consulting with the patient's physician when the dentist has detected significant findings.

Whether using a preprinted questionnaire or an interview technique, the general health history should include a **review of systems.** The information gained through the review of systems enables the dentist (1) to recognize significant health problems that may affect dental treatment and (2) to elicit information suggestive of new health problems that have been previously unrecognized, undiagnosed, or untreated. Commonly reviewed systems and examples of some significant findings are shown in Table 1-1.

***Medication history.*** Including both prescription and nonprescription medications in the medication history also provides valuable insight into the patient's overall health. Any over-the-counter medications, herbal remedies, vitamins, or nutritional supplements used also should be included. The medication history can corroborate findings from the health history or may suggest new diseases or conditions that need further investigation. Some medications are, in themselves, cause for limiting, delaying, or modifying dental treatment. The dentist may consult one of several reference sources to help determine the indications and potential problems that may arise from the use of various drugs. Several references, available on electronic media or on the Internet, provide rapid access to information (Figure 1-5).

***Personal history.*** The patient's social, emotional, and behavioral history represents one of the most important and challenging areas to investigate. The patient's occupation, habits, financial resources, and general lifestyle can significantly influence attitudes about dentistry. It is important to investigate the patient's attitudes about the profession, including priorities, expectations, and motivations for seeking treatment. The personal history is also a prime source of information about the patient's financial status, time availability for treatment, and mode of transportation to dental visits—any or all of which may have a bearing on how dental

**TABLE 1-1 Review of Systems With Examples of Significant Findings for Dentists**

| System | Examples of significant findings for dentists |
|---|---|
| Constitutional symptoms (e.g., fever, weight loss) | Unexplained weight loss, fatigue and malaise, fever, recent trauma |
| Eyes | Vision loss |
| Ears, nose, mouth, and throat | Hearing loss, sinus problems |
| Cardiovascular | Hypertension, chest pain, shortness of breath |
| Respiratory | Cough, shortness of breath, wheezing |
| Gastrointestinal | Gastroesophageal reflux disease (GERD), unhealthy diet, food avoidance, and allergies |
| Genitourinary | Pregnancy |
| Musculoskeletal | Arthritis and joint pain, inability to sit/recline |
| Integumentary (skin and/or breast) | Skin lesions |
| Neurological | Headache, seizures, fainting |
| Psychiatric | Depression, anxiety, bipolar disorders, side effects of medications |
| Endocrine | Diabetes, thyroid problems |
| Hematologic/lymphatic | Anemia, coagulation problems, liver diseases |
| Allergic/immunologic | Medication allergies, seasonal allergies |

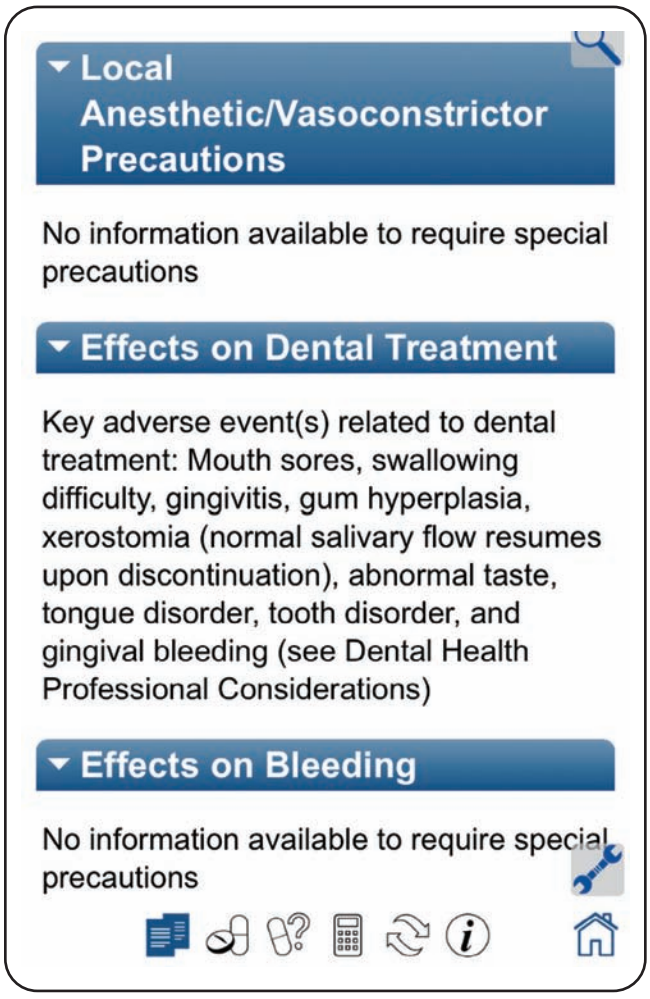



**FIG 1-5** Example of drug information from an application viewed on a mobile device. (Courtesy Wolters Kluwer Clinical Drug Information, Inc. Dental Lexi-Drugs. Wolters Kluwer; 2014.)

treatment is planned or executed. Much of the personal history will overlap with the oral health history, especially concerns relating to fear of dental treatment (covered in depth in Chapter 14) and concerns about the cost of treatment (discussed in Chapter 18).

The personal history also includes information about the patient's nutrition and dietary habits, with the primary goal of determining the level of fermentable carbohydrates consumed.[3] Frequently used screening questions include
"What do you drink during the day?"
"What do you eat for meals and for snacks?"
"Where is there sugar in your diet?"

The health questionnaire can be used to evaluate the personal history for information about habits such as smoking, alcohol, and drug use, and the clinician should quantify the extent of use. Often, however, these questions are best pursued verbally, during the patient interview. For cigarette smokers, the number of packs of cigarettes is multiplied by the number of years the patient has smoked (½ pack a day for 10 years is a 5 pack-year smoking habit). A patient's behavior or medication profile may suggest the presence of some type of psychological disorder, a topic discussed further in Chapter 15.

***Oral health history.*** The oral health history incorporates such areas as the date of last dental examination, frequency of dental visits, types of treatment received, and history of any problems that have emerged when receiving dental care. Common problems include syncope (fainting), general anxiety, and reactions to drugs used in dentistry. Patients should also be questioned about their oral hygiene practices. Experienced dentists spend whatever time is necessary to investigate the oral health history of the patient because of the strong influence it can have on future treatment.

While obtaining the oral health history, the dentist should first determine the general nature of the patient's past care. Has the patient seen a dentist regularly or been treated only on an episodic basis? What kind of oral healthcare did the patient receive as a child? The frequency of oral healthcare can be an important predictor of how effectively the patient will comply with new treatment recommendations. If the patient has visited the dentist regularly, what types of treatment were provided? Was the patient satisfied with the treatment received? Did the dentist do anything in particular to make treatment more comfortable? It also is important to establish whether the patient has had any specialty treatment, such as orthodontic, endodontic, or periodontal care, in the event additional such treatment is required in the future.

Investigation into the patient's dental history supplements the clinical examination, during which new findings may be identified. The dentist should establish the explanation for any missing teeth, including when they were removed. Knowing the age of suspect restorations may yield important perspectives on the quality of previous work, how well previous treatment has held up, the patient's oral hygiene, and the prognosis for new work. The age of tooth replacements may also have a bearing on whether the patient's dental insurance will cover any necessary replacement.

## Clinical Examination

Developing an accurate and comprehensive treatment plan depends on a thorough analysis of all general and oral health conditions that exist when the patient presents for evaluation. A comprehensive clinical examination involves assembling significant findings from the following five areas:

- Physical examination
- Intraoral and extraoral soft tissue examination
- Periodontal examination
- Examination of the teeth
- Radiographic examination

### Physical Examination

The dentist has several tools that can be used to evaluate the patient's overall physical condition. Obtaining the patient's blood pressure and pulse rate represents one objective method. A more subjective, but equally valuable, approach involves simply evaluating the patient's appearance, looking both at general physical attributes and, more specifically, at the head and neck area. During this process, the clinician is searching for variations from normal that are not being managed by a physician and may have significance in a dental setting.

Unlike the physician, who examines many areas of the body for signs of disease, the dentist in general practice usually performs only a limited overall physical examination that includes only evaluation of

- Patient posture and gait
- Exposed skin surfaces
- Vital signs
- Cognition and mental acuity
- Speech and ability to communicate

With careful observation and findings from the health history, the dentist can detect many signs of systemic diseases that could have treatment implications and may suggest referral to a physician. For example, a patient who has difficulty walking may be afflicted with osteoarthritis or have a neurologic problem, such as Parkinson's disease or the after effects of a stroke. The appearance of the skin, hair, and eyes may suggest such diseases as anemia, hypothyroidism, or hepatitis.

***Vital signs.*** Measuring vital signs provides an easy and objective measurement for physical evaluation. Blood pressure and pulse rate measurements should be obtained at every new patient examination, and at subsequent periodic examinations. With the advent of accurate electronic blood pressure measuring devices, measuring blood pressure and pulse rate has become a relatively simple process. Many clinicians routinely take the blood pressure at every visit in which a local anesthetic or sedative medication will be administered. The vital signs should also be taken at the beginning of *all* visits for patients under treatment for high blood pressure, thyroid disease, or cardiac disease.

Blood pressure measurements can vary considerably between individuals. Target blood pressure values for adults are listed in Table 1-2. The dentist is primarily concerned when the patient has high blood pressure. Low blood pressure measurements (<60 mm Hg, diastolic) may be seen in some

**TABLE 1-2 Targets for Adult Blood Pressure**

| Patient Subgroup | Target SBP (mm Hg) | Target DBP (mm Hg) |
|---|---|---|
| ≥60 years | <150 | <90 |
| <60 years | <140 | <90 |
| >18 years with CKD | <140 | <90 |
| >18 years with diabetes | <140 | <90 |

Adapted from James PA, Oparil S, Carter BL, et al: 2014 evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). *JAMA* 311(5):507-20, 2014.
CKD, Chronic kidney disease; DBP, diastolic blood pressure; SBP, systolic blood pressure.

individuals, but such measurements usually are not significant unless the patient has other health problems or reports symptoms of light-headedness and fainting. Repeated high blood pressure readings may signify **hypertension,** a disease that can lead to such serious health problems as heart failure, stroke, and kidney failure. Major risk factors for hypertension include smoking, diabetes, increasing age, gender (higher risk in men and in postmenopausal women), ethnicity, family history of hypertension, and high levels of certain lipids in the blood. Information about managing the patient with high blood pressure can be found in Chapter 17.

The pulse rate can be measured either manually or automatically with an electronic blood pressure cuff. An advantage of manual measurement, typically obtained by palpating the radial artery, is that the *character* of the pulse, in terms of regularity and strength, can also be detected. The normal heart rate is 60 to 80 beats per minute and is strong in character. High pulse rates, typically in the 80 to 100 beats per minute range, may reflect an anxious patient or one who is under stress, has been smoking, or has just engaged in moderate exercise, such as rushing to the dentist's office. Individuals who are very physically fit or those who have severe heart problems may demonstrate a pulse rate lower than 60.

Abnormal pulse measurements that cannot be explained by findings from the health history or from such circumstances as those previously listed may be significant. The primary concern for the dentist is the possibility of uncontrolled cardiac, pulmonary, or thyroid disease. For example, a rapid but weak pulse can be a sign of a failing circulatory system. A weak, thready, and irregular pulse may signal a health crisis or emergency. Other conditions that may cause an irregular pulse rate include atrial fibrillation, dehydration, and medication side effects.

Although not regularly measured at the examination visit, the dentist occasionally will be interested in checking the patient's oral temperature and respiration rate. Normal oral temperature is 98.6° F (37° C) and may vary as much as ±1° F during the day. Patients who have severe oral infections may feel feverish and have an elevated temperature. The respiration rate in adults is normally in the range of 12 to 20 breaths per minute. Shallow, irregular, or rapid breathing may be a sign of severe heart or lung disease, whereas breathing at a very rapid rate may indicate that the patient is apprehensive. Some practitioners record height and weight measurements for children, with the latter being especially useful for calculating medication dosages and Body Mass Index (BMI).

### Intraoral and Extraoral Soft Tissue Examination

Evaluation of head and neck structures for evidence of tissue abnormalities or **lesions** constitutes an important part of a comprehensive examination. This is typically accomplished by looking for variations from normal and by palpating the tissues to detect abnormalities. Figure 1-6 illustrates normal head and neck anatomy. The following instruments and materials should be available before the examination is begun:

- Dental mirror
- Cotton gauze squares
- Tongue depressor
- Millimeter ruler

The extraoral examination begins with the patient positioned sitting upright with head unsupported to facilitate observation. The following extraoral structures of the head and neck should be evaluated in a systematic fashion: facial form and symmetry, the exposed skin, temporomandibular joint, eyes, ears, nose, major salivary glands, regional lymph nodes, and the thyroid gland. The location and characteristics of any lesions should be noted in the patient record (Box 1-2). (See Video 1-2 Head and Neck Examination on Evolve.)

After the extraoral examination, the dentist evaluates the intraoral structures, which include the lips, buccal mucosa and vestibule, tongue, floor of the mouth, salivary glands, hard and soft palate, and oropharynx (Figure 1-7).

The significance of positive findings from the head and neck examination may be difficult to determine without further evaluation or biopsy. Common findings, such as small ulcerations, can be observed for 5 to 10 days to see if they resolve. The patient can usually provide important historical information, such as how long the lesion has existed and whether it is associated with symptoms of pain or other discomfort. Along with this information, a history of repeated sun exposure or tobacco or alcohol use may elevate the significance

**BOX 1-2 Characteristics of Surface Lesions**

Location
Size
Color
Shape
Borders
Surface contour
Surface texture
Consistency
Drainage/bleeding
Blanching with pressure
Fixed/moveable

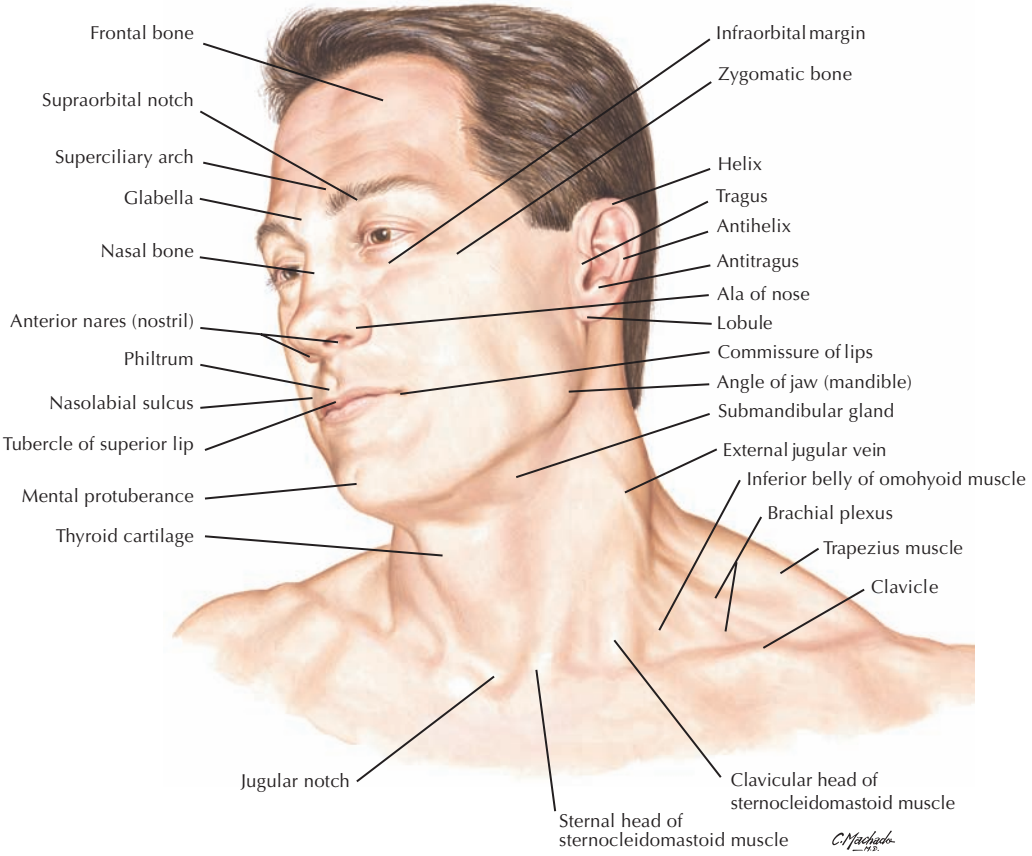



**FIG 1-6** Normal head and neck anatomy. (Netter illustration from www.netterimages.com © Elsevier Inc. All rights reserved.)

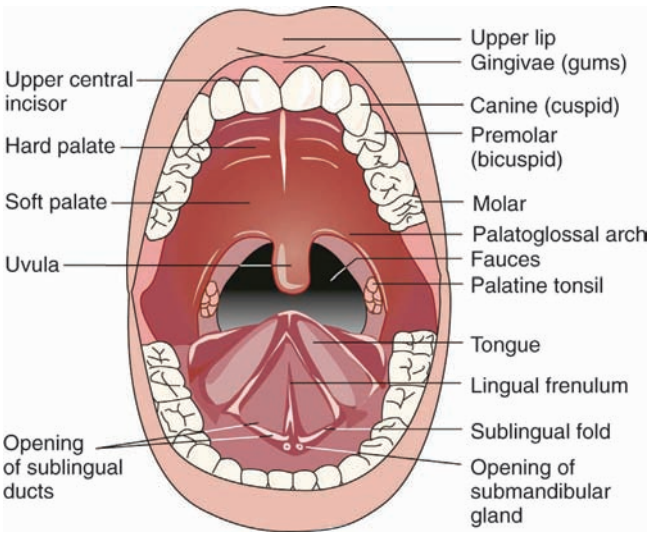



**FIG 1-7** Intraoral landmarks. (From VanMeter KG, Hubert RJ: Gould's pathophysiology for the health professions, ed 5, St. Louis, 2015, Saunders.)

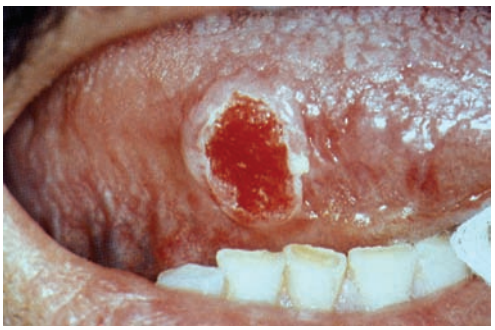


**FIG 1-8** This firm, ulcerated lesion on the right lateral border of the tongue was found in a patient who had used tobacco for more than 30 years. After biopsy and histologic evaluation, the lesion was diagnosed as a squamous cell carcinoma.

of skin and oral lesions, suggesting the possibility of cancer (Figure 1-8).

## Periodontal Examination

Evaluating the periodontium is an important part of a comprehensive examination. Problems with the supporting structures of the teeth can affect the entire treatment planning process. The dentist records findings from the examination on a periodontal chart as part of the record. (See Video 1-3 Periodontal Examination on Evolve.)

The examination begins with an overall assessment of the patient's oral hygiene and the appearance of periodontal soft tissue. Significant findings include areas of plaque and food accumulation on the teeth. Using disclosing solution can further reveal the presence and distribution of plaque and calculus, but this is best accomplished at the conclusion of

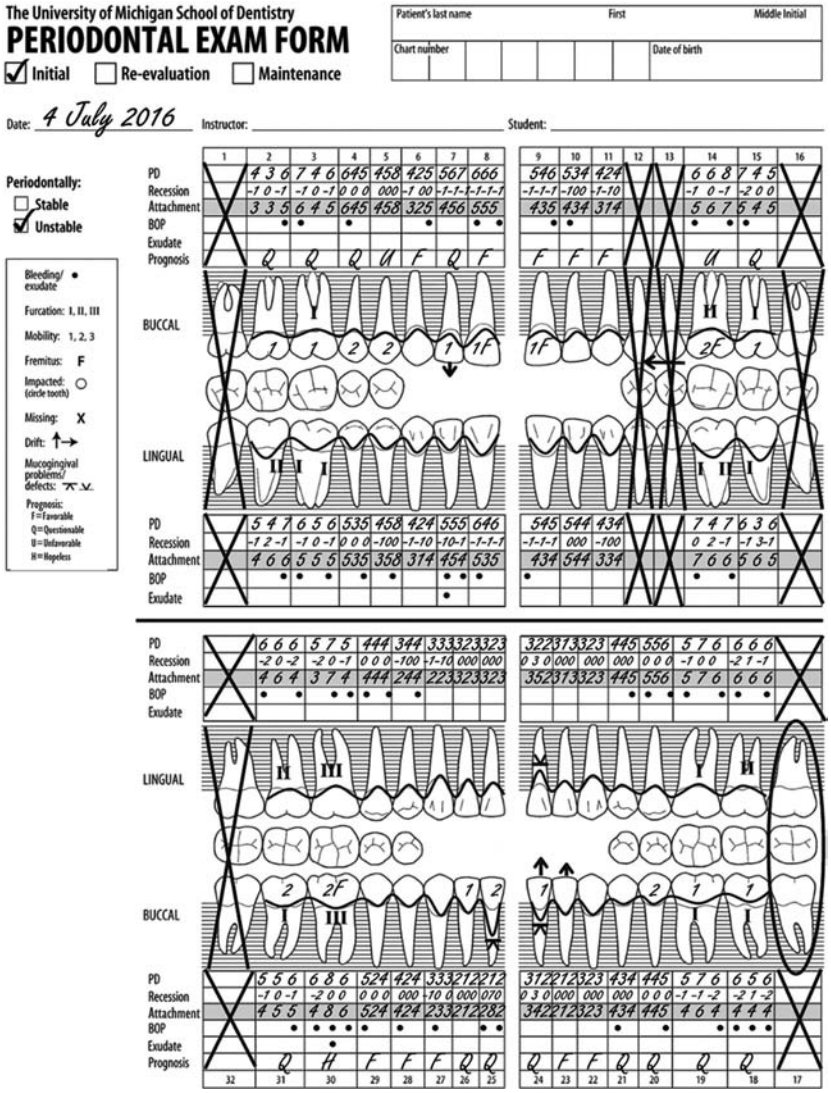



**FIG 1-9** Periodontal charting form. (Courtesy Dr. Phil Richards.)

the examination so that tissue color can be examined in its natural state. The clinician should look for deviations from healthy soft tissue, such as inflammation or rolled gingival margins.

The dentist next checks each tooth for excessive mobility, which may be related to loss of periodontal attachment or trauma from occlusion. Radiographs and periodontal probing depths provide information about the level of periodontal hard and soft tissue support. The dentist may use the periodontal screening and recording (PSR) system for determining the extent of periodontal probing (see *In Clinical Practice: PSR—An Early Detection System for Periodontal Disease* box). A full mouth periodontal charting (Figure 1-9) includes identification of probing depths; the gingival margin; presence of bleeding on probing and areas of gingival recession; mucogingival problems, such as deficiencies of keratinized tissue; abnormal frenulum insertions; and the presence, location, and extent of furcation involvement. The relationship between periodontal pocket depth and attachment loss are demonstrated in Figures 1-10 and 11.

## Examination of the Teeth

See Video 1-4 Examination of the Teeth on Evolve.

***General assessment.*** Patients usually perceive the examination of the teeth as the most important reason to be evaluated by the dentist. The procedure also is important from the dentist's point of view, because dental problems are common patient complaints. For an effective examination, it is important that the teeth are relatively clean and free from stain, plaque, and calculus, or significant findings may be missed. For patients with extensive plaque and calculus, it may be best to perform a cursory examination of the dentition, begin periodontal treatment to clean the teeth, and have the patient return to finish the examination at a later appointment.

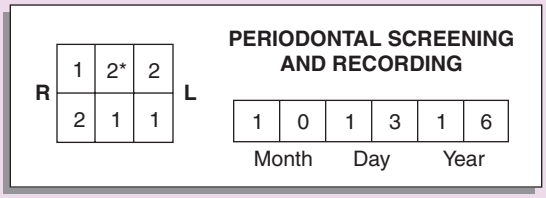
The following instruments should be readily available for use when examining the teeth (Figure 1-12):

- Ruler
- Dental mirror
- Dental explorer
- Periodontal probe
- Miller forceps and articulating paper

## IN CLINICAL PRACTICE

**PSR—An Early Detection System for Periodontal Disease**

In 1992, the American Dental Association and the American Academy of Periodontology introduced a screening system for the detection of periodontal disease in adults, referred to as **periodontal screening and recording**, or **PSR**. To perform a PSR examination, a special periodontal probe is "walked" through the gingival crevice of the teeth, and measurements are observed at six sites around each tooth. A numeric score between 0 and 4 is recorded for each sextant of the mouth, based on the deepest recorded probing in the sextant. An asterisk added to the score denotes presence of furcation invasion, mobility, mucogingival problems, or recession of more than 3.5 mm. The data from the PSR examination are recorded using a simple chart:




The PSR program is intended for the dentist in general practice. Relatively easy to administer, the PSR technique can be performed in only a few minutes. It serves as a screening tool for patients and can assist the clinician in deciding whether more comprehensive periodontal data collection is indicated. In addition, the PSR scores provide a general measure of periodontal disease throughout the mouth. Armed with this information, a dentist in general practice can decide whether to treat the patient or refer to a periodontist for additional care.

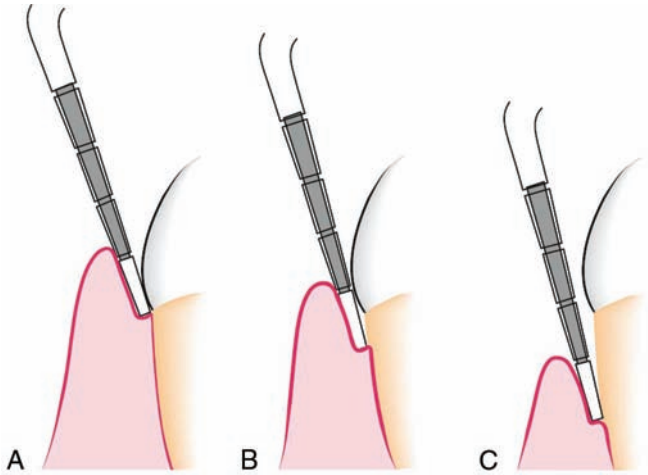



**FIG 1-10** Same pocket depth with different amounts of recession and attachment loss. **A,** Gingival pocket with no recession and attachment loss. **B,** Periodontal picket of similar depth as in **A** but with some degree of recession and attachment loss. **C,** Pocket depth same as in **A** and **B** but with still more recession and attachment loss. (From Newman MG, Takei H, Klokkevold PR, et al: *Carranza's clinical periodontology,* ed 12, St. Louis, Saunders, 2015.)

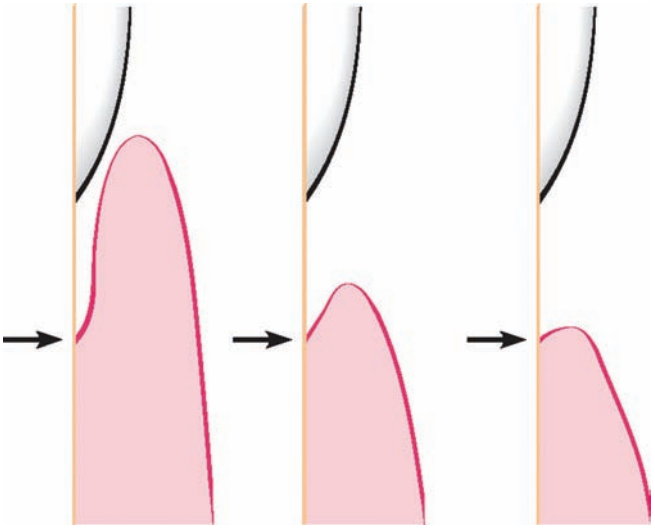


**FIG 1-11** Different pocket depths with the same amount of attachment loss. Arrows point to bottom of the pocket. The distance between the arrow and the cemento-enamel junctions remains the same, despite varying pocket depths. (From Newman MG, Takei H, Klokkevold PR, et al: *Carranza's clinical periodontology,* ed 12, St. Louis, 2015, Saunders.)

**FIG 1-12** Instruments and materials that should be available when examining a patient include a ruler, mouth mirror, dental explorer, periodontal probe, articulating paper with forceps, air/water syringe tip, cotton forceps, wooden tongue blade, dental floss, cotton rolls, and gauze squares.

- Cotton forceps
- Cotton rolls and gauze
- Air/water syringe
- Dental floss
- Wooden tongue blade

In addition, an electric pulp tester and refrigerant spray (for cold testing) will help to evaluate the pulp vitality of individual teeth. Although optional, the dentist's use of magnifying loupes or glasses is highly desirable to help identify early signs of dental disease.

**FIG 1-13** It is important to dry the teeth before examination to prevent missing any significant findings.

**FIG 1-14** Erosion of the posterior teeth in a patient with bulimia. The restoration appears to protrude from the occlusal surface because of the loss of tooth structure.

Before beginning the examination, the dentist should review any significant findings from the dental history, especially chief concerns involving the teeth. The patient should be asked again about any dental problems, including teeth that might be sensitive to being dried with air. The dentist should review any available radiographs during the examination so that radiographic findings can be correlated with those found clinically. For efficiency and to maintain asepsis, it will be advantageous to use a worksheet that can later be disposed of or to have an assistant available to record findings during the examination.

Each tooth is then evaluated sequentially, usually from the maxillary right to the mandibular left. First, air-dry a sextant of teeth and, if necessary, use cotton rolls to maintain dryness and isolation (Figure 1-13). Next, the type and extent of all existing restorations is recorded. Any missing teeth are noted and any replacements for them, such as implants, fixed or removable partial dentures, or complete dentures, are evaluated. The patient should be questioned as to the history of any missing teeth. If the patient has removable prostheses, they can be evaluated in the mouth at this time and then removed. Use dental floss to check the integrity of each interproximal contact. Vital teeth with large restorations or those that are symptomatic should be percussed with the end of the mirror handle and/or evaluated with hot and cold or an electric pulp tester. Finally, assess teeth for general condition, noting overall numbers and types of restorations and any irregularities of tooth color, morphology, or ability to function.

The patient can be questioned about any concerns he or she has with the appearance of the teeth. Common esthetic concerns include tooth discoloration, crowding of teeth (especially the lower anteriors), spaces between teeth (referred to as **diastemas**) and variations in tooth size and shape. There may also be a loss of tooth structure, usually enamel, from exposure to acid, referred to as **erosion** (Figure 1-14). This is most frequently due to dietary sources and, less commonly, regurgitation of stomach acid owing to gastroesophageal reflux disease, **GERD.**

***Occlusal examination.*** Before examining individual teeth, the dentist should evaluate the dentition as a whole by examining the patient's occlusion. Looking at each arch separately, the clinician first checks for shifts of the dentition from the midline. Are the marginal ridges even, or are teeth extruded or intruded from the occlusal plane? Have teeth moved mesially or distally into any edentulous spaces? Is there evidence of excessive wear to the teeth? Instruct the patient to occlude in the maximum intercuspal position, so that the amount of overbite and overjet in the incisor area can be evaluated. Note the Angle classification by examining the relationships between the maxillary and mandibular canines and molar teeth. At this time, also note in the record any open bite or cross-bite. Instruct the patient to move the mandible from side to side and forward to study which teeth guide the occlusion in lateral and protrusive excursions. The dentist can then manipulate the lower jaw to evaluate the centric relation and look for interferences in lateral and protrusive movements. At this point in the examination, question the patient about any pain or tenderness in the temporomandibular joint and associated muscles. The patient should be evaluated for visual, palpatory, or auditory evidence, such as "pops," "clicks," or crepitation. Any deviation on opening should be noted. Finally, ask the patient to demonstrate how wide the mouth can be opened. A more detailed investigation is warranted if the patient has pain, an inability to chew, or a limited opening (<30 mm). The examiner should note any signs of abnormal tooth wear due to excessive function (referred to as **attrition**). This is frequently a result of **bruxism**, or grinding the teeth, often at night (Figure 1-15).

***Caries assessment.*** The examination of teeth for caries lesion detection (i.e., identifying existing caries lesions) and assessment (i.e., characterizing the severity of lesions once they have been detected) is the basis for evidence-based caries management.[4] The ability to detect and differentiate between the various stages of caries lesion severity depends on the caries detection method and/or the clinical criteria being used. Many criteria have been developed for the examination and assessment of teeth for caries lesions, including visual and/or tactile-based criteria.[5] In the past, tactile criteria, based on use of the explorer under force to confirm cavitation ("catch"), was a commonly used criteria for the identification of dental

**FIG 1-15** Both the maxillary denture and mandibular teeth show signs of excessive attrition from bruxism in this patient who ground his teeth at night.

caries, and for many decades was considered the gold standard for caries detection.[6] In today's practice of dentistry, however, forceful use of a sharp explorer for the sole purpose of detecting caries lesions is highly discouraged.[7] The evidence clearly shows that noncavitated lesions (i.e., lesions with an apparently intact surface layer, commonly referred to as white or brown spot lesions) can become damaged/cavitated, creating a discontinuity or break in the surface, possibly exposing dentin, simply through pressure from the explorer during examination.[8] This, in turn, can accelerate lesion progression and undermine the possibility of non-surgical caries management, such as use of fluorides and sealants. Furthermore, use of the explorer during examination *does not* improve accuracy in the detection of caries lesions.[9,10]

As a result, examination of the teeth using predominantly visually based criteria is currently the most commonly recommended method for caries detection.[5,11] As an example, an international effort has created a set of harmonized criteria, building on best evidence, the International Caries Detection and Assessment System (ICDAS), which is designed to serve as a unifying, predominantly visual set of criteria codes based on the characteristics of clean, dry teeth at both the enamel and dentin caries levels, and which is capable of assessing both caries severity and activity.[12] Supporting histological validation for this approach has been reported.[13-15] The ICDAS includes six caries lesion codes (1-6) that can be used individually or collapsed into fewer categories, which are sometimes useful for clinical care—for example, non-cavitated lesions (codes 1-2) vs. cavitated lesions (codes 3-6), or incipient (codes 1-2) vs. moderate (codes 3-4) vs. advanced lesions (codes 5-6).[4,13]

The following steps should be followed when visually examining teeth for caries lesion detection and assessment:

1. Ask patient to remove any intraoral appliances (e.g., removable prostheses).
2. Clean surfaces with a toothbrush and water (in some patients, flossing between tight contacts may be needed and/or a more extensive prophylaxis may be necessary).
3. Isolate with cotton rolls if saliva will interfere with drying.
4. Examine all teeth and surfaces in order, first when the tooth is wet and then after gently air drying for 5 seconds.
5. The explorer is only an aid to visual caries examination and should never be used with force for caries detection. The appropriate use of the explorer includes only the following:
   - to gently clean debris or remove plaque,
   - to very gently help confirm cavitation *only when in doubt,*
   - to aid in determination of lesion activity (e.g., soft dentin or rough-opaque enamel), and
   - after the tooth has been sealed or restored, to help assess the dental material's integrity and retention.
6. After defects on tooth surfaces have been detected and assessed for severity, based on appearance and location, determine their origin—in other words, whether they are caries lesions or other defects, such as wear, fluorosis, and erosion. If they are caries lesions, then a determination of degree of activity (i.e., progressing or arrested) is necessary to complete the diagnosis of caries (see Chapter 2 for specifics).
7. Record findings.

In recent decades, a concerted effort has been made in dentistry to identify ways to enhance visual examination, including the use of magnification and the adoption of technology-based methods for detecting carious lesions and/or quantifying demineralization in non-cavitated lesions.[16,17] Magnification may be useful for tooth examination; however, there is relatively little research on its use for caries detection and assessment. Among the in vitro studies that do exist, comparisons of visual assessment with or without magnification present conflicting results. Some preliminary clinical data suggest that, although use of magnification may not affect the ability of expert clinicians to distinguish between different stages of lesion severity, this technology may lead to more aggressive treatment decisions.[18] Thus, if magnification is to be used for caries detection and assessment, it must be used with caution. For example, it is possible that with increased magnification, non-cavitated lesions may actually appear cavitated, thus leading to more aggressive or unnecessary interventions.[19]

Although there are many technology-based instruments available to assist the clinician with the detection and monitoring of non-cavitated lesions, these are not "stand alone" diagnostic methods that can be used as a substitute for the dentist's clinical judgment.[16,20] These methods serve as aids to visual examination and clinical decision-making. Examples include use of transillumination, digital fiber optic transillumination (DiFOTI), fluorescence (e.g., Diagnodent, Quantitative Light-Induced Fluorescence), electrical conductance/resistance, and optical coherence tomography, among many others. In general, when used correctly, these technologies can play an important role in caries lesion detection and, if they allow for quantification, they may additionally help stage the severity of a caries lesion and assist in the diagnosis of caries lesion activity by monitoring lesion changes over time and thus helping to select the most appropriate treatment choice/regimen for a particular patient in a private practice setting.[17] Furthermore, systematic reviews suggest that these instruments

have higher sensitivity but lower specificity than traditional visual caries detection methods at the earlier, non-cavitated stages in the caries process.[20] This means that in populations for whom caries rates have fallen and caries progression rates have slowed, or in which caries rates are not high, the indiscriminant use of these technologies is likely to result in a high number of false-positive caries diagnoses, which could then, depending on how the instrument's "caries" call is interpreted by the clinician, decrease the number of teeth that could benefit from non-invasive caries management interventions and/or increase the number of unnecessary restorations.[19] Thus, although these technologies can be valuable aids to allow more objective caries detection, assessment, and monitoring (especially if a quantitative scale is provided), they require expertise and training for their correct use and for interpretation of the data they produce. As these methods are rapidly evolving, and new ones are constantly appearing on the market, the competent user of any technology-based caries detection method should always understand the strength of the supporting evidence and be able to interpret the data obtained, as well as to follow the manufacturer's indications, contraindications, and instructions regarding proper use of the instrument.[4]

## Radiographic Examination

Conventional and digital radiographs provide informative images of the teeth and jaws, and serve to document the patient's dental condition at the beginning of treatment. Before ordering any radiographs, the dentist should review the patient's oral health history and perform the clinical examination. When possible, any radiographs made by a previous dentist should be obtained, particularly those less than 3 years old.

The dentist determines which type of radiograph to obtain based on patient age, clinical findings, and oral health history. Certain factors place a patient at higher risk for oral problems, necessitating a more extensive radiographic survey; see Box 1-3. Radiographs should be made only when the diagnostic benefits outweigh the risks of exposure to ionizing radiation. The American Dental Association and the U.S. Food and Drug Administration (FDA) have issued a series of recommendations to assist practitioners with this decision (Table 1-3).

Dentists in general practice commonly use several types of radiographs to examine the patient for signs of pathologic conditions, caries, periodontal or periapical problems, and remnants of missing teeth, and to examine the quality of existing dental restorations. The primary intraoral exposures are periapical, interproximal (or bite-wing), and occlusal projections. The dentist can select from among several types of extraoral radiographs, with the panoramic being most frequently used for examining areas not readily visualized with intraoral films.

**Periapical radiographs** should show all of a particular tooth and the surrounding bone. Useful for imaging the teeth, detecting caries, and documenting signs of periodontal and periapical disease, these radiographs are limited by their size and the need to be placed in the mouth. A complete mouth survey of a completely dentate patient usually consists of 16 to 20 periapical radiographs along with four interproximal radiographs (Figure 1-16).

Horizontal and vertical **interproximal** or **bite-wing radiographs** show the coronal portion of the teeth in both arches and the alveolar crestal bone. Most frequently used for the detection of interproximal caries and for evaluating crestal bone height, bite-wing radiographs are also valuable as a screening tool for patient evaluation before deciding to make posterior periapical radiographs.

**Occlusal radiographs** are placed over the teeth in the occlusal plane. In adults, their use is limited to visualizing palatal lesions and searching for impacted or supernumerary teeth. The film can also be helpful in documenting expansion of bone in the mandible or salivary stones in the ducts of the submandibular gland (Figure 1-17).

The **panoramic radiograph** (also referred to as a **pantomograph**) displays a wide area of the jaws and hence enables evaluation of structures not visible in intraoral projections (Figure 1-18). Relatively easy to expose, the radiographs may help detect developmental anomalies, pathologic lesions of

### BOX 1-3 Clinical Situations for Which Radiographs May Be Indicated

**Positive Historical Findings**

- Previous periodontal or endodontic treatment
- History of pain or trauma
- Family history of dental anomalies
- Postoperative evaluation of healing
- Remineralization monitoring
- Presence of implants, previous implant-related pathosis, or evaluation for implant placement

**Positive Clinical Signs/Symptoms**

- Clinical evidence of periodontal disease
- Large or deep restorations
- Deep carious lesions
- Malposed or clinically impacted teeth
- Swelling
- Evidence of dentofacial trauma
- Mobility of teeth
- Sinus tract (fistula)
- Clinically suspected sinus pathosis
- Growth abnormalities
- Oral involvement in known or suspected systemic disease
- Positive neurologic findings in the head and neck
- Evidence of foreign objects
- Pain and/or dysfunction of temporomandibular joint
- Facial asymmetry
- Abutment teeth for fixed or removable partial prosthesis
- Unexplained bleeding
- Unexplained sensitivity of teeth
- Unusual eruption, spacing, or migration of teeth
- Unusual tooth morphology, calcification, or color
- Unexplained absence of teeth
- Clinical erosion
- Peri-implantitis

## TABLE 1-3 Recommendations for Prescribing Dental Radiographs

These recommendations are subject to clinical judgment and may not apply to every patient. They are to be used by dentists only after reviewing the patient's health history and completing a clinical examination. Even though radiation exposure from dental radiographs is low, once a decision to obtain radiographs is made, it is the dentist's responsibility to follow the ALARA (As Low As Reasonably Achievable) Principle to minimize the patient's exposure.

| | PATIENT AGE AND DENTAL DEVELOPMENTAL STAGE | | | | |
|---|---|---|---|---|---|
| **Type of Encounter** | **Child with Primary Dentition (before eruption of first permanent tooth)** | **Child with Transitional Dentition (after eruption of first permanent tooth** | **Adolescent with Permanent Dentition (before eruption of third molars)** | **Adult, Dentate, or Partially Edentulous** | **Adult, Edentulous** |
| New Patient being evaluated for oral diseases | Individualized radiographic exam consisting of selected periapical/occlusal views and/or posterior bitewings if proximal surfaces cannot be visualized or probed. Patients without evidence of disease and with open proximal contacts may not require a radiographic exam at this time. | Individualized radiographic exam consisting of posterior bitewings with panoramic exam or posterior bitewings and selected periapical images. | Individualized radiographic exam consisting of posterior bitewings with panoramic exam or posterior bitewings and selected periapical images. A full-mouth intraoral radiographic exam is preferred when the patient has clinical evidence of generalized oral disease or a history of extensive dental treatment. | | Individualized radiographic exam, based on clinical signs and symptoms. |
| Recall Patient with clinical caries or at increased risk for caries | Posterior bitewing exam at 6- to 12-month intervals if proximal surfaces cannot be examined visually or with a probe. | | | Posterior bitewing exam at 6- to 18-month intervals | Not applicable. |
| Recall Patient with no clinical caries and not at increased risk for caries | Posterior bitewing exam at 12- to 24-month intervals if proximal surfaces cannot be examined visually or with a probe. | | Posterior bitewing exam at 18- to 36-month intervals | Posterior bitewing exam at 24- to 36-month intervals | Not applicable. |
| Recall Patient with periodontal disease | Clinical judgment as to the need for and type of radiographic images for the evaluation of periodontal disease. Imaging may consist of, but is not limited to, selected bitewing and/or periapical images of areas where periodontal disease (other than nonspecific gingivitis) can be demonstrated clinically. | | | | Not applicable. |
| Patient (New and Recall) for monitoring of dentofacial growth and development, and/or assessment of dental/skeletal relationships. | Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth and development or assessment of dental and skeletal relationships. | | Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth and development, or assessment of dental and skeletal relationships. Panoramic or periapical exam to assess developing third molars. | | Usually not indicated for monitoring of growth and development. Clinical judgment as to the need for and type of radiographic images for evaluation of dental and skeletal relationships. |
| Patient with other circumstances including, but not limited to, proposed or existing implants, other dental and craniofacial pathoses, restorative/endodontic needs, treated periodontal disease, and caries remineralization | Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of these conditions. | | | | |

From American Dental Association, Council on Scientific Affairs; U.S. Department of Health and Human Services, Public Health Service and Food and Drug Administration: Dental radiographic examination: recommendations for patient selection and limiting radiation exposure, <http://www.ada.org/~/media/ADA/Member%20Center/FIles/Dental_Radiographic_Examinations_2012.ashx/> 2012.

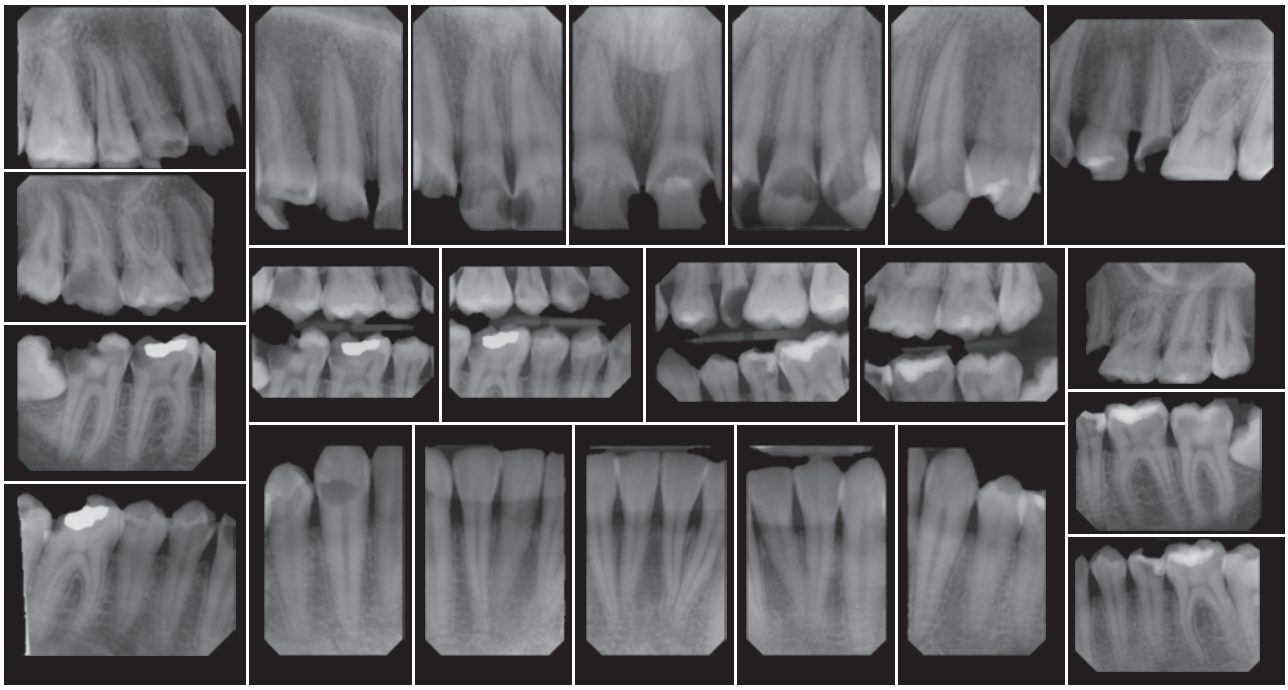


**FIG 1-16** A 22-image complete mouth survey (CMS) consisting of 18 periapical and 4 bite-wing radiographs. The patient exhibits radiographic signs of rampant dental caries, impacted mandibular third molars, and erosion of the maxillary anterior teeth. (Courtesy Dr. Erika Benavides.)

**FIG 1-17** A mandibular occlusal radiograph showing a sialolith in the patient's right submandibular gland duct.

the teeth and jaws, or other bone fractures. In adults, dentists most commonly use this radiograph to evaluate third molar position or the condition of edentulous areas of the jaws before fabricating removable prosthodontics or placing implants. Because of the lower resolution and superimposition of structures, a film-based panoramic radiograph does not provide the fine detail necessary to diagnose caries or document periodontal bone loss. Digital panoramic radiographs are approaching the diagnostic yield of intraoral radiographs and may be used in combination with bite-wing images.

There are several situations in which imaging information in the third dimension is beneficial in diagnosis and treatment planning. Some examples include the placement of dental implants, evaluation of the relationship of third molar root tips to the mandibular canal before surgery, assessment of bony expansion for pathologic jaw lesions, or the analysis of jaw relationships in orthodontics. In the past, this information could be gained only from medical **computed tomographic (CT)** examination, but today, **cone-beam CT (CBCT)** scanners dedicated to maxillofacial imaging are available (Figure 1-19). This equipment permits acquisition of three-dimensional images with a lower radiation dose than with a medical scanner.

## Other Diagnostic Aids

### Study Casts

Study casts are used during the examination stage to document and analyze the patient's dentition before providing treatment. Individual casts show the position and inclination of teeth and can be used to create matrices for fabricating temporary restorations. Study models should be obtained and mounted on an articulator to evaluate occlusal relationships whenever prosthodontic treatment is planned. The dentist can also use mounted casts to evaluate the necessity for preprosthetic surgery, especially in the edentulous patient with large maxillary tuberosities. Casts can also serve as visual aids for presenting information to patients.

**FIG 1-18** A panoramic radiograph of a patient after a fist fight. Note the fracture on the right anterior mandible repaired with surgical plates. On the left ramus, there is a displaced condylar neck fracture, a fracture of the anterior ascending ramus, and signs of a displaced fragment superimposed over the angle of the mandible.

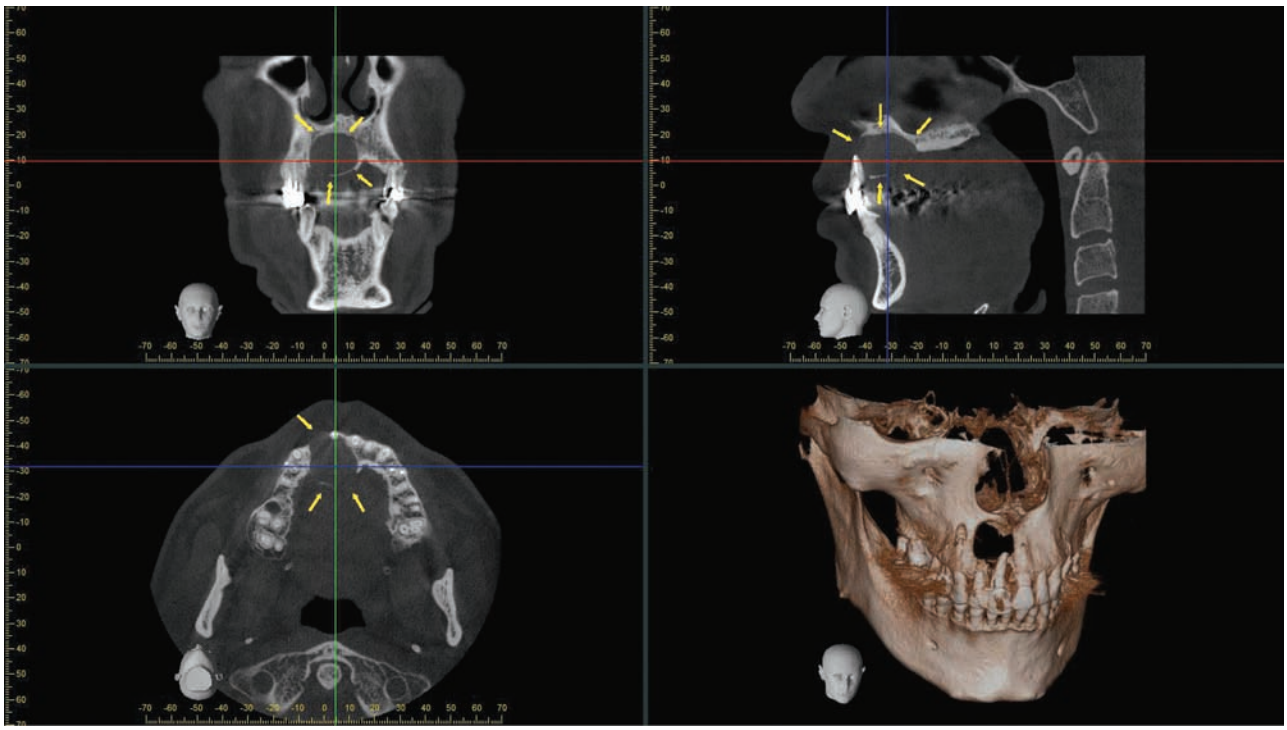


**FIG 1-19** Multi-planar cone beam computed tomographic (CBCT) images and a three-dimensional volumetric reconstruction of a large, well-defined, low-density periapical lesion associated with an endodontically treated maxillary right central incisor. The lesion is causing expansion and perforation of the buccal and palatal cortical plates. (Courtesy Dr. Erika Benavides.)

### Diagnostic Wax-Ups and Altered Casts

Diagnostic wax-ups on study casts help the practitioner and patient visualize the tooth form, contour, and occlusion that will result from the proposed treatment. Wax-ups are especially useful when missing teeth are to be replaced or existing teeth significantly altered. The casts are usually mounted on an articulator to evaluate the waxing in the proposed functional relationship.

Altered casts should be made on duplicate models of the original study casts. Study casts are useful for establishing ideal relationships for jaw segments in planning orthognathic surgery or extensive fixed prosthodontic treatment. When the new relationships have been finalized, templates (thermoplastic shims) can be made from the altered casts to serve as guides for tooth preparation or the location of tooth and jaw position during surgery.

### Occlusal Splints

When patients exhibit signs of temporomandibular dysfunction (TMD), such as jaw muscle pain or chronic headaches, it may be advisable to construct a passive occlusal splint to relieve symptoms. In such a situation, the occlusal splint becomes both a treatment modality and a diagnostic aid. If the pain persists after splint therapy, the clinician may need to reevaluate the initial working diagnosis of TMD and search for alternative causes for the pain.

### Caries Excavation

Caries excavation, in addition to being an operative procedure, can also serve as a diagnostic technique. For example, it may be necessary to remove caries from a severely decayed tooth, often before endodontic therapy, to determine whether the tooth can be restored. Extensive treatment for a tooth may be contraindicated if it is not restorable, and the tooth should be extracted. The issue of restorability is discussed in greater depth in Chapters 8 and 9.

### Consultation

When is consultation with another dentist or a physician about the patient necessary or advisable? In general, if the primary care provider has questions concerning the patient's general health, or the diagnosis or treatment of the patient's oral problems, it is in everyone's best interest to seek further guidance. For example, it may be appropriate to contact the patient's physician to establish any medical diagnoses and to consult about the capacity of the patient to withstand dental treatment. When a consultation is sought, it must be implemented with the patient's understanding and consent. The consultation, whether obtained by telephone, facsimile, letter, or electronic mail, should include

- Identifying information about the patient (i.e., complete name, date of birth)
- A summary of significant findings from the general and/or oral health history
- A brief description of the overall treatment plan
- A clear description of the information requested from the consultant
- The requesting dentist's name, address, and telephone number

If the information is obtained by telephone, ideally the consultation should be followed up with some form of documentation from the consultant that can be retained in the patient's record. At a minimum, a summary of the interaction should be entered into the patient's record.

### Biopsy

Biopsy procedures are indicated to diagnose persistent oral lesions or to ensure that a previously diagnosed condition is still benign. The procedure consists of removing all or part of a lesion and submitting the tissue for histologic evaluation by a pathologist. Dentists should not hesitate to biopsy lesions themselves, or to refer the patient for further evaluation and treatment, especially when the lesions are suggestive of oral cancer.

### Medical Laboratory Tests

Recent years have seen a steady increase in the number of patients with serious systemic disease who present for oral healthcare. Many may be taking medications that alter their blood coagulation time or immune system. In other situations, the dentist may suspect that a patient has an untreated systemic problem, such as leukemia or diabetes, that can only be confirmed with laboratory tests. Certain surgical procedures may require laboratory testing before treatment is provided. In these situations, the dentist usually refers the patient to a general health provider and requests a copy of the test results.

Screening for diabetes, high blood pressure, high cholesterol, and other chronic conditions may be performed by members of the dental profession in the future.[21] Practitioners should be cautious, however, about performing tests for conditions about which they would be unable to counsel the patient adequately. The patient should instead be referred to a general medical health provider for evaluation.

### Microbiologic and Other Testing Systems

The use of microbiologic tests in dental offices currently is limited, but in the future will become more widely used, especially as a tool for diagnosing caries susceptibility and periodontal disease activity.

Caries susceptibility can be evaluated by measuring the quantity of cariogenic bacteria, such as *Streptococcus mutans* and lactobacilli. A sample of the patient's saliva is placed on a special agar medium, which is then incubated. The patient's caries risk is related to the number of bacterial colonies that grow on the plate. A low salivary flow rate ($<$1 ml/min of stimulated saliva) and low salivary buffering capacity represent risk factors for increased caries activity. The evaluation of substances in a patient's saliva has the potential to serve as a non-invasive test for several oral and systemic diseases.

Determining levels of enzymes and inflammatory mediators in blood serum or gingival crevicular fluid can provide evidence of active periodontal disease. Deoxyribonucleic acid (DNA) probes can also be used to screen for signs of periodontal disease.

## Documentation

All examination results and diagnoses must be clearly documented in the patient record. Record entries need to be accurate, complete, and consistent between patients. This can be challenging if there are multiple clinicians in a dental office or in an environment with a large turnover in clinicians and patients, such as a dental school. Consistent paper or electronic forms are helpful, as are standardized abbreviations. See eTable 1-1 for a full list of abbreviations.

**Progress or treatment notes** document each appointment. These notes can include appointment-specific diagnoses, evidence of health history review, details of treatment provided, patient behavior, and plans for the next visit (Figure 1-20). Entries must be stated clearly and objectively. Treatment detail should include the teeth or soft tissue area treated, medications administered, and details surrounding the treatment procedures. Any potentially life threatening condition or medical problem that could have a significant impact on the dental treatment should be displayed in a prominent place in the record. Examples include allergies, need for premedication, and avoidance of epinephrine.

The retention of study models for all patients presents storage problems. No specific guidelines for retention exist, but many dentists retain casts for patients who have had orthodontic treatment or extensive prosthodontic work. It is possible to digitize models and store the data electronically. The models can be recreated at a later date if necessary.

Color photographs and digital images of patients are excellent methods for recording patient findings, both before and after treatment. Some practitioners, especially orthodontists, routinely take photographs of all their patients. Intraoral video cameras are used to educate patients about specific problems in their mouths. Many systems can instantaneously print still images that can be given to the patient or placed in the record.

Several varieties of worksheets and dental charts are available for recording findings, diagnoses, and treatment recommendations. The choice of forms is a personal decision. Ideally, entries should be made in pen for permanence, with black ink to facilitate photocopying. The union of digital photographs and digital radiography with electronic charting and procedural notes has led to the creation of an **electronic patient record, EPR**.

| Treatment Note |
|---|
| Problem: |
| *Caries distal upper right first molar.* |
| Health status: |
| *Reviewed. Treated hypertension, BP 125/85.* |
| Treatment: |
| *1.7 cc 2% lidocaine 1:100,000 epinephrine infiltration, rubber dam isolation. DO composite, shade A-2, placed over glass ionomer liner.* |
| Patient evaluation: |
| *Patient was apprehensive but cooperative.* |
| Next visit: |
| *Composite restorations for maxillary incisors. Check bite splint.* |

**FIG 1-20** Example of a Treatment Note entry.

Physical and electronic patient records must be maintained in good order and be retrievable even after the patient has left the dental practice. Good record keeping, complete examination documentation, and the ability to retrieve the record represent essential elements in dental practice. In the event of litigation, good documentation can protect the dentist by demonstrating a high level of professional competence. Good records help prevent litigation, win a malpractice suit, or decrease damages. Patients who change practitioners have a legal right to obtain copies of recent radiographs. Finally, an additional important reason for maintaining a complete diagnostic and treatment-related information/file for each patient is that the dentist may have the unpleasant duty of providing dental records, postmortem, for the purpose of patient identification.

## REVIEW QUESTIONS

- What are the major categories of information required to begin to create a treatment plan?
- Describe techniques that can be used and techniques to be avoided when interviewing a dental patient.
- What are the components of a patient history? What information is included in each of those components?
- List indications for obtaining study casts as part of the initial examination of the patient.
- When the dentist requests a consultation with a physician or other healthcare provider, what information is the dentist seeking and how will it be recorded in the patient record?

## REFERENCES


1. Terezhalmy GT, Schiff T: The historical profile, *Dent Clin North Am* 30(3):357–368, 1986.
2. Stein PS, Aalboe JA, Savage MW, Scott AM: Strategies for communicating with older dental patients, *J Am Dent Assoc* 145(2):159–164, 2014.
3. Al-Dajani M, Limeback H: Emerging science in the dietary control and prevention of dental caries, *J Mich Dent Assoc* 95(5):34–38, 2013.
4. Fontana M, Gonzalez-Cabezas C, Fitzgerald M: Cariology for the 21st century-current caries management concepts for dental practice, *J Mich Dent Assoc* 95(4):32–40, 2013.
5. Pitts NB, Stamm JW: International Consensus Workshop on Caries Clinical Trials (ICW-CCT)—final consensus statements: agreeing where the evidence leads, *J Dent Res* 83(Spec No C):125–128, 2004.
6. Radike AW: *Criteria for the Diagnosis of Dental Caries. American Dental Association. Proceedings of the Conference on the Clinical Testing of Cariogenic Agents,* Chicago, 1968, The American Dental Association, pp 87–88.

## eTABLE 1-1 The University of Michigan School of Dentistry List of Abbreviations

This list is intended to assist clinicians decipher abbreviations.
To reduce errors and misinterpretation, clinicians should refrain from using abbreviations in notes and prescriptions.

### General

| | |
|---|---|
| ✓ | check |
| A&O | alert and oriented |
| adj | adjust(ment) |
| AMA | against medical advice |
| appt | appointment |
| ASA + I, II or III | American Society of Anesthesiologist Classification |
| ASAP | As soon as possible |
| BA | broken appointment |
| beh | behavior |
| bond | bonding |
| BP | blood pressure |
| brux | brux(er) (ism) |
| CA | cancelled appointment |
| CAV | cavity check |
| CC | chief concern/complaint |
| ck | check |
| CO | centric occlusion |
| cons | consultation |
| CR | caries removal |
| CR | centric relation |
| d/c | discontinue |
| def | defective |
| del | deliver |
| DentHx | dental history |
| dx | diagnosis |
| DZ | disease |
| emerg | emergency |
| endo | endodontic |
| eval | evaluation |
| exam | examination |
| f/u | follow up |
| freq | frequent |
| FX | fracture |
| H/O | history of |
| H&C | hot and cold |
| HH | health history |
| HPI | history of present illness |
| HX, HX/O | history, history of |
| hyg | hygiene |
| ID | identification |
| immed | immediate |
| imp | impression |
| indir | indirect |
| iso | isolation |
| iv | intravenous |
| LA | local anesthetic, anesthesia |
| lab | laboratory |
| MedHx | medical history |
| Meds | medication |
| MHR | medical history review |
| mod | moderate |
| MP | mouth prop |
| n/a | not applicable |
| n/c | no charge |
| NKA | no known allergy |
| NKDA | no known drug allergy |
| NS | no show |
| NSF | no significant findings |
| NV | next visit |
| OBS | observe |
| occ | occlus(al) (ion) |
| OS | oral surgery |
| OTC | over the counter |
| palp | palpation |
| Perio | periodontal |
| POI | post-operative instructions |
| pol | polish |
| porc | porcelain |
| post op | post operative |
| pre op | pre-operative |
| prefab | prefabricated |
| prelim | preliminary |
| premed | premedicated |
| prep | prepar(e)(ation) |
| PRN | as needed |
| prog | prog(nosis) (ress) |
| pros | prosthodonti(cs) (st) |
| prosth | prosthetic, prosthodontic |
| prov | provisional |
| pt | patient |
| PX | prognosis |
| Q | question |
| r/o | rule out |
| RC | recall |
| RCT | root canal therapy |
| RDI | rubber dam isolation |
| re-eval | re-evaluation |
| REC | recommend |
| reg | regular |
| rest | restor(ation) (e) |
| RMH | reviewed medical history |
| ROS | review of systems |
| RTC | return to clinic |
| Rx | prescription |
| s/p | status post |
| sed | sedative |
| sens | sensitive |
| SX | surgery |
| Symp | symptoms |
| TB | toothbrush |
| TBI | tooth brushing instructions |
| Temp | temporary |
| Tx | treatment |
| w/ | with |
| W/O | without |
| WNL | within normal limits |
| y/o | years old |
| ↑ | upper |
| ↓ | lower |

*Continued*

## eTABLE 1-1 The University of Michigan School of Dentistry List of Abbreviations—cont'd

### Location

| | |
|---|---|
| ant | anterior |
| B | buccal |
| CEJ | cementoenamel junction |
| D | distal |
| F | facial |
| L | lingual |
| LL | lower left |
| LR | lower right |
| lrg | large |
| Lt | left |
| M | mesial |
| mand | mandibular |
| max | maxi(lla) (llary) (mum) |
| O | occlusal |
| P | palatal |
| POST | posterior |
| prox | proximal |
| quad | quadrant |
| Rt | right |
| sub-g | subginigival |
| supra-g | supragingival |
| u | upper |
| UL | upper left |
| UR | upper right |

### Condition

| | |
|---|---|
| COPD | chronic obstructive pulmonary disease |
| CVA | cerebrovascular accident |
| edent | edentulous |
| HBV | hepatitis B |
| HCV | hepatitis C |
| HTN | hypertension |
| LPJI | late prosthetic joint infection |
| MI | myocardial infarction |
| MRSA | Methicillin-resistant Staphylococcous aureus |
| SBE | sub-acute bacterial endocarditis |
| TMD | temporomandibular joint disorder |
| URI | upper respiratory infection |

### Measurement

| | |
|---|---|
| BMI | body mass index |
| cm | centimeter |
| g | gram |
| Kg | kilogram |
| m | meter |
| Mcg | micrograms |
| mg | milligram |
| tbsp | tablespoon |
| tsp | teaspoon |

### Material

| | |
|---|---|
| acr | acrylic |
| alg | alginate |
| am or amal | amalgam |
| Au | gold |
| bond | bonding agent |
| CaOH | calcium hydroxide |
| cem | cement |
| GI | glass ionomer |
| GIC | glass inonmer cement |
| IRM | intermediate restorative material |
| Mtx | matrix |
| PIP | pressure indicating paste |
| PVS | polyvinyl siloxane |
| ZOE | zinc oxide eugenol |

### Medication

| | |
|---|---|
| ABX | antibiotics |
| ASA + mg. | aspirin |
| BID | two times a day |
| CHX | chlorhexidine |
| disp | dispense |
| epi | epinephrine |
| EtOH | ethyl (drinking) alcohol |
| FL | fluoride |
| lido | lidocaine |
| mepiv | mepivicaine |
| N2O | nitrous oxide |
| NaF | sodium fluoride |
| NSAID | nonsteriodial anti-inflammatory drug |
| QD | once a day |
| QID | four times a day |
| SIG | write on label |
| TID | three times a day |
| xylo | Xylocaine |

### Treatment

| | |
|---|---|
| Bx | biopsy |
| CLD | complete lower denture |
| CR | crown |
| crn lngth | crown lengthening |
| CUD | complete upper denture |
| DPC | direct pulp cap |
| EOE | extraoral examination |
| etch | acid etch |
| ext | extract(ion) |
| FGC | full gold crown |
| FPD | fixed partial denture |
| impl | implant |
| impr | impression |
| inf | infiltration |
| IOE | intraoral examination |
| IPC/IPT | indirect pulp cap/therapy |
| OCD | over complete denture |
| OE | oral examination |
| OHI | oral hygiene instructions |
| P & C | post and core |
| PFM | porcelain fused to metal |
| prophy | prophylaxis |
| PRR | preventive resin restoration |
| PVC | porcelain veneer crown |
| recem | recement |
| rel | reline |
| RPD | removable partial denture |

## eTABLE 1-1 The University of Michigan School of Dentistry List of Abbreviations—cont'd

| | |
|---|---|
| RPD | removable partial denture |
| S&RP | scaling and root planing |
| SC | scale |
| SC/RP | scaling and root planing |
| seal | sealant |
| sed | sedative |
| SM | space maintainer |
| SSC | stainless steel crown |
| STE | soft tissue exam |
| t cond | tissue condition(er) (ing) |
| temp CLD | mandibular stayplate |
| temp CUD | maxillary stayplate |
| temp L RPD | mandibular flipper |
| temp U RPD | maxillary flipper |

**Imaging**

| | |
|---|---|
| AO | anterior occlusal radiograph |
| bwx | bite wing x-ray |
| CBCT | cone bean computerized tomography |
| Ceph | cephlometiric film |
| CXR | chest x-ray |
| FMS | full mouth survey |
| FMX | full mouth x-rays |
| MRI | magnetic resonance imaging |
| Occ | occlusal radiograph |
| PA | periapical radiograph |
| Pan | panoramic radiograph |
| PAX | periapical x-ray |

**Structure**

| | |
|---|---|
| IA | inferior alveolar |
| IAN | inferior alveolar nerve |
| MGJ | mucogingival junction |
| ms | muscle |
| MSA | middle superior alveolar |
| PSA | posterior superior alveolar |
| TMJ | tempromandibular joint |

**Ortho/Pedo**

| | |
|---|---|
| AW | arch wire |
| B&L | band and loop |
| band | banding |
| coop | cooperative |
| DB | debond |
| decal | decalcified area |
| FTT | failure to thrive |
| HG | head gear |
| hypoplas | hypoplasia area |
| LLHA | lower lingual holding arch |
| MMP | Molt mouth prop |
| OB | overbite |
| SS | Stainless Steel |

**Prosthodontics**

| | |
|---|---|
| abut | abutment |
| appl | appliance |
| BS | bite splint |
| CD | complete denture |
| CP | centric position |
| CR | centric relation |
| fmwk | framework |
| ICP | intercuspal position |
| MI | maximum intercuspation |
| OVD | occlusal vertical dimension |
| RBFPD | resin-bonded fixed partial denture: Maryland bridge |
| RCP | retruded constant position |
| reb | rebase |

**Periodontics**

| | |
|---|---|
| BOP | bleeding on probing |
| CAL | clinical attachment level |
| calc | calculus |
| GI | gingival index |
| ging | gingiva |
| PD | pocket/probing depths |
| PSR | periodontal screening and recording |

**Surgery**

| | |
|---|---|
| FTMPF | full thickness mucoperisteal flap |
| INR | international normalized ratio |
| Mal Class | Mallampati classification |
| NPO | nothing by mouth |
| RAO2 | room air saturation |

**Endodontics**

| | |
|---|---|
| Ca [OH]2 | calcium hydroxide |
| CB | carrier based obturation |
| CP | cotton Pellet |
| CW | continuous wave obturation |
| EAL | electronic apex locator |
| F | fine |
| GP | gutta percha |
| LC | lateral condensation |
| MAF | master apical file |
| MC | master cone |
| NaOCl | sodium hypochlorite |
| Ni Ti | nickel titanium |
| WL | working length |
| WVn | warm vertical obturation |

Courtesy the University of Michigan School of Dentistry, Ann Arbor, MI.

7. American Dental Association: Council on Scientific Affairs: Treating caries as an infectious disease, *J Am Dent Assoc* 125(Spec Iss):2S–15S, 1995.
8. Ekstrand K, Qvist V, Thylstrup A: Light microscope study of the effect of probing in occlusal surfaces, *Caries Res* 21: 363–374, 1987.
9. van Dorp CS, Exterkate RA, ten Cate JM: The effect of dental probing on subsequent enamel demineralization, *ASDC J Dent Child* 55:343–347, 1988.
10. Penning C, van Amerongen JP, Seef RE, ten Cate JM: Validity of probing for fissure caries diagnosis, *Caries Res* 26:445–449, 1992.
11. Fontana M, Horlak D, Sharples S, et al: Teaching of cariology in US dental schools, *AADR meeting* Abstract 313, 2012.
12. Shivakumar K, Prasad S, Chandu G: International caries detection and assessment system: A new paradigm in detection of dental caries. J Conserv Dent 12(1):10-16, 2009.
13. Pitts N: "ICDAS"—an international system for caries detection and assessment being developed to facilitate caries epidemiology, research and appropriate clinical management, *Community Dent Health* 21:193–198, 2004.
14. Jablonski-Momeni A, Stachniss V, Ricketts DN, et al: Reproducibility and Accuracy of the ICDAS-II for Detection of Occlusal Caries in vitro, *Caries Res* 42:79–87, 2008.
15. Shoaib L, Deery C, Ricketts DNJ, Nugent ZJ: Validity and reproducibility of ICDAS II in primary teeth, *Caries Res* 43: 442–448, 2009.
16. Stookey GK, Gonzalez Cabezas C: Emerging methods of caries diagnosis, *J Dent Educ* 65:1001–1006, 2001.
17. Fontana M, Gonzalez-Cabezas C: Changing paradigm. A different view of caries lesions, *Compendium* 32(Special Issue 4):24–27, 2011.
18. Stump A, Fontana M, Gonzalez-Cabezas C, et al: The effect of magnification on occlusal carious lesion treatment decisions, *IADR meeting*, Abstract 2554, 2011.
19. Fontana M, Zero D, Beltrán-Aguilar E, Grey SK: Techniques for tooth surface assessments in school-based sealant programs, *J Amer Dent Assoc* 141(7):854–860, 2010.
20. Bader JD, Shugars DA: A systematic review of the performance of a laser fluorescence device for detecting caries, *J Am Dent Assoc* 135:1413–1426, 2004.
21. Soderlund K: Chairside medical screening could save $102 million a year, *ADA News* 45(5):2, 2014.

2

# Common Diagnoses in Dentistry

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http://evolve.elsevier.com/Stefanac/diagnosis/

## OUTLINE

**PATIENT DIAGNOSIS**
**Diagnoses and Problems**
**Benefits of a Diagnosis and Problem List**
Foundation for the Treatment Plan
Organization
Professional Competence
Patient Education
Standard of Care
**The Comprehensive Patient Diagnosis**
**COMMON DIAGNOSES**
**A. Diagnoses Derived from the Patient's Chief Concern and Other Concerns**
**B. General Health Diagnoses**
**C. Patient Considerations That Influence the Treatment Plan**
**D. Extraoral Diagnoses**
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Abnormalities Apparent on the Hands or Exposed Skin Surfaces
Abnormalities in the Head, Face, and Neck Region
**E. Intraoral Soft Tissue Diagnoses**
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Traumatic and Reactive Lesions
Infection/Inflammation
Autoimmune Processes
Cysts/Tumors/Neoplasias of Soft Tissue Origin
**F. Salivary Gland Abnormalities**
Nonneoplastic Lesions
Neoplastic Lesions
**G. Abnormalities of the Jaws (Nonperiodontal Radiographic)**
**H. Temporomandibular Joint Diseases: Neuropathic Pain- and Neurovascular Pain**
Temporomandibular Disorders
Neuropathic Pain
Neurovascular Pain
**I. Periodontal Diseases**
Plaque-induced Gingival Diseases
Chronic Periodontitis
The Concept of the Reduced Periodontium
**J. Pulpal and Periapical Diagnoses**
**K. Dental Caries**
Some Guiding Definitions
Caries Lesion Severity
Caries Lesion Activity (Net Progression Toward Demineralization)
Classification of Lesions by Anatomical Location
Radiographic Detection of the Caries Lesion
**L. Tooth Cracks and Fractures**
Classifying the Longitudinal Fractures and Cracks
**M. Other Noncarious Abnormalities of Teeth**
**N. Occlusal Abnormalities**
**O. Esthetic Problems**
Dentofacial Issues
Tooth-related Esthetic Issues
Lip and Gingival Esthetic Issues
**P. Single Tooth Restoration Defects**
**Q. Fixed Prosthodontic Problems**
**R. Removable Prosthodontic Problems**
**S. Implant-Related Diagnoses**

## PATIENT DIAGNOSIS

### DIAGNOSES AND PROBLEMS

Armed with the significant findings from the examination process, the dentist now begins to assemble a list of diagnoses for the patient. Diagnoses are precise, scientific terms used to describe variations from normal. They can be applied to a systemic disease, such as diabetes, or a specific oral health condition, such as aggressive periodontitis. Other examples of diagnoses include occlusal caries, irreversible pulpitis, squamous cell carcinoma (SCCA), and Class II malocclusion. Often, more than one finding may be necessary to formulate a diagnosis. For example, a tooth that appears darker than the

Images in the tables can be viewed larger in the expanded chapter on Evolve.

others may or may not be a significant finding. This finding, concurrent with a tooth that tests negative to electric pulp testing and the radiographic appearance of a periapical radiolucency, would strongly suggest pulpal necrosis.

Several *types* of diagnoses are possible. When several findings point clearly to a specific disease entity, the clinician may make a **definitive diagnosis,** indicating a high level of certainty. On the other hand, when the findings suggest several possible conditions, the process of distinguishing among the list of possibilities is referred to as a **differential diagnosis.** For example, the differential diagnosis of a lump on the patient's palate might require differentiation among such possibilities as a maxillary torus, a salivary gland tumor, or an odontogenic infection. Without more information, such as findings from a radiograph or a biopsy result, it may be impossible to reach a definitive diagnosis. A "golden rule" of treatment planning is that a diagnosis should be made before treatment begins. When the diagnosis is uncertain, but it is prudent to begin some type of treatment, a **working** or **tentative diagnosis** may be made. Diagnostic tests, consultation with other providers, or reevaluation of the patient will usually be required to either confirm the diagnosis or to change to a new, more definitive, diagnosis.

On many occasions, a precise diagnosis that matches a significant finding may not be achievable. For example, the patient may reveal that he or she has limited funds available for dental treatment. This is a significant finding that may affect the treatment plan but it does not fit the classic definition of a diagnosis. Such issues are typically referred to as **problems.** Patient problems can be general or specific issues that suggest the need for attention. Common examples of patient problems include dental pain of undetermined origin, fear of dental treatment, or the patient who requires the assistance of a caregiver to brush the teeth.

## BENEFITS OF A DIAGNOSIS AND PROBLEM LIST

After completing the patient examination, the dentist must assemble and organize all the significant findings to create a list of patient diagnoses and problems. This list is then documented in the patient record. The benefits of creating such a list include:

### Foundation for the Treatment Plan

When generating a patient's treatment plan or plan of care each treatment on the plan must be justified by one or more diagnoses or **reasons for treatment**. The patient's diagnosis is the essential basis for any treatment plan. A treatment plan that lacks this foundation is often missing key components. Important patient concerns and/or oral health problems may be overlooked and go untreated.

### Organization

Diagnoses and problems can be sorted and organized more readily than findings. The dentist typically lists the important issues first, such as the chief complaint, with other diagnoses following in order of significance. This process of prioritization sets the stage for developing a sequenced treatment plan.

### Professional Competence

Documenting diagnoses in the record provides an important safeguard against avoiding the appearance of providing unnecessary treatment. In the event of malpractice litigation, dentists who list this information fare better than those who do not. A discussion of standardized codes is featured in the *In Clinical Practice* box.

## IN CLINICAL PRACTICE

**Diagnostic Codes**

As discussed throughout this chapter, the dentist should always have arrived at a diagnosis, whether definitive or tentative, before beginning the patient's treatment. Each treatment procedure should be rationalized with a specific diagnosis or set of diagnoses. The benefits of utilizing a standardized system of diagnostic nomenclature and coding are significant and include: accurate data recording; effective and efficient communication; treatment outcome tracking; evaluation of treatment outcomes; quality improvement; and facilitation of third party accounting, billing, and payment. As dental patients become more medically complex, frequently with multiple healthcare providers and insurers, standardized terminology and coding for diagnoses and treatment procedures have become essential. The increasing use of electronic health records (EHR) and electronic dental records (EDR) requires encoded standard health terminology. Universally accepted diagnostic codes will provide a foundation for integrating interprofessional (IP) patient care (see Chapter 5), and coordinating services between dental care providers and other healthcare providers.

Currently, three diagnostic coding systems are used in U.S. dentistry: the dental subset of SNOMED CT known as SNODENT; the Code on Dental Procedures and Nomenclature also referred to as Current Dental Terminology (CDT); and the International Classification of Diseases—Clinical Modification, Release 9 (ICD-9-CM).

The International Statistical Classification of Diseases and Related Health Problems, also called the International Classification of Diseases (ICD), evolved from the International Lists of Diseases and Causes of Death created and revised decennially beginning in the late 19th century (1891). After World War II, the World Health Organization (WHO) assumed the responsibility of maintaining and updating these lists. The tenth version, ICD-10, has been adopted by many WHO member countries since 1994. In the U.S., ICD-10-CM and ICD-10-PCS (ICD-10 procedure coding system) is scheduled for implementation in 2015. ICD-11 is currently under development by the WHO and implementation is expected by 2017.

CDT has been developed by the American Dental Association (ADA) to achieve uniformity, consistency, and specificity in

accurately reporting dental treatment and to enable efficient processing of dental claims. The first CDT Code set was published in 1969 as the Uniform Code on Dental Procedures and Nomenclature in *The Journal of the American Dental Association*. Since then, updates have been released periodically by the ADA. In 2000 the CDT Code was designated as a HIPAA standard code set. Any claim submitted on a HIPAA standard electronic dental claim form must use dental procedure codes from the version of the CDT Code in effect on the date of service. Increasingly, insurance companies are requiring a specific diagnosis or diagnoses for each dental procedure. In 2012 the ADA updated the dental claim form to support reporting up to four diagnosis codes per dental procedure. SNODENT (see later) is the best resource for the diagnosis codes. The claim form also contains ICD-9 CM and ICD-10 CM diagnosis codes for medical procedures provided by dentists who are eligible providers.

The SNOMED Clinical Terms (SNOMED CT) document was released in 2002 as a convergence of The College of American Pathologists (CAP) SNOMED reference terminology (SNOMED RT) and the United Kingdom's Clinical Terms Version 3 (formerly known as the Read Codes). The CAP began the development of Systematized Nomenclature of Pathology (SNOP) in 1965. In 1974 SNOP was expanded from a pathology-centric nomenclature to a broader version called the Systematized Nomenclature of Medicine (SNOMED). SNOMED RT was the 2000 updated version, containing a broad range of basic sciences, laboratory, and specialty medicine terminology for the EHR environment and cross-mapped to ICD-9 CM. In 2007 an international nonprofit organization, the International Health Terminology Standards Development Organization (IHTSDO), was created in Denmark to continue the updating, maintenance, and distribution of the SNOMED CT.

Both SNOMED CT and ICD have included only limited terminology for dental problem description and diagnosis. The ADA began development of the Systematized Nomenclature of Dentistry (SNODENT) in the 1990s. In 2007 the ADA began the process of updating SNODENT for electronic dental record use and for inclusion as a subset of SNOMED CT by cross-mapping SNOMED CT, ICD-9, and ICD-10. In 2012 the ADA and IHTSDO reached a licensing agreement for use of SNODENT as the dental subset of SNOMED CT. Eligible dental schools and practitioners who participate in Medicare and/or Medicaid may be required to use SNODENT for dental service claims, just as SNOMED CT is required terminology for these same payers. As a component of IHTSDO, the ADA is collaborating with the WHO to ensure that the oral health codes within ICD-11 are complete and are comparable and compatible with SNODENT.

As this process unfolds, it is anticipated that the use of standardized and encoded diagnostic terminology will become the norm in dental practice.

For further discussion of this topic, the reader is referred to Kelly Soderlund: SNODENT takes the global stage: ADA and WHO evaluating latest version of International Classification of Diseases, ADA News April 11, 2013. Or visit: http://www.ada.org and http://www.ihtsdo.org.

### Patient Education

At the conclusion of the examination, the dentist should inform the patient about his or her oral condition. A list of diagnoses and problems provides a convenient and straightforward way to share this information. Discussing diagnoses and problems with the patient becomes part of the process of obtaining **informed consent** to provide treatment.

### Standard of Care

Dental professional organizations typically include in their codes of ethical principles the expectation that the dentist will arrive at a diagnosis and inform the patient of that diagnosis before beginning treatment. Most dental boards now explicitly require a documented diagnosis of the patient's condition before the dentist begins treatment.

## THE COMPREHENSIVE PATIENT DIAGNOSIS

The patient's comprehensive diagnosis list or patient diagnosis is a compilation of any of the patient's problems or concerns that require (1) *recognition,* (2) *management,* or (3) *treatment*.

Not all diagnoses will require therapeutic or surgical intervention at the time of initial treatment planning. Some diagnoses need only to be identified and *recognized* at this juncture. A frequently encountered example is the patient with an amalgam tattoo. Any pigmented lesion in the oral cavity warrants our attention—but when the history, clinical appearance, and lack of symptoms are consistent with a diagnosis of an amalgam tattoo, the usual course of action will be to record the presence, location, and appearance of the tattoo and to compare that description with the appearance of the tattoo at future periodic (recall) visits. Initial photographic images can facilitate this process. The diagnosis is explained to the patient and the patient is reassured as to the benign nature of the discoloration. No biopsy is necessary at this time.

A patient who, according to the American Heart Association guidelines, is at the highest risk for endocarditis will require antibiotic premedication for dental procedures for which tissue manipulation is expected. By taking into account issues relating to the patient's general health (i.e., the potential for endocarditis) we are not treating the patient's medical condition, but rather we are *managing* the patient's general health needs by providing dental treatment in a manner consistent with professional practice standards and in the patient's best general health interests.

The majority of a patient's oral health diagnoses will be *treated* through some form of direct chemotherapeutic, surgical, or restorative intervention.

Most patient diagnoses can be expected to fall into the following categories. While it would be extremely unusual for any one patient to have issues in all of these categories, the general dentist can expect to regularly encounter all of these diagnoses in his or her family of patients (Box 2-1):

The patient's chief concern
General health issues that impact on dental treatment
Diagnoses that evolve from the patient's oral health history

**BOX 2-1 Example of a Patient Diagnosis List**

The following is an example of a diagnosis list for a dental patient. For clarity, acronyms and abbreviations are either avoided or explained. Tooth numbers are not included so as to avoid confusion with varying numbering systems. In this example, the diagnoses are generally broad (not tooth or surface specific) with the presumption that specific clinical findings relating to tooth and surface lesions are identified in the patient record.

1. Chief concern: fractured maxillary right lateral incisor with exposed dentin and reversible pulpitis
2. Type 2 diabetes well controlled with oral hypoglycemic
3. Hypertension well controlled with medications
4. Allergic to penicillin and latex
5. Current smoker (30 pack-year smoking history)
6. Sporadic dental treatment history; last cleaning 3 years ago
7. Actinic keratosis on the lower lip
8. Hyposalivation
9. Multiple primary and secondary carious lesions (see charting for teeth and surfaces)
10. High caries risk
11. Localized moderate marginal periodontitis
12. Gingival recession on the facial surfaces of most posterior teeth
13. Root sensitivity on maxillary right canine
14. Maxillary left second molar with cervical caries penetrating into the pulp—necrotic pulp and chronic apical periodontitis*
15. Partial edentulism
16. Hypererupted maxillary left first molar
17. Upper and lower RPDs (removable partial dentures)—fractured clasp and poor retention with upper RPD

*Current American Academy of Endodontics designation: asymptomatic apical periodontitis (AAP).

Diagnoses that evolve from the patient's personal history
Findings from the intraoral and extraoral exam
Findings from the radiographic exam
Disorders of the temporomandibular joint (TMJ) complex
Skeletal and occlusal abnormalities
Periodontal pathology
Pathology of the pulp or apical periodontium
Caries and noncarious abnormalities of the teeth
Esthetic concerns and problems
Defects or problems with restorations, an oral prosthesis and/or implants

# COMMON DIAGNOSES

## A. DIAGNOSES DERIVED FROM THE PATIENT'S CHIEF CONCERN AND OTHER CONCERNS

As described in Chapter 1, the patient interview begins with an investigation of the patient's **chief concern**. A chief concern expressed as a request like "I need a check-up and cleaning" would not normally be carried over to the patient's diagnosis as it would be a routine part of the patient's plan of care. Any chief concern that will require patient-specific action by the dental team, however, should be included in the diagnosis (Figure 2-1).

A patient who presents to the initial examination visit with a chief concern described as "a toothache" definitely needs to have that problem recorded in the diagnosis. The way the problem is recorded, however, will vary with the findings that are available to the dentist at the initial visit. If, during the course of the initial examination, definitive tooth, pulp, and apical diagnoses can be determined, it will be appropriate to include all those related problems in the patient's diagnosis. If the diagnosis for the "toothache" is suspected but unconfirmed, it may be listed in the diagnosis as a tentative or working diagnosis. If the diagnosis for the "toothache" is undetermined at the initial exam and it is difficult to even speculate on a diagnosis, it will then be appropriate to include the problem as *tooth pain of undetermined origin* in the diagnosis list.

Although often the chief concern is not an acute problem, that does not diminish its importance. Certainly, if the patient presents with a chief concern of "I don't like my smile; my teeth don't look good" that concern needs to be included in the diagnosis.

A patient may present with more than one concern and may have multiple treatment desires or objectives. Therefore, *any* patient concern – not just the chief concern – that may need to be addressed by the dental team is appropriate to include in the diagnosis list.

## B. GENERAL HEALTH DIAGNOSES

A wide variety of diagnoses can be made concerning a patient's general health condition. Many of these diagnoses will

**FIG 2-1** Example of oral problem that if symptomatic would warrant urgent treatment. (Courtesy Dr. Lee Boushell, Chapel Hill, N.C.)

be self-reported by the patient on the general health history questionnaire. The dentist may have additional concerns after reviewing the medication list, interviewing and examining the patient, and evaluating the vital signs. If any findings contradict the patient's own appraisal/report of his or her general health, it may be necessary to contact the patient's primary healthcare provider. Similarly, a patient who presents with signs or symptoms of an undiagnosed or untreated medical problem will need to be medically managed before, during, and following dental treatment (Figure 2-2).

Any general health issues that may have an impact on the treatment plan or the delivery of dental treatment should be included in the diagnosis. When possible, an objective qualifier should be added to indicate both the type of problem and the level of disease control.

For example:

Asthma with last attack 25 years ago versus asthma with weekly attacks
Stable or unstable angina
Controlled or uncontrolled hypertension
Type 2 diabetes mellitus with the Hb A1C 7.0 measured 1 month ago
History of head and neck radiation with total radiation to the jaw bones
History of intravenous bisphosphonate use for the last 5 years in conjunction with breast cancer
History of deep vein thrombosis – currently taking warfarin

An overview of medical problems and their management in the context of dental treatment is set forth in Chapter 7 (Systemic Phase of Treatment). Selected general health diagnoses are also detailed in Chapters 12 (Patients with Special Needs), and 17 (Geriatric Patients). Additionally, Chapter 13 discusses substance abuse problems; Chapter 14 addresses patients with dental anxiety; and Chapter 15 focuses on psychological disorders.

## C. PATIENT CONSIDERATIONS THAT INFLUENCE THE TREATMENT PLAN

**Patient considerations** are those modifiers to treatment planning that are derived exclusively from information *about*

**FIG 2-2** **A,** Bleeding diathesis. **B,** Clubbing associated with cardio-pulmonary disease. **C,** Diabetes. **D,** Herpes simplex virus. **E,** Hyperthyroidism. (**A,** Courtesy Robert Henry, DMD, Lexington, KY; **A, B, E,** from Little JW, Falace DA, Miller CS, Rhodus NL: *Dental management of the medically compromised patient,* ed 8, St Louis, 2013, Mosby; **C,** from Bricker SL, Langlais RP, Miller CS: *Oral diagnosis, oral medicine, and treatment planning,* ed 2, Hamilton, 2002, BC Decker; **D,** from Sapp JP, et al: *Contemporary oral and maxillofacial pathology,* ed 2, St. Louis, 2004, Mosby.)

the patient. The personal history and the oral health history can be a rich source for this information. Additionally, patient considerations will be revealed in the course of conversation over subsequent dental visits as the dental team and the patient become better acquainted. Some patient considerations, especially those that reflect the patient's motivation and abilities to accept recommendations and execute behavioral changes, will be fully revealed only after considerable time and experience.

Throughout this book, the importance of including and weighing patient considerations in considering treatment options and formulating treatment proposals is emphasized. An understanding of patient choices and preferences is essential to the development of a treatment plan that will be acceptable to the patient and addresses his or her expectations. This understanding is also critical if the patient is to be fully involved in the treatment planning process and not only compliant, but energetically engaged in the treatment process as well. With the patient invested and engaged, the probability of success is also much improved and the patient is more likely to recognize and appreciate the benefits of the treatment that is rendered.

The following is a list of some of the patient considerations that can have significant impact in planning treatment for a patient. Such factors, when they are believed by either the patient or the dentist to limit the scope of treatment or to require modification in the way treatment can be delivered, should be identified and recorded in the patient's diagnosis:

Patient's level of knowledge relating to oral health issues and problems

Patient's ability to establish and maintain effective oral self-care practices

Patient's motivation to embark on dental treatment and the ability to sustain that effort

Sufficient patient physical and mental stamina to engage in treatment in the face of competing personal priorities and family and society demands

The resources – including time and money – necessary for participation in the treatment

Reliable means of transportation to and from the dental office

Note: Chapter 18 specifically addresses the needs of patients who are motivationally compromised and/or have limited financial resources.

## D. EXTRAORAL DIAGNOSES

When the patient walks (or is assisted) into the dental operatory for an initial oral examination, any tremors, imbalance, or abnormalities of posture, gait, sight, hearing, or cognition will be readily apparent. As discussed in Chapter 1, the initial oral examination of the dental patient includes taking vital signs and a visual and palpatory assessment of exposed skin surfaces of the head, face, and neck. On occasion, the patient may request an opinion concerning an abnormality that is identified during this stage of the initial examination; for example, the discovery of a colored lesion on the skin that the patient had been previously unaware of. If there is any question about the diagnosis in the dentist or the patient's mind it will be appropriate for the dentist, as a healthcare provider, to refer the patient to a dermatologist or other clinician for evaluation and treatment. The dentist also should be cognizant of any underlying health problem that may affect the treatment planning or the manner in which dental treatment will be delivered. This section highlights some of the more common conditions that may become apparent during an extraoral examination that are *likely to have a significant impact on treatment planning for the patient*. The topics in this section are organized and sequenced in the order in which the extraoral examination is usually executed. For a more comprehensive and detailed analysis, the reader is referred to several authoritative textbooks in the Suggested Readings at the end of this chapter.

### Abnormalities Apparent Through General Observation

#### Parkinson's Disease (PD)

This degenerative disorder of the central nervous system causes involuntary uncontrolled movements. The disorder progresses to widespread motor function impairments and sensory, emotional, and cognitive dysfunction.

Classic signs include body rigidity, short dragging footsteps, and trembling hands. These patients often have challenges arranging transportation to the dental office, ambulating to the dental operatory, holding the mouth open during dental procedures, and performing daily oral self-care procedures (see Chapter 17 for more information).

#### Arthritis

Both osteoarthritis and rheumatoid arthritis may affect multiple joints of the body, causing difficulty in walking and in head and neck movement. Impairment of the dominant hand joints may contribute to ineffective oral hygiene. When the temporomandibular joints are affected, the range of jaw movement may be limited.

#### Cerebrovascular Accident (CVA)

A CVA, also known as a stroke, occurs when there is a disruption in the blood supply and oxygen deprivation to a portion of the brain, causing the death of some brain cells. The immediate cause of the disruption is often a blood clot or thrombus. The patient may exhibit a temporary (and sometimes permanent) speech or motor deficit on the side of the body controlled by the affected portion of the brain. In the dental setting, the patient may manifest aphonia, dysphonia, and hemiplegia, and may have difficulty carrying out the activities of daily living independently. The patient may need assistance with oral hygiene activities.

#### Neuromuscular Disorders

Neuromuscular disorders are a group of diseases related to either muscles, nerves, or both that result in impaired movement and, with some conditions, sensory or other neurologic dysfunctions. These disorders can be categorized based on the cause. Examples include multiple sclerosis, Huntington disease, myasthenia gravis, muscular dystrophy, and idiopathic inflammatory myositis. These disorders may pose

challenges to oral healthcare depending on the severity of the disease and the effects of treatment medications.

### Vital Signs Irregularities

***Hypertension (high blood pressure).*** Patients may present at the initial visit with a history of hypertension, or hypertension may be suspected when the dental team assesses the blood pressure (see Chapter 1). When hypertension has no known cause it may be identified as essential hypertension, primary hypertension, or idiopathic hypertension. Hypertension is a risk factor for heart attack, stroke, and chronic kidney disease. Its high prevalence and low rate of diagnosis and treatment has been a major public health concern. Oral healthcare providers have the responsibility to refer patients with persistent elevated blood pressure, including those resistant to treatment, to a physician for evaluation, diagnosis, and treatment. A high blood pressure reading in the dental clinic may indicate the presence of a significant cardiovascular conditions such as left ventricular hypertrophy, aortic stenosis, or conduction defects that warrant pretreatment evaluation by a cardiologist. The patient's cardiologist may wish to provide treatment, such as medication modification, to avoid perioperative cardiovascular complications. In addition, many antihypertensive medications have adverse oral effects, most notably hyposalivation, that are relevant to oral healthcare and treatment planning.

***Irregular pulse (arrhythmia; includes rhythm, intensity, rate abnormalities).*** Arrhythmia is a general term for a group of conditions characterized by an irregular heartbeat. Some arrhythmias are genetic and others are acquired. Some are trivial; others can be life threatening. Severe arrhythmia can be precipitated by intense pain or by a variety of drugs or drug-drug interactions. The patient's underlying cardiac condition may also play a role in the precipitation of a life-threatening arrhythmia. For example, in susceptible patients certain antibiotics can cause QT elongation and may precipitate a *Torsade de pointe* (Tdp), a severe ventricular fibrillation, and sudden cardiac arrest. To avoid precipitating severe arrhythmia it is important that the dentist identify patients who are at risk through their health and medication histories.

## Abnormalities Apparent on the Hands or Exposed Skin Surfaces

### Arthritic Hands

The hands (Figure 2-3) can provide insights into the patient's general health. Swollen and inflamed joints can be signs of many autoimmune diseases, including rheumatoid arthritis. The disease or its treatment may influence oral health or oral healthcare; for example, additional help may be needed for effective oral hygiene; treatment modification may be necessary.

### Bruises (Ecchymosis)

Bruises on the skin (Figure 2-4) can be a sign of an acquired or hereditary bleeding disorder and may warrant further investigation or treatment plan modification. They can also be the result of trauma or physical abuse.

**FIG 2-3** Arthritic hands. (Courtesy Dr. Rose Geist, Detroit, Mich.)

**FIG 2-4** Ecchymosis. (Courtesy Dr. Rose Geist, Detroit, Mich.)

### Splinter Hemorrhages

Splinter hemorrhages are dots or vertical streaks of hemorrhages under the nails (eFigure 2-1). Nail trauma is the most common cause but skin disorders, systemic diseases, or medication use can also be responsible. Examples of systemic diseases that cause the condition include nail psoriasis, endocarditis, and systemic lupus erythematosus. Aspirin and warfarin are medications that have been reported to cause splinter hemorrhages.[1]

### Pitting (or Dependent) Edema

Pitting edema is an abnormal accumulation of fluid in the extracellular space of lower limb tissue resulting in swelling that can be dimpled with finger pressure (eFigure 2-2). This may occur during pregnancy or may be associated with serious health problems such as congestive heart failure, kidney failure, or liver cirrhosis.

### Nevi

It is not uncommon to find dark brown or black macules or papules on the skin of the face and neck (eFigure 2-3). The most common diagnosis of these lesions is *nevi* (plural for nevus). These most common benign tumors of the skin

**eFIG 2-1** Splinter hemorrhages. (From Hordinsky MK, Sawaya ME, Scher RK: *Atlas of hair and nails,* Philadelphia, 2000, Churchill Livingstone.)

**eFIG 2-2** Pitting edema. (From Forbes CD, Jackson WD: *Color atlas and text of clinical medicine,* ed 3, London, 2003, Mosby.)

**eFIG 2-3** Nevi. (Published with permission. From Hueso-Gabriel L, Mahiques Santos L, Terrádez Mas L, Santonja López N: Nevos displásicos eruptivos tras el consumo de Melanotan. *Actas Dermosifiliogr* 2012;103(4):329-331. Copyright © 2011 Elsevier España, S.L. y AEDV. All rights reserved.)

consist of clusters of nevus cells in the epidermis or dermis. By examining their clinical presentation, nevi can be differentiated from other common benign lesions of skin, such as dermatosis papulosa nigra or seborrheic keratosis, or from more serious conditions, such as malignant melanoma, pigmented basal cell carcinoma (BCCA), or SCCA. Oral healthcare providers play an important role in recognizing and identifying these pigmented lesions. When clinical findings are not discriminatory, referral to a dermatologist for evaluation and biopsy is indicated.

### Seborrheic Keratosis

Seborrheic keratoses (eFigure 2-4) are light or dark brown lesions that are flat or slightly elevated on the skin of older individuals. The lesions vary in size but are usually less than 1 cm in diameter and have a velvety to finely verrucous surface. The dentist should be able to differentiate this condition from premalignant or malignant skin lesions; if in doubt, the patient should be referred to a dermatologist.

### Solar (or Actinic) Cheilosis and Solar Keratosis

Solar keratosis is a premalignant skin condition caused by sun damage and usually occurs in older individuals with light complexions who have experienced prolonged sunlight exposure, causing the skin to become scaly, rough, and slightly red and elevated. Solar cheilosis is solar keratosis of the lower lip (eFigure 2-5); it appears vermilion with indistinct mucocutaneous borders. The dental team should recommend strategies to prevent the development of lip or skin cancer including reducing sun exposure, wearing sun protective clothing, and use of applied sun block agents.

### Basal Cell Carcinoma (BCCA)

BCCA is a common neoplasm often found on the skin of adults who have a history of long exposure to sunlight (eFigure 2-6). In spite of being malignant, this condition rarely metastasizes. The patient should be referred to a dermatologist for definitive diagnosis and treatment.

### Squamous Cell Carcinoma (SCCA)

SCCA, a malignant neoplasm of epidermal or epithelial origin, has potential for distant metastasis (eFigure 2-7). Although less common than BCCA on the skin of the head and neck, it has a significantly higher morbidity and mortality. Early detection and treatment is the key to survival. Oral health professionals should be prepared to recognize a variety of clinical presentations of early SCCA. If detected, timely referral for further evaluation is warranted.

### Melanoma

Melanoma, a malignant neoplasm of melanocytes in the basal layer of the epidermis and epithelium, occurs primarily in the skin of the head and neck region (eFigure 2-8). Excessive exposure to sunlight is a major risk factor. Although melanoma rarely occurs in the oral mucosa, given its serious nature, it must be included in the differential diagnosis of any intraoral pigmented lesion.

### Urticaria

Urticaria is a transient skin condition, also known as hives, characterized by red or white bumps on the skin with intense itching (eFigure 2-9). The most common cause is an Ig-E mediated allergic reaction to drugs or food. A less common cause can be an autoimmune disease in which the hives come and go repeatedly over months or years. Emotional stress, temperature, and sun exposure have also been linked to episodes of hives. In many cases the cause remains unknown.

### Angioedema

Although a result of the same mechanisms characteristic of hives, in which the edema is localized and limited to the superficial portion of the dermis, angioedema involves a wider and deeper portion of the dermis and subdermis, resulting in swelling over a larger area (eFigure 2-10). The causes of angioedema are similar to those of hives. Both are short-lived phenomena, lasting only a few hours. A local anesthetic may be the cause of angioedema and of anaphylaxis—a potentially life-threatening medical emergency (see Malamed's *Medical Emergencies in the Dental Office* for in-depth discussion).

### Contact Dermatitis (Dermatitis Medicamentosa)

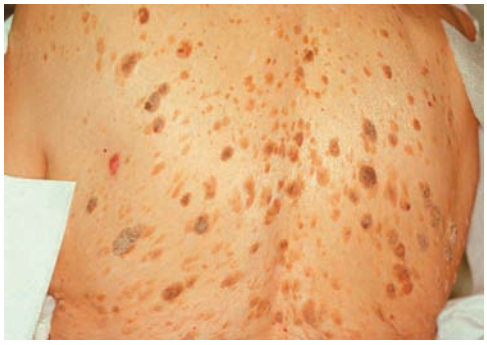
Contact dermatitis is a T cell-mediated delayed hypersensitivity reaction in which an antigen comes into contact with the skin and is linked to skin protein, forming an antigen complex that leads to sensitization (eFigure 2-11). Upon re-exposure of the epidermis to the offending antigen, the sensitized T cells initiate an inflammatory cascade. Within 24 to 48 hours after contact, pruritic erythema, vesicles, and bullae form. As the inflammation dwindles, a crust forms on the affected area, which heals in about three weeks.

Common antigens causing this reaction include poison ivy, nickel, and some fragrances. Patients who are sensitive to acrylic or metals in dental prostheses may develop this reaction.

A variety of topical medicaments, including antibiotics, steroids, anesthetics, and antifungals are frequently encountered as the cause of allergic contact dermatitis. Neomycin and lidocaine are most often reported.

### Herpes Zoster (Shingles)

Herpes zoster is a skin eruption spreading in a beltlike pattern and is a recurrent episode of latent varicella zoster virus infection in individuals who contracted chickenpox in childhood and carry latent viruses in the sensory nerve ganglia (eFigure 2-12). Reactivation occurs spontaneously later in adult life when the immune system may be suppressed. The lesions of herpes zoster are localized to distribution in one or more sensory nerves with sharp demarcation. When occurring in the head region, the lesions follow the distribution of the trigeminal nerve branches. Intraoral cases may be extremely painful and debilitating and, in severe form, may result in destruction of periodontal tissues on the affected side (see Suggested Readings at the end of the chapter for information on the diagnosis and management of herpes zoster).



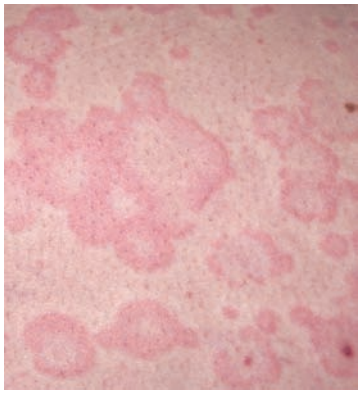
**eFIG 2-4** Seborrheic keratosis. (From Pfenninger JL, Fowler GC: *Pfenninger and Fowler's procedures for primary care,* ed 3, Philadelphia, 2011, Mosby.)

**eFIG 2-5** Solar cheilitis and solar keratosis. (From Neville BW, Damm DD, Allen C, et al: *Oral and maxillofacial pathology,* ed 4, St. Louis, 2016, Elsevier.)

**eFIG 2-6** Basal cell carcinoma. (From Rigel DS, Robinson JK, Ross MI, et al: *Cancer of the skin,* ed 2, Edinburgh, 2011, Saunders.)

**eFIG 2-7** Squamous cell carcinoma (lip). (From Neville BW, Damm DD, Allen C, et al: *Oral and maxillofacial pathology,* ed 4, St. Louis, 2016, Elsevier.)

**eFIG 2-8** Melanoma. (From Swartz MH: *Textbook of physical diagnosis: history and examination,* ed 7, Philadelphia, 2014, Saunders.)



**eFIG 2-9** Urticaria. (From Habif TP: *Clinical dermatology: a color guide to diagnosis and therapy,* ed 6, St. Louis, 2016, Elsevier.)

**eFIG 2-11** Contact dermatitis. (From Weston WL, Lane AT, Morelli JG: *Color textbook of pediatric dermatology,* ed 4, Philadelphia, 2007, Mosby.)

**eFIG 2-10** Angioedema. (From Scully C: *Scully's medical problems in dentistry,* ed 7, Edinburgh, 2014, Churchill Livingstone/Elsevier.)

**eFIG 2-12** Herpes zoster. (From Sapp JP, Eversole LR: *Contemporary oral and maxillofacial pathology,* ed 2, St. Louis, 2004, Mosby.)

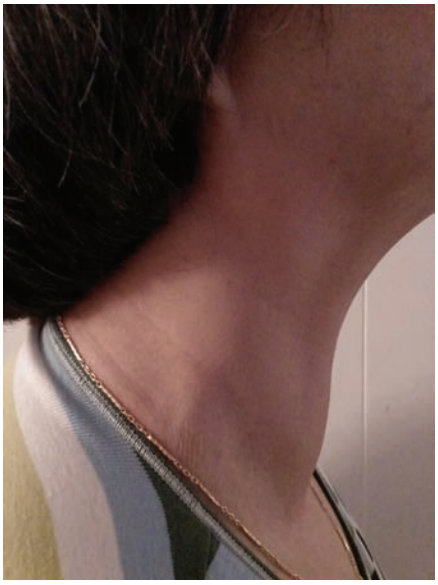


**FIG 2-5** Thyroid enlargement. (Courtesy Dr. Rose Geist, Detroit, Mich.)

## Abnormalities in the Head, Face, and Neck Region

### Thyroid Gland Enlargement/goiter

Enlargement of the thyroid gland may be diffuse or nodular and may be unilateral or bilateral (Figure 2-5). An enlarged thyroid gland may function normally or may be associated with hyper- or hypothyroidism. When a thyroid enlargement is newly discovered in the course of the initial oral examination, referral to an endocrinologist or primary medical care provider is on order. Laboratory testing can reveal the status of the gland. Visibly prominent thyroid enlargement, or goiter, may also be classified in terms of the cause, which can be iodine deficiency, autoimmune disease (Hashimoto thyroiditis, Graves' disease), or benign or malignant neoplasia. The dental team must be attentive to the possibility that a patient with a goiter and clinical signs of hyperthyroidism may develop an acute life-threatening medical emergency while in the dental chair (see Malamed's *Medical Emergencies in the Dental Office*).

### Lymphadenopathy (Lymphadenitis/Lymphoid Hyperplasia/Calcified Lymph Nodes)

Abnormal cervical lymph nodes, also known as lymphadenopathy, can be the result of various antigenic stimuli including infectious agents or unidentified agents. The term lymphadenitis refers to inflammatory disease in the nodes, in which the nodes become enlarged or tender. Lymphoid hyperplasia consists of enlargement of normal lymphoid aggregates, often caused by an antigenic stimulus. It is not uncommon for these reactive lymph nodes to become calcified, producing a radiopaque image on panoramic radiographs. Neoplasms can originate in or metastasize to the lymph nodes, causing enlargement of the nodes. Detection and diagnosis of cervical lymphadenopathy can help identify the underlying disease and may greatly influence the outcome, especially in the case of head and neck cancer. The dentist must have the clinical skills necessary for detecting and diagnosing cervical lymphadenopathy and must be able to recognize instances in which the patient should be referred to other healthcare providers.

### Carotid Atherosclerosis

Atherosclerosis is a degenerative disease of the arteries characterized by formation of atheromas or plaques in the vessel wall consisting of necrotic cells, lipids, and cholesterol crystals. The coronary and carotid arteries are among the most commonly affected. The plaques formed in the carotid artery wall may rupture, causing thrombosis and possible embolism, which can cause a stroke. Plaques with high risk of rupture are characterized as "high risk" or "vulnerable" plaques. Carotid plaques may become calcified and visible on dental panoramic images. Computed tomography (CT) and magnetic resonance imaging (MRI) images provide more reliable capability for prediction of the risk of rupture. The significance of calcified carotid atheromas is controversial. An oral health professional has the responsibility to inform the patient's healthcare provider about the presence of carotid calcified atheromas so that a decision on further investigation or intervention can be made.

### Cleft Lip and Cleft Palate

Cleft lip and palate are defects that arise during gestation as a result of improper merging of soft tissues and/or bones (eFigure 2-13). Both hereditary and environmental factors may be involved in cleft formation. Cleft lip results from the failure of the medial nasal and maxillary processes to fuse. Clefts of the lip may range from a small defect in the vermilion border to a large lesion that extends into the nose. Clefts can be unilateral or bilateral. Palatal clefts result from the incomplete union of the palatine processes of the right and left maxillary bones and, in some cases, may also involve the nasal septum. Cleft palate may manifest simply as a bifid uvula (involving only soft tissue) or may traverse the entire length of the hard and soft palates, involving both bone and soft tissue. Individuals may exhibit cleft lip alone, cleft palate alone, or clefts of both lip and palate.

# E. INTRAORAL SOFT TISSUE DIAGNOSES

In this section, some of the most common conditions found during an intraoral soft tissue examination of the patient will be delineated. Because most of these conditions occur in more than one location in the oral cavity, they are organized here by origin rather than by location.

## Developmental Lesions

### Ankyloglossia

Ankyloglossia (also known as tongue-tie) is a condition in which the lingual frenum is attached too far anteriorly toward the tip of the tongue, preventing the tip of the tongue from reaching the hard palate when the mouth is open (Figure 2-6). Depending on the severity of the condition, individuals may experience aberration in speech. When ankyloglossia causes speech, swallowing, or other functional problems, surgical correction may be needed.

**eFIG 2-13** Cleft lip/palate. (From Kaban L, Troulis M: *Pediatric oral and maxillofacial surgery,* Philadelphia, 2004, Saunders.)

**FIG 2-6** Ankyloglossia. (Courtesy Dr. Rose Geist, Detroit, Mich.)

### Hairy Tongue

Hairy tongue is a condition in which the filiform papillae become markedly long, resulting in an appearance similar to a long tufted carpet (eFigure 2-14). The long filiform papillae may trap chromogenic bacteria, fungi, and food pigmentations, giving the tongue various colors: white, brown, or black. Brushing the tongue with the toothbrush or using a tongue scraper will usually eliminate the discoloration commonly associated with the condition.

### Varix/Varicosity

Varix or varicosity refers to dilation of a vein (eFigure 2-15). Common locations for varix in the head and neck region are the ventral surface of the tongue and the lower lip in older adults. Varices appear as purple or blue papules, nodules, or tortuous dilated veins that blanch with pressure. No treatment is required, but the dentist must be able to differentiate varicosities from other vascular or pigmented lesions found in the oral cavity.

### Torus and Other Exostoses

Exostoses are benign protuberances of bone that may arise on the cortical surface of the jaws (eFigure 2-16). A torus (plural: tori) is an exostosis that occurs in one of two locations intraorally. Torus palatinus is an exostosis in the midline of the hard palate and may appear as a solitary mass or may be multilobular. Torus mandibularis appears on the lingual surface of the mandible near the canines and premolars and may be unilateral or bilateral. Exostoses usually appear as nodular masses on the buccal alveolar process. They can be solitary or multiple and sometimes become confluent, forming a shelf-like protuberance. If removable prostheses are planned, surgical removal may be required.

### Cleft Palate

Cleft palate can occur with or without cleft lip. See Section D, *Extraoral Diagnoses* and eFigure 2-13.

## Traumatic and Reactive Lesions

### Chewing/Biting of Oral Mucosa

The Latin name for this condition is morsicatio, from the Latin word for "bite." These lesions, caused by chronic chewing of the mucosa, are usually habit or stress induced and may occur in children or adults (eFigure 2-17). Patients with this condition exhibit areas of thickened white and shredded mucosal surface interspersed with thin pink or red serrated areas, most commonly in the buccal or labial mucosa or on the lateral border of the tongue.

### Linea Alba

The linea alba is a linear thickening of the buccal mucosa (hyperkeratosis) that occurs along the occlusal plane (eFigure 2-18). Linea alba often presents with a scalloping shape, representing occlusal indentations. In the presence of persistent trauma or unresolving ulceration, a biopsy may be warranted.

### Traumatic Ulcers

An ulcer is a lesion characterized by focal loss of epithelium. Traumatic ulcers result from a cut, abrasion, or irritation of the mucosa (eFigure 2-19). They often appear as a yellowish area reflecting the fibrinous exudate that has formed a pseudomembrane over traumatized tissue in the days following the causative action. The ulcers have red borders caused by inflammation and vary in size and shape. They usually heal in one or two weeks.

### Leukoplakia

See discussion later in this section.

### Hyperkeratosis

Hyperkeratosis is a term referring to a microscopic layer of thickened parakeratin and/or orthokeratin of the oral mucosal epithelium (eFigure 2-20). Because the thickened keratin layer exhibits a whitish clinical appearance in the moist environment of the oral cavity, the term hyperkeratosis is often used clinically to refer to white areas on oral mucosa without annotation as to the cause of the condition. The most common cause of hyperkeratosis is chronic irritation, or *frictional keratosis*. These lesions must be monitored. If the patient, dentist, or hygienist observes changes in the lesion color, shape, borders, or surface texture, a biopsy may be appropriate.

### Amalgam Tattoo

Amalgam in the gingiva, alveolar process, palate, or buccal mucosa may produce a tattoo—a dark blue or black discoloration—ranging in size from a few millimeters to approximately 1 centimeter (eFigure 2-21). The amalgam tattoo is usually an incidental finding. Radiography of the lesion sometimes reveals radiopaque granules consistent with metal fragments. The dental team must be able to conclusively differentiate an amalgam tattoo from other types of intraoral pigmented lesions.

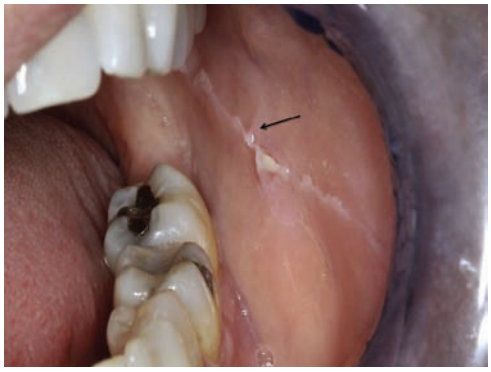
### Nicotine Stomatitis

The nicotine stomatitis lesion occurs on the posterior hard palate and anterior soft palate of smokers, especially pipe smokers (eFigure 2-22). It is caused by heat on the mucosa and not actually by the nicotine itself. Nicotine stomatitis

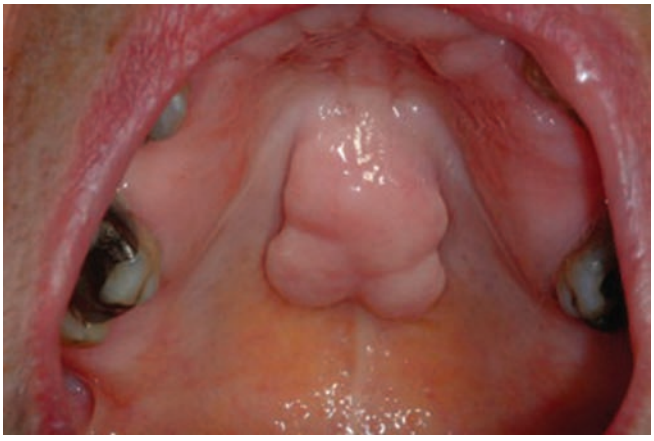
**eFIG 2-14** Hairy tongue. (From Regezi JA, Sciubba JJ, Jordan RCK: *Oral pathology: clinical pathologic correlations,* ed 6, St. Louis, 2012, Saunders.)

**eFIG 2-17** Chewing/biting of oral mucosa. (From Sapp JP, Eversole LR: *Contemporary oral and maxillofacial pathology,* ed 2, St. Louis, 2004, Mosby.)

**eFIG 2-15** Varix/varicosity. (From Regezi JA, Sciubba JJ, Jordan RCK: *Oral pathology: clinical pathologic correlations,* ed 6, St. Louis, 2012, Saunders.)



**eFIG 2-18** Linea alba. (From Pinto A, Haberland CM, Baker S: Pediatric soft tissue oral lesions. *Dent Clin North Am* 58(2): 437-453, 2014.)

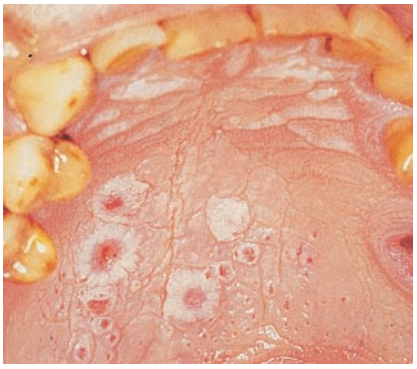


**eFIG 2-16** Torus palatinus. (From Scully C: *Oral and maxillofacial medicine: the basis of diagnosis and treatment,* ed 3, Edinburgh, 2013, Churchill Livingstone/Elsevier.)

**eFIG 2-19** Traumatic ulcer. (From Neville BW, Damm DD, Allen C, et al: *Oral and maxillofacial pathology,* ed 4, St. Louis, 2016, Elsevier.)

**eFIG 2-21** Amalgam tattoo. (From Woo S: *Oral pathology: a comprehensive atlas and text,* Philadelphia, 2012, Saunders.)

**eFIG 2-20** Hyperkeratosis. (From Mignogna MD, Fortuna G, Leuci S, et al: Frictional keratoses on the facial attached gingica are rare clinical findings and do not belong to the category of leukoplakia. *J Oral Maxillofac Surg* 69(5):1367-1374, 2011.)



**eFIG 2-22** Nicotine stomatitis. (From Darby ML, Walsh M: *Dental hygiene: theory and practice,* ed 4, St. Louis, 2015, Saunders.)

consists of papules with an opaque white surface and red dot in the center. The whiteness represents hyperkeratosis and the red dot is the dilated opening of an inflamed salivary gland duct. Papules often become confluent, forming a white plaque with interspersed red spots. The patient should be strongly encouraged to discontinue smoking (see Chapter 9).

### Pyogenic Granuloma

Pyogenic granuloma is an overgrowth of young, highly vascular granulation tissue; it is a reaction to chronic irritation or dental plaque (eFigure 2-23). (Note: The name is a misnomer; the condition does not produce pus and it is not a granuloma *per se.*) During pregnancy or puberty, hormonal changes may cause exaggerated tissue reactions to oral irritants, and pyogenic granuloma is sometimes called a "pregnancy tumor" when occurring in gravid women. Pyogenic granuloma can occur at any age, however, and in males and females. Clinically it appears as a bright red enlargement caused by the vascularity of granulation tissue and the frequent loss of epithelium over the lesion. The lesion, which bleeds easily, can occur anywhere in the oral mucous or on the skin. The dentist must discern the cause for the granuloma (e.g., an iatrogenic restoration, a foreign body, a dental infection) and resolve that problem.

### Fibroma

The term "fibroma" usually refers to a reactive overgrowth of fibrous tissue and is not a true neoplasm. Clinically, it is a well-circumscribed firm swelling on the lip or buccal mucosa, usually less than 1 centimeter in dimension (eFigure 2-24). Patients usually report a history of trauma in the area; in such cases the term "traumatic fibroma" is widely used. Excisional biopsy should be considered if the patient considers the lesion to be unsightly, or if it is repeatedly traumatized, or if the patient habitually rubs or manipulates the lesion.

### Hematoma

A hematoma consists of extravasated blood pooling under the epithelium or deep in the connective tissue or muscle, usually as a result of blunt trauma (eFigure 2-25). The superficial hematoma of the oral mucosa appears as a dark red papule or nodule that ruptures easily. It occurs more often in individuals with bleeding disorders. It can be expected to resolve spontaneously. Administration of an inferior alveolar nerve block will, on occasion, cause a hematoma.

### Mucocele (Mucous Extravasation Phenomenon/Mucous Retention Cyst/Ranula)

See Section F, *Salivary Gland Abnormalities.*

## Infection/Inflammation

### Parulis

Parulis is a small abscess on the gingiva, originating from an apical or periodontal abscess, sometimes called a "gumboil." Clinically, it is a localized and often acute swelling on the gingiva with fluctuation (eFigure 2-26). A yellow point appears at the center of the swelling before spontaneous drainage. The parulis will resolve when the source of the infection is eliminated.

### Patent Sinus Tract (Draining Fistula)

Following drainage of a parulis, if the infection source (commonly a necrotic pulp) is not removed, the drainage of pus may be continuous through the formed sinus tract (eFigure 2-27). An asymptomatic papule of granulation tissue often forms on the gingiva in response to the chronic irritation of the drainage. This papule is the opening of a sinus tract or fistula. The sinus tract will close when the source of the infection is eliminated, but the papule may persist in the form of a fibroma.

### Herpes Infection (Primary Herpetic Gingivostomatitis/ Recurrent Herpes/Herpetic Ulcers)

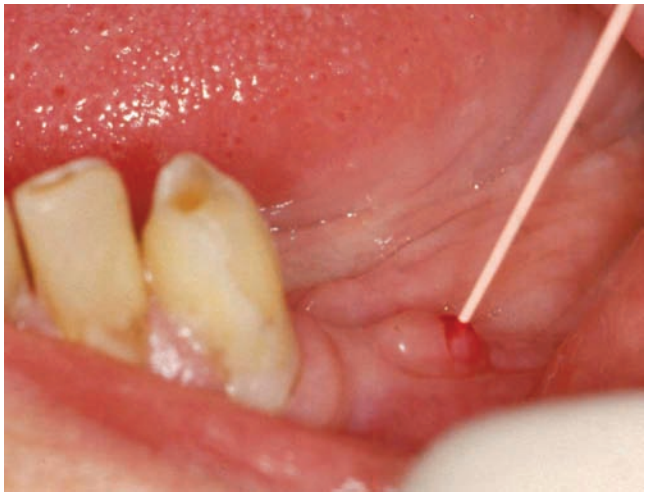
Eight or more types of herpes virus are known to infect humans, including herpes simplex virus type 1 (HSV-1), herpes simplex virus type 2 (HSV-2), and varicella zoster virus (VZV) (eFigure 2-28). These viruses target epithelial cells, causing skin and mucosal lesions. When epithelial cells are infected, the viruses replicate, enter into the neurons, and travel to the nerve ganglia where they remain latent until reactivated under certain triggers; they then travel to the skin or mucosa, causing lesions. Both HSV-1 and HSV-2 infect perioral skin and oral mucosa. The first (primary) infection is often subclinical. Some cases are preceded by subtle systemic symptoms and signs such as mild fever, general malaise, or pharyngitis. Oral lesions of primary infection are widespread with small vesicles that may form anywhere on the lip and mucosa. Generalized gingivitis may also occur. The vesicles soon coalesce and rupture to form widespread ulcers often described as primary herpetic gingivostomatitis. The oral lesions resolve in 10 to 14 days without a trace. Stress, strong sunlight exposure, and immune suppression status are some of the triggers that can lead to recurrence. Recurrent infections are usually less severe and the oral lesions only occur on keratinized tissue, such as the paraoral skin, gingiva, and hard palate. The vesicles are short lived and the ulcers are discrete, characteristically smaller than 2 mm. If the patient experiences recurring painful episodes of intraoral herpes infection, antiviral medications are often prescribed.

### Candidiasis

Candidiasis is an opportunistic infection of *candida albicans* (eFigure 2-29). These organisms are commensal in the human gastrointestinal (GI) tract and lower female reproductive tract. Most healthy individuals have candida-specific innate immunity. Candidiasis occurs only when these innate defense mechanisms are defective, the candida organisms alter their virulence, or environmental factors favor their growth. Predisposing factors include human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS), diabetes mellitus, cancer chemotherapy, systemic or inhaled corticosteroids, an extended course of antibiotics, birth control pills, pregnancy, hyposalivation, tobacco smoking, and aging.

Oral candidiasis has several clinical forms: pseudomembranous, erythematous, central papillary atrophy (median rhomboid glossitis), candida-associated angular cheilitis, and chronic hyperplastic candidiasis. Denture stomatitis is often

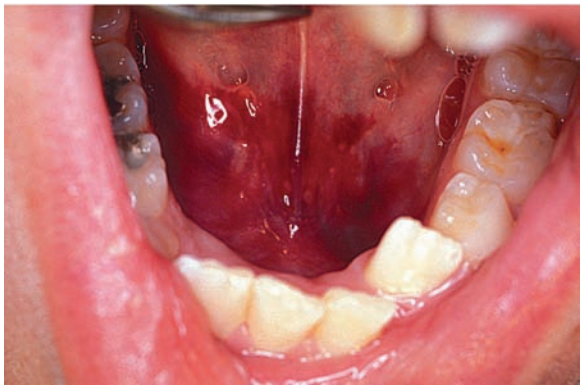
**eFIG 2-23** Pyogenic granuloma. (From Daniel SJ, Harfst SA: *Mosby's dental hygiene: concepts, cases, and competencies,* ed 2, St. Louis, 2008, Mosby.)



**eFIG 2-26** Parulis. (From Woo S: *Oral pathology: a comprehensive atlas and text,* Philadelphia, 2012, Saunders.)

**eFIG 2-24** Fibroma. (From Casamassimo PS, Fields HW, McTique DJ, Nowak A, editors: *Pediatric dentistry: infancy through adolescence,* ed 5, St. Louis, 2013, Saunders.)

**eFIG 2-27** Patent sinus tract (draining fistula). (From Hupp JR, Tucker MR, Ellis E: *Contemporary oral and maxillofacial surgery,* ed 6, St. Louis, 2014, Mosby.)



**eFIG 2-25** Hematoma. (From Casamassimo PS, Fields HW, McTique, et al, editors: *Pediatric dentistry: infancy through adolescence,* ed 5, St. Louis, 2013, Saunders.)

**eFIG 2-28** Herpes simplex labialis. (From Regezi JA, Sciubba JJ, Jordan RCK: *Oral pathology: clinical pathologic correlations,* ed 6, St. Louis, 2012, Saunders.)

**eFIG 2-29** Candidiasis. (From Swartz MH: *Textbook of physical diagnosis: history and examination,* ed 7, Philadelphia, 2014, Saunders.)

included, although evidence does not support it as true infection; it may simply be a reactive lesion. Persistent candidiasis is usually treated with antifungal agents.

### Angular Cheilitis

Angular cheilitis presents as an inflammation at the corner of the mouth (Figure 2-7). Most cases are caused by a mixture of infective organisms such as *candida albicans, staphylococcus aureus,* and beta-hemolytic streptococcus. The condition occurs most frequently in aged individuals with deep labial folds after loss of occlusal height (decreased vertical dimension of occlusion). The deep labial folds become red, sore, and fissured after constant bathing by saliva. In some cases habitual licking of the corner of the mouth may also lead to the development of angular cheilitis without deep labial folds. Deficiencies of vitamin B, iron, or folic acid have been reported as predisposing factors. Resolution can usually be achieved with the use of topical antifungal agents.

### Verruca Vulgaris

Verruca vulgaris (Latin for "common wart") is a benign epithelial lesion of the skin and mucous membrane. Caused by human papillomavirus (HPV) types 1, 2, and 4, the condition can occur anywhere on the oral mucosa as a pedunculated or sessile papule with a whitish and/or pink cauliflower-like surface (eFigure 2-30). Management is similar to that for a fibroma.

## Autoimmune Processes

### Aphthous Ulcers

Aphthous ulcers (also known as recurrent aphthous ulcers, aphthous stomatitis, recurrent aphthous stomatitis [RAS], or canker sores) are a common oral mucosal disease (eFigure 2-31). They are ulcerations with no known cause and a wide spectrum of severity and frequency of recurrence. Clinically, RAS consists of solitary or multiple nonspecific ulcers, usually on nonkeratinized oral mucosa. It has been proposed that aphthous ulcerations represent an autoimmune reaction and may be precipitated by stress or hormonal changes. They can be associated with various systemic conditions such as vitamin deficiencies, iron deficiency, and inflammatory bowel diseases. Recurrent aphthous ulcers or major aphthae are commonly treated with topical steroids.

**FIG 2-7** Angular cheilitis. (Courtesy Dr. Rose Geist, Detroit, Mich.)

### Lichen Planus

Lichen planus is a chronic inflammatory skin disorder characterized by pruritic, purple eruptions with white streaks (Wickham striae) on the surface (eFigure 2-32). The lesions can persist for months or years. Lichen planus is believed to be a cell-mediated immune response with characteristics of a bandlike, subepithelial lymphocytic infiltration and basement membrane degeneration, although the cause is unknown. The oral component of lichen planus (oral lichen planus [OLP]) may occur before, concurrent with, or after skin lesions. In addition to the classic clinical presentation of interlacing white lines, OLP can present as a plaque, erosion, or ulceration of the oral mucosa and may pose diagnostic challenges. The erosive form of lichen planus is usually treated effectively with topical or a short-term burst of systemic steroids.

### Lichenoid Reaction

A lichenoid reaction is an oral mucosal condition that is clinically and histologically indistinguishable from OLP except for identifiable causes. When the cause (such as amalgam or an offending medication) is removed the lesion will resolve with time.

### Atrophic Glossitis (Bald Tongue/Burning Tongue)

Atrophic glossitis refers to papillary atrophy of the tongue, characterized by an absence of filiform and fungiform papillae (eFigure 2-33). Frequently the tongue is also fiery red, edematous, and painful, hence the term "burning tongue." Many systemic conditions have been reported to be associated with this condition including vitamin B deficiency, avitaminosis, anemia, Sjögren syndrome, and graft versus host disease. Treatment will vary depending on the cause of the condition.

## Cysts/Tumors/Neoplasias of Soft Tissue Origin

### Developmental Odontogenic Cysts

See also Section G, *Abnormalities of the Jaws (Nonperiodontal Radiographic*). A cyst is a pathologic cavity lined with epithelium and usually containing fluid or semi-solid material in the lumen. Developmental odontogenic cysts arise from the epithelium of the tooth-forming apparatus and are not inflammatory in nature, and thus are to be distinguished from periapical (radicular) cysts. Developmental odontogenic cysts include: dentigerous cysts, odontogenic keratocysts, and lateral periodontal cysts.

### Leukoplakia

The term leukoplakia is derived from the Greek and means simply "white patch" (eFigure 2-34). It is a clinical diagnosis and has no specific histologic implication. It is a diagnosis of exclusion—occurring after other white lesions such as frictional keratosis, hyperplastic candidiasis, and smoker's keratosis have been ruled out. This designation has been applied

**eFIG 2-30** Verruca vulgaris. (From Neville BW, Damm DD, Allen C, et al: *Oral and maxillofacial pathology,* ed 4, St. Louis, 2015, Elsevier.)

**eFIG 2-31** Aphthous ulcers. (From Rich RR, Fleisher TA, Shearer WT, et al: *Clinical immunology: principles and practice,* ed 4, London, 2013, Saunders.)

**eFIG 2-32** Lichen planus. (From Noonan VL, Kabani S: Diagnosis and management of suspicious lesions of the oral cavity, *Otolaryngol Clin North Am* 38(1):21–35, 2005.)

**eFIG 2-33** Atrophic glossitis. (From Regezi JA, Sciubba JJ, Pogrel MA: *Atlas of oral and maxillofacial pathology,* Philadelphia, 2000, Saunders.)

**eFIG 2-34** Leukoplakia. (From Silverman S Jr: *Color atlas of oral manifestations of AIDS,* ed 2, St. Louis, 1996, Mosby.)

to a clinically evident white plaque or patch that has malignant potential.[2,3,4] When the diagnosis of leukoplakia is made, regardless of the location of the lesion, biopsy should be performed for histopathologic study to rule out dysplasia (precancerous), carcinoma in situ (early malignancy), or invasive cancer (malignancy).

### Erythroplakia

In 1978, WHO defined oral erythroplakia (eFigure 2-35) as "bright red, velvety plaques which cannot be characterized clinically or pathologically as being due to any other condition".[5] Oral erythroplakia, like oral leukoplakia, is a term that has been used as a clinical but not a histologic diagnosis. Studies have shown that 90% of lesions clinically diagnosed as erythroplakia were either premalignant or malignant.[3] Biopsies must be performed to confirm or rule out the presence of premalignancy or malignancy.

### Erythroleukoplakia

Erythroleukoplakia, also known as speckled leukoplakia or speckled erythroplakia, is a clinical diagnosis of an oral leukoplakia with a red component or an oral erythroplakia intermingled with white plaque (eFigure 2-36). The risk for finding premalignancy or malignancy upon biopsy is higher than for homogenous leukoplakia. Studies have found 14% to be invasive carcinoma and 51% to be epithelial dysplasia.[2] Biopsy of an erythroleukoplakia is essential and the sample should be from or include the red area.

### Squamous Cell Carcinoma

**SCCA** is the most common oral malignancy. The lateral border of the tongue, oropharynx, and floor of the mouth are the most common sites. Clinical presentation can be a white plaque, a red plaque, a lesion with white and red components, ulceration, a papule, or a nodule (eFigure 2-37). The most common contributing factors are tobacco and alcohol. Because early detection and treatment are the keys to survival, and because oral healthcare providers are better qualified than other healthcare providers to examine oral tissues, any suspicious lesion in a patient with the most common contributing factors should raise an alert to the healthcare provider for the possibility of SCCA. Differentiating an SCCA from a benign lesion with similar clinical features can be challenging. In light of the morbidity and mortality associated with an SCCA, it is imperative that any suspicious lesion be biopsied.

## F. SALIVARY GLAND ABNORMALITIES

**Ricardo J. Padilla**

An abnormality of the salivary glands may be an incidental finding or a clinical correlation made secondary to a symptom reported by the patient. It is important to remember that the major and minor salivary glands must be visually inspected and palpated. The orifices of the Stensen and Wharton ducts must be evaluated and saliva must be expressed bilaterally. Saliva should be clear and thin.

## Nonneoplastic Lesions

### Mucocele and Ranula

When saliva is retained, it may be located inside the duct or the gland, or it may be in the surrounding tissue spaces. If the saliva has escaped the duct, the term used is **extravasation phenomenon**. The common clinical term used for mucous extravasation phenomenon is mucocele. A **mucocele** is most commonly found on the mucosal surface of the lower lip (Figure 2-8, *A*). If the mucous extravasation phenomenon is associated with the submandibular or sublingual glands and is located in the floor of the mouth, it is known as a ranula. A **ranula** that occurs below the mylohyoid muscle is known as a plunging ranula and will be more evident extraorally than intraorally, in contrast to a conventional ranula, which usually is evident in the floor of the mouth and elevates the tongue (eFigure 2-38). A ranula should be surgically removed. The patient may elect to have a mucocele removed if it persists, if it is repeatedly traumatized, or if its presence is annoying.

### Sialolithiasis (Salivary Stones)

Salivary stones are most commonly found in the submandibular gland, and somewhat less frequently in the parotid gland. They are rarely encountered in the minor salivary or the sublingual glands. Presenting signs include salivary fluid blockage, ductal or glandular swelling that may be symptomatic especially before meals, or as radiopacities visible in radiographs. Radiographic evidence of a sialolith is only obtainable when the stone is sufficiently calcified as to prevent the x-rays from reaching the sensor or film. If the patient is unable to pass the stone and continues to exhibit symptoms, surgical removal may be necessary.

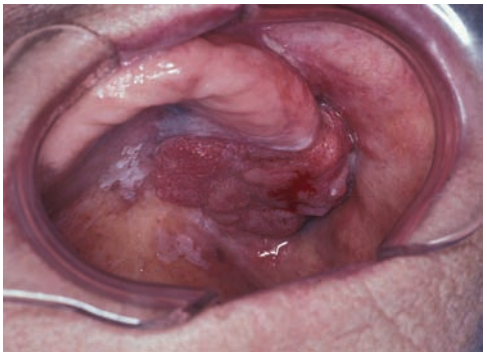
### Hyposalivation

**Hyposalivation** (hypoptyalism) is defined as a diminished secretion of saliva. The condition may be associated with one of several factors or in combination with more than one. Such factors include dehydration, radiation therapy for the salivary gland regions, anxiety, menopause, use of certain drugs, vitamin deficiency, inflammation or infection of the salivary glands, and various syndromes (e.g., Sjögren).[6]

### Xerostomia

**Xerostomia** or dry mouth may be caused by a primary degenerative or autoimmune disease that affects the salivary glands or by a secondary condition that inhibits salivary secretion. Secondary xerostomia is frequently a side effect of some medications, dehydration, and hormonal imbalances. Commonly, antihypertensives, antihistamines, antidepressants, antipsychotics, and antiasthmatic medications may cause dry mouth. Xerostomia has many oral consequences, including increased incidence of caries, oral infections, discomfort, altered digestion and deglutition, and speech alteration.

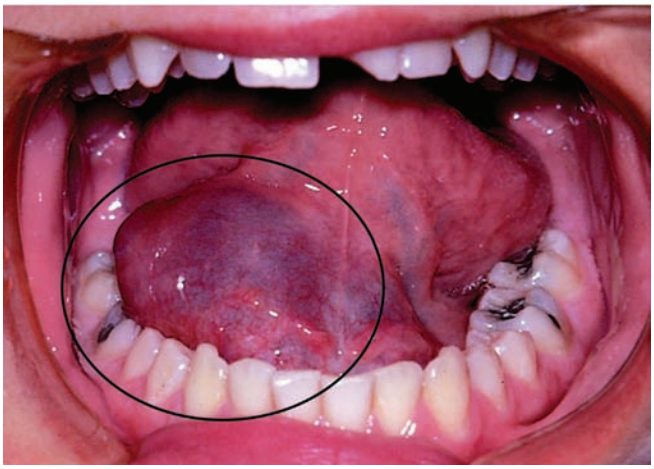
The management of dry mouth should focus initially on identifying the cause and eliminating it if possible. If this cannot be accomplished, mitigation with salivary substitutes and oral lubricants will be necessary. Discussion of the



**eFIG 2-35** Erythroplakia. (From Reddi SP, Shafer AT: Oral premalignant lesions: management considerations. *Oral Maxillofac Surg Clin North Am* 18(4):425–433, 2006.)

**eFIG 2-36** Erythroleukoplakia. (From Reddi SP, Shafer AT: Oral premalignant lesions: management considerations. *Oral Maxillofac Surg Clin North Am* 18(4):425–433, 2006.)

**eFIG 2-37** Squamous cell carcinoma (intraoral). (From Sapp JP, Eversole LR: Contemporary oral and maxillofacial pathology, ed 2, St. Louis, 2004, Mosby.)



**eFIG 2-38** Ranula. (From Swartz MH: *Textbook of physical diagnosis: history and examination,* ed 7, Philadelphia, 2014, Saunders.)

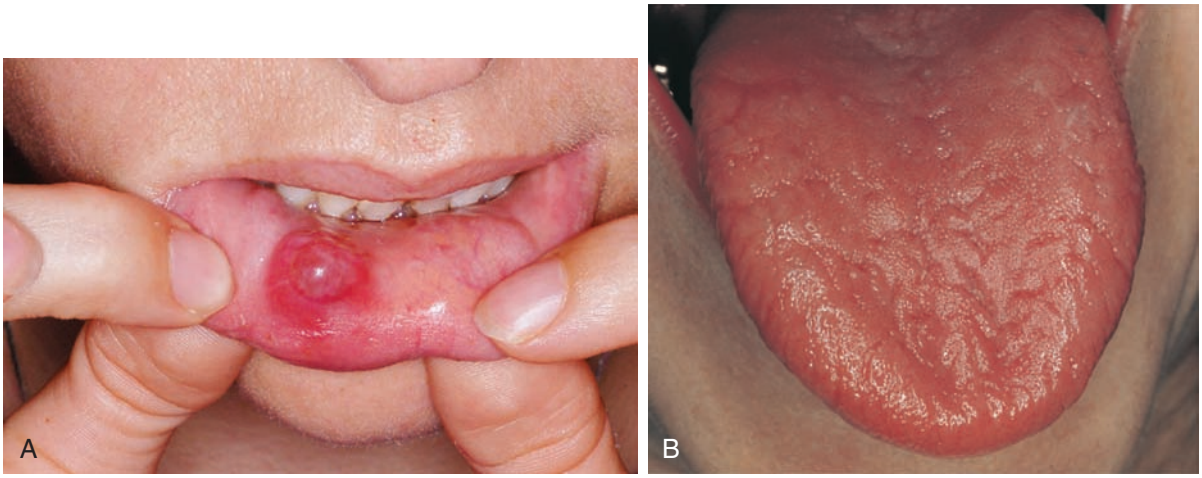



**FIG 2-8** **A,** Mucocele. **B,** Sjögren syndrome. (**A,** Courtesy Dr. Ricardo J. Padilla; **B,** from Ibsen OAC, Phelan JA: *Oral pathology for the dental hygienist,* ed 6, St. Louis, 2014, Saunders).

management of xerostomia can be found in Chapters 12, 15, and 17.

### Sjögren Syndrome

**Sjögren syndrome** is an autoimmune disorder that affects the exocrine glands, specifically the lacrimal and salivary glands, causing dry eyes and dry mouth (Figure 2-8, *B*) (eFigure 2-39). The disorder can be classified as primary or secondary. In primary Sjögren there may also be vaginal or nasal dryness and chronic bronchitis. Secondary Sjögren is associated with other autoimmune diseases such as lupus, scleroderma, sarcoidosis, or rheumatoid arthritis. The diagnosis of Sjögren is based on clinical, laboratory, and sometimes histopathological criteria. Patients with Sjögren syndrome have a higher incidence of certain types of lymphoma. Patients with Sjögren may exhibit the same oral complaints and problems as described previously for xerostomia.

## Neoplastic Lesions

### Pleomorphic Adenoma (PA)

There are many different salivary gland neoplasias in adults and children; the most common is the **pleomorphic adenoma** referred to in the older literature as a "benign mixed tumor." Intraorally, like most salivary gland neoplasms, it is often located on the palate, but any site that contains salivary glands may develop a PA (eFigure 2-40). It presents initially as a dome-shaped mass without ulceration or symptoms. Because it is asymptomatic and slow growing, the patient is often unaware of it, and the dentist is the first to recognize the abnormality during a comprehensive or a periodic examination. If the lesion is traumatized, the patient may develop secondary ulceration, swelling, inflammation, and pain—findings that may mislead the clinician to think that the lesion is malignant. PAs are comprised of ductal and myoepithelial cells. The supporting stroma may vary from myxoid to cartilaginous and the texture of the lesion can therefore range from firm to very soft. This tumor is usually managed with surgical excision.

# G. ABNORMALITIES OF THE JAWS (NONPERIODONTAL RADIOGRAPHIC)

Many abnormalities of the jaws have clinical signs and symptoms that make radiographic imaging an integral component to the diagnostic process. The radiographic image can provide additional information that may not be evident in clinical evaluation. In addition, some abnormalities may not have a clinical presentation, especially in the early stages, and will be first identified through radiographic imaging.

Only a few abnormalities of the jaws are definitively diagnosed based on radiographic imaging alone; therefore, developing a differential diagnosis is essential to the diagnostic process and subsequent management and treatment. An effective method for developing a differential diagnosis involves first identifying key radiographic features and second, analyzing the ways in which those features relate to typical patterns and behaviors of various disease processes. Table 2-1 reviews the basic radiographic features of each category. From these, the clinician can select one or more disease categories that seem most likely to represent the abnormality. The differential diagnosis may list the disease category or a more specific entity within the selected category.

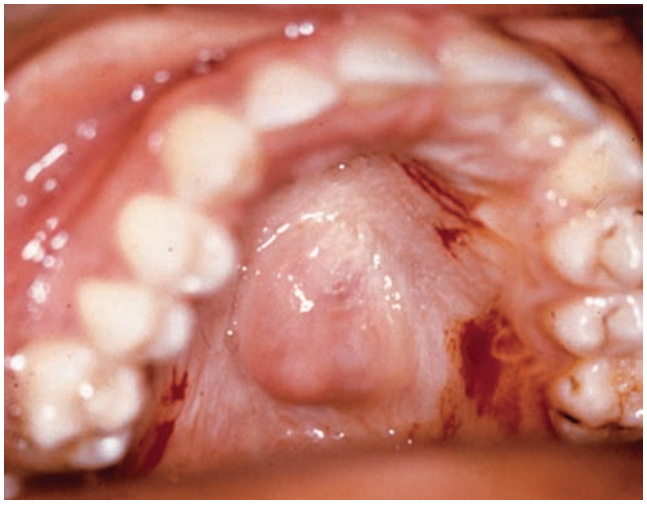
# H. TEMPOROMANDIBULAR JOINT DISEASES: NEUROPATHIC PAIN AND NEUROVASCULAR PAIN

**Pei Feng Lim**

## Temporomandibular Disorders

Temporomandibular disorders (TMD) are a group of musculoskeletal and neuromuscular conditions affecting the masticatory muscles, the temporomandibular joints (TMJ), and/or associated structures. These conditions affect mainly women in the reproductive age group. Common symptoms of TMD include popping/clicking or crepitus during jaw movement, jaw locking, restricted mouth opening, jaw pain, headaches, ear

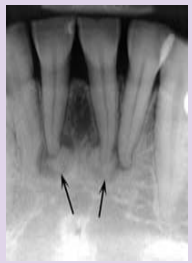
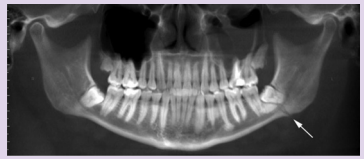
**eFIG 2-39** Sjögren syndrome showing dry eyes (keratoconjunctivitis sicca) and dry mouth (xerostomia). (From Hupp Jr, Ellis E, Tucker MR: *Contemporary oral and maxillofacial surgery,* ed 6, St. Louis, 2014, Elsevier Mosby.



**eFIG 2-40** Pleomorphic adenoma. (From Sapp JP, Eversole LR: *Contemporary oral and maxillofacial pathology,* ed 2, St. Louis, 2004, Mosby.)

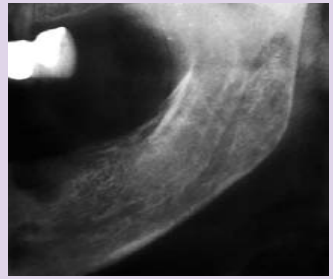
## TABLE 2-1 Abnormalities of the Jaws/Radiographic Findings

| Category | Disease Process | Key Radiographic Features | Significance | Radiographic Examples of Abnormalities of the Jaws | Image Description |
|---|---|---|---|---|---|
| Cysts | Cells from the epithelial lining excrete fluid that fills and uniformly expands the cavity. | Well defined<br>Uniform round or oval, some scalloped<br>Thin corticated border<br>Unilocular<br>Radiolucent center<br>Slow growth | Usually painless unless secondarily infected.<br>May prevent eruption of a tooth, displace teeth or cause tooth resorption, displace inferior alveolar canal or paranasal sinus borders. May expand, thin, and erode cortical bony plates.<br>Growth usually self-limiting. | | Odontogenic cyst, dentigerous cyst. |
| Benign odontogenic tumors | Abnormal growth of cells within the tissue of origin. Although their growth is unlimited, generally these cells do not invade adjacent tissues. | Well defined<br>Uniform smooth borders<br>May or may not be corticated<br>Radiolucent, radiopaque, mixed<br>Unilocular or multilocular with septa<br>Slow growth | May cause pain or paresthesia.<br>May prevent eruption of a tooth; displace or resorb teeth.<br>May displace inferior alveolar canal.<br>May expand, thin, and erode cortical bony plates.<br>May displace the cortical boundary of paranasal sinuses.<br>A benign tumor may be associated with a syndrome. For example, multiple *keratocystic odontogenic tumors* are associated with Basal Cell Nevus Syndrome.<br>If left untreated may grow to considerable size, destroying adjacent structures and impacting morbidity. | | Benign odontogenic tumor, multilocular ameloblastoma |
| Malignant tumors | Abnormal growth of cells that have unlimited growth potential and the ability to invade and destroy any tissue. | Ill-defined, noncorticated, mostly radiolucent<br>Displaced teeth, floating teeth<br>Spiked root resorption<br>Irregular resorption of cortical borders<br>Sunburst appearance of bone<br>Invasive growth | May cause pain or paresthesia.<br>Impacts adjacent structures by destroying cortical bone, teeth.<br>Left untreated the tumor can metastasize to bone or lungs, impacting mortality. | | Malignant tumor, squamous cell carcinoma |

| | | | | | |
|---|---|---|---|---|---|
| Osseous dysplasia | Fibrous tissue with calcified components.<br>Replaces normal bone. | Variable, dependent upon process | Generally growth ceases at skeletal maturity, although hormonal changes may reactivate the lesions.<br>Impacts appearance by deforming affected bone areas. |  | Osseous dysplasia, periapical osseous dysplasia |
| Dystrophic calcifications | Damaged soft tissue has influx of calcium; calcification may progress to ossification. | Radiopacity located within soft tissue<br>May be small round or large irregular<br>Various locations dependent on anatomy | Impact dependent on location.<br>Ossification of the stylohyoid ligament may present as an incidental finding with no required treatment.<br>Calcification within the carotid arteries reduces blood flow, increasing the risk of a cerebrovascular incident (i.e., stroke). | | Dystrophic calcification, tonsilloliths, and calcified stylohyoid ligament |
| Trauma (fractures of the jaws) | Traumatic insult is most likely cause. | Radiolucent line<br>Discontinuity of cortical borders<br>Step deformity<br>Maxillary sinus fluid | May impact adjacent structures, altering innervation and circulation.<br>Some fractures may heal inappropriately, leading to occlusal and functional problems. | | Trauma, fractured tooth |
| | | | |  | Trauma, fractured jaw |

*Continued*

**TABLE 2-1 Abnormalities of the Jaws/Radiographic Findings—cont'd**

| Category | Disease Process | Key Radiographic Features | Significance | Radiographic Examples of Abnormalities of the Jaws | Image Description |
|---|---|---|---|---|---|
| Inflammation (e.g., osteomyelitis; sinusitis) | Reaction to injury; involves an imbalance between osteoclastic and osteoblastic processes. | Localized or generalized<br>Ill-defined borders<br>Radiolucent and/or radiopaque | May spread to fascial planes, impacting patient's overall health and well-being. | | Inflammation, apical rarefying osteitis |
| Systemic/metabolic (e.g., osteoporosis) | Disturbance of the body's normal physiological processes. | Variable, usually generalized to entire regions | Dependent on particular process; may impact patient's overall general health and well-being. |  | Systemic process, osteoporosis |

Images from White SC, Pharoah M: *Oral radiology: principles and interpretation,* ed 7, St. Louis, 2014, Mosby.

symptoms (e.g., sense of fullness in the ears, earache, tinnitus), and bruxism. The condition is often associated with elevated psychological distress (including depression, anxiety disorder, and somatization), poor general heath, fatigue, and sleep disturbance. The signs and symptoms of TMD often wax and wane throughout life. Chronic TMD is comorbid with other bodily pain conditions such as fibromyalgia, irritable bowel syndrome, headaches, vulvodynia, spinal pain, and low back pain. Although the cause of TMD is unclear, it is recognized that enhanced pain perception, elevated levels of psychological distress, exposure to certain environmental events, and genetic predisposing factors may all play an important role in the etiopathogenesis and in the patient's perception of pain onset and persistence. TMJ disorders include arthralgia, arthritis, articular disc disorders, hyper- and hypomobility disorders, joint diseases, and congenital/developmental disorders. Masticatory muscle disorders include myalgia, contracture, hypertrophy, neoplasm, and movement disorders. (See Chapter 8 for more information on acute TMDs.)

### Radiographic Abnormalities of the TMJ Complex

Radiographic imaging of the temporomandibular joint complements the diagnostic process when clinical signs and symptoms suggest a history of trauma, a developmental abnormality, or a suspected tumor or other pathologic process. eTable 2-1 illustrates radiographic findings of abnormalities associated with the temporomandibular complex.

## Neuropathic Pain

Neuropathic pain is defined as pain that arises as a direct consequence of a lesion or disease affecting the somatosensory system; that is, the peripheral and/or central nervous system. Five of the more common types of trigeminal neuropathic pain are described here.

### Trigeminal Neuralgia (TN)

**Trigeminal neuralgia (TN),** also known as *tic douloureux*, is characterized by paroxysmal lancinating pain affecting one or more divisions of the trigeminal nerve. The pain may be spontaneous or may be evoked by nonpainful stimuli such as lightly touching the face, brushing the teeth, or talking. The pain is typically severe, and each pain episode lasts seconds to minutes. TN is characterized by remissions and recurrences.

### Atypical Odontalgia

**Atypical odontalgia**, or idiopathic continuous neuropathic pain, refers to pain in the dentoalveolar region (in a tooth or a tooth socket after extraction) in the absence of apparent dental pathology. This diagnosis is often made following exclusion of other nonodontogenic pain conditions, such as other local and systemic causes of pain or referred pain from nearby structures.

### Postherpetic Neuralgia (PHN)

**Postherpetic neuralgia (PHN)** is pain that develops during the acute phase of herpes zoster and recurs or persists for more than 3 months after the onset of herpetic eruption.

### Trigeminal Nerve Injury (Deafferentation)

**Trigeminal nerve injury** or **deafferentation** pain follows the loss of normal afferent input to the central nervous system. Typical causes include infection, injury during surgery (iatrogenic), or as a result of nerve block with local anesthesia. The common clinical findings are anesthesia and/or paresthesia.

### Burning Mouth Syndrome

**Burning mouth syndrome** or disorder is characterized by persistent burning pain perceived in the oral mucosa, tongue, and/or lips. Burning pain secondary to local (e.g., candidiasis) or systemic (e.g., diabetes) causes must be ruled out. This condition is more common in older women and is often associated with xerostomia and dysgeusia.

## Neurovascular Pain

### Migraine Headache

**Migraine headache** is characterized by recurrent, severe, and disabling attacks of head pain, often unilateral and pulsating, along with symptoms of sensory disturbance, such as photophobia, phonophobia, and hyperosmia. It may or may not be associated with an "aura" or reversible focal neurologic symptoms such as visual phenomena, migrating paresthesia, or dysphasic speech.

### Trigeminal Autonomic Cephalalgias (TAC)

**Trigeminal autonomic cephalalgias (TAC)** refer to a variety of idiopathic headaches, involving activation of trigeminovascular nociceptive pathways along with reflex cranial autonomic activation. This type of headache is described as cluster headache, paroxysmal hemicrania, or short-lasting unilateral neuralgiform headache with conjunctival injection and tearing (SUNCT). These headaches share some common features, namely brief duration, unilaterality, severe pain, and accompanying autonomic signs and symptoms.

# I. PERIODONTAL DISEASES

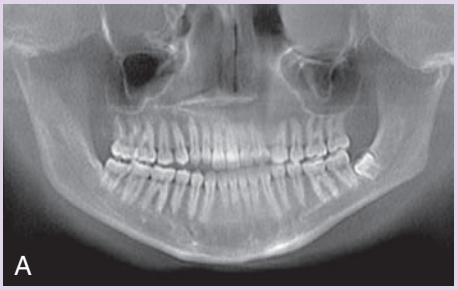
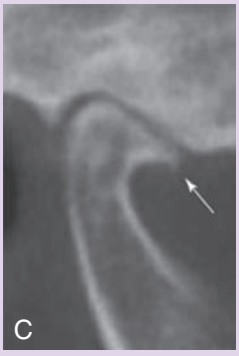
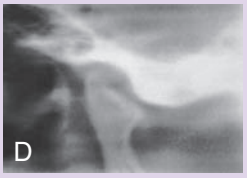
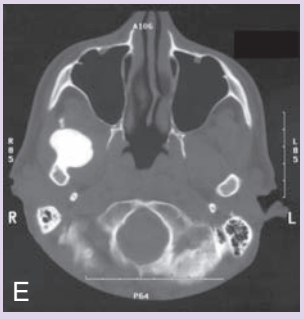
**Jonathan Reside and Antonio Moretti**

Periodontal diseases constitute a wide variety of conditions in the marginal periodontium that exhibit varied clinical presentations and are recognized as having multiple causes. The contemporary classification system includes eight broad categories:[7]

Gingival diseases
Chronic periodontitis
Aggressive periodontitis
Periodontitis as a manifestation of systemic disease (especially hematologic or genetic disorders)
Necrotizing periodontal diseases
Abscesses of the periodontium
Periodontitis associated with endodontic lesions
Developmental or acquired deformities and conditions

Each of the previously listed categories includes several subcategories to assist in further describing and classifying the patient's periodontal condition. Abscesses of the periodontium, for example, may be classified as gingival, periodontal, or pericoronal. The most common categories routinely

## eTABLE 2-1 Radiographic abnormalities of the TMJ Complex

| Common Diagnosis | Common Key Features | Example Radiograph |
|---|---|---|
| Condylar hyperplasia | Overall morphology: large condylar head<br>Normal cortical borders<br>Normal subchondral bone<br>Enlarged anterior-posterior and vertical dimensions<br>Enlarged mandibular ramus<br>Fossa remodeling to accommodate size |  A |
| Condylar hypoplasia | Overall morphology: small condylar head<br>Normal shape and structure<br>Normal cortical borders<br>Normal subchondral bone<br>Slender condylar neck, may be short or long<br>Slender, elongated appearing coronoid process<br>Shortened mandibular ramus<br>Small corresponding fossa | B |
| Degenerative joint disease (osteoarthritis) | Condylar resorption from superior surface<br>Unilateral or bilateral<br>Erosions<br>Osteophytes<br>Sclerosis<br>Flattening<br>Narrowed joint space |  C |
| Rheumatoid arthritis | Flattening of anterior and posterior surface<br>Narrowed joint space<br>Anterior open bite<br>Reduced trabecular pattern in condylar head and articular components |  D |
| Osteochondroma | Irregular enlargement of condyle<br>Enlarged condyle in small condylar fossa<br>Normal size mandibular ramus |  E |

**A** and **B,** From Tsiklakis K: From Cone beam computed tomographic findings in temporomandibular joint disorders. *Alpha Omegan* 103(2): 68-78, 2010; **C** and **D,** from Okeson JP: *Management of temporomandibular disorders and occlusion,* ed 7, St. Louis, 2013, Mosby; **E,** from Ward BB, Pires CAS, Feinberg SE: Osteochondromas of the mandible: case reports and rationale for treatment. *J Oral Maxillofac Surg* 63(7):1039-1044, 2005.

observed by the general dentist are dental plaque-induced gingival diseases and chronic periodontitis. A hallmark differentiating these two classifications is the presence or absence of alveolar bone loss (determined radiographically) and of clinical attachment loss (identified during the periodontal examination).

## Plaque-Induced Gingival Diseases

**Gingivitis** is one of the most common conditions affecting all ages of humankind.[8] Clinically, changes in color, volume, and texture can be observed manifesting as reddening and swelling of the marginal gingiva with a loss of stippling and rolling of the margins (Figure 2-9). While deeper probing depths may be present, no attachment loss is detected. Upon periodontal probing, bleeding is likely to occur. In addition, the patient often notices bleeding when brushing and flossing. These changes most often occur in the presence of plaque/bacterial biofilm. Calculus may be present and, whether supragingival or intrasulcular/subgingival, is confined to the enamel. If left untreated, gingivitis may result in damage to the periodontal tissues (i.e., the development of chronic periodontitis). Timely removal of this primary factor typically results in the resolution of clinical signs of gingivitis with no sequelae to the periodontal tissues.

Because of individual differences in immune system response, the rate of disease progression varies among individuals. Some patients show resistance to the development of chronic periodontitis in the longstanding presence of bacterial insult, and others experience damage to the periodontium at a more rapid rate. It is important to treat patients with gingivitis in a timely fashion for two primary reasons:

1. The difficulty in predicting the rate of progression from gingivitis to periodontitis because of individual differences in immune response; and
2. The possibility of potential systemic effects resulting from the presence of a persistent inflammatory burden.

**FIG 2-9** Gingivitis. On clinical examination, this 34-year-old male has probing depths of 3 mm or less with bleeding on probing noted for all surfaces of the mandibular anterior teeth and the interproximal surfaces of the posterior teeth. Though generalized plaque deposits are present throughout the mouth, light supragingival calculus deposits are only identified on the lingual aspects of the mandibular anterior teeth. Marginal erythema and edema is noted (especially on the facial aspect of the mandibular anterior teeth). No appreciable attachment loss is identified and the crestal bone heights appear ideal on radiographic examination. (Courtesy Dr. Jonathan Reside, Chapel Hill, N.C.)

## Chronic Periodontitis

Approximately 50% of the adult American population is affected by **periodontitis**. Among adults aged 65 years and older, 64% are affected by either moderate or severe periodontitis.[9] In these patients the clinical signs of gingivitis are present with the addition of attachment loss and radiographic bone loss (Figures 2-10 and 2-11). Increased probing depths are commonly seen. Plaque/bacterial biofilm and calculus are commonly present along the root surface apical to the cementoenamel junction (CEJ). Roughness of the root surfaces may be detected upon probing.

When classifying periodontitis it is important to take into account both the severity and the distribution of the disease. Disease severity is classified by the extent of clinical attachment loss in millimeters (1 or 2 mm = slight, 3 or 4 mm = moderate, ≥ 5 mm = severe). Distribution of the disease is determined by the percentage of sites involved (> 30% = generalized, ≤ 30% = localized) (Box 2-2). Untreated periodontitis will result in progressive bone loss, attachment loss, gingival recession, tooth mobility, furcation involvement (in molars), and possible tooth loss. As with gingivitis, this inflammatory burden may affect systemic health. Timely treatment is necessary not only for arresting disease progression but also for the overall health of the patient.

## The Concept of the Reduced Periodontium

The clinician may find difficulty in diagnosing a patient with clinically healthy gingiva in the presence of generalized gingival recession (i.e., attachment loss) (Figure 2-12). To understand this configuration, the concept of the **reduced periodontium** becomes important. Attachment loss may occur as a result of plaque-induced disease or because of other habits or conditions (Box 2-3). Treatment of these diseases/events focuses on restoring health to the periodontal tissues. In many cases, although the attachment loss is not fully reversible, gingival health may be restored and the progression of attachment loss arrested. Based on the previously outlined classification criteria, the novice clinician may erroneously classify these patients as exhibiting periodontitis when they may be exhibiting either periodontal health or gingivitis on a reduced periodontium. This diagnosis suggests that the occurrence or development of clinical attachment loss is halted. Repeated periodontal examinations over multiple time points are necessary to confirm this diagnosis.

An accurate periodontal diagnosis and classification will guide the clinician to deliver appropriate treatment. Treatment to begin addressing these periodontal conditions will be largely based on the presence or absence of plaque (and other etiologic factors), probing depths, and the extent of attachment loss. These factors are detailed in Chapter 9.

Correct classification of the patient's periodontal status is critically important because treatment planning is inextricably linked with the diagnosis and an incorrect diagnosis often leads to inappropriate treatment—sometimes

**FIG 2-10** **A-C,** Intraoral photos, and **D,** radiographs, showing generalized slight chronic periodontitis. This 16-year-old female has probing depths of 4 mm in the posterior sextants and select anterior teeth with bleeding on probing present. Supragingival and subgingival calculus and plaque are detected clinically on enamel and root surfaces. Heavy subgingival calculus is especially noted on the palatal/lingual surfaces of the posterior teeth. Attachment loss no greater than 1 to 2 mm affects . 30% of sites. The presence of gingival inflammation, the slight increases in probing depth, the degree of attachment loss, and the presence of plaque and calculus all justify the diagnosis of generalized slight chronic periodontitis. (Courtesy Dr. Jonathan Reside, Chapel Hill, N.C.)

**FIG 2-11** **A-C,** Intraoral photos, and **D,** radiographs, showing localized severe chronic periodontitis. This 49-year-old male cigarette smoker has localized probing depths of 5 to 9 mm in the posterior sextants with light bleeding on probing present. Supragingival and subgingival calculus and plaque are detected clinically on enamel and select root surfaces. Though generalized attachment loss is identified, < 30% of sites have attachment loss of 5 mm or greater. The attachment loss measurements—in the context of the deeper probing depths and the presence of plaque and calculus—justify the diagnosis of localized severe chronic periodontitis. (Courtesy Antonio Moretti, Chapel Hill, N.C.)

## BOX 2-2 Classification System for Periodontal Diseases and Conditions

I. Gingival Diseases
- A. Dental plaque-induced gingival diseases*
  - 1. Gingivitis associated with dental plaque only
    - a) Without other local contributing factors
    - b) With local contributing factors (see VIII.A)
  - 2. Gingival diseases modified by systemic factors
    - a) Associated with the endocrine system
      - (1) Puberty-associated gingivitis
      - (2) Menstrual cycle-associated gingivitis
      - (3) Pregnancy-associated
        - (a) Gingivitis
        - (b) Pyogenic granuloma
      - (4) Diabetes mellitus-associated gingivitis
    - b) Associated with blood dyscrasias
      - (1) Leukemia-associated gingivitis
      - (2) Other
  - 3. Gingival diseases modified by medications
    - a) Drug-influenced gingival diseases
      - (1) Drug-influenced gingival enlargements
      - (2) Drug-influenced gingivitis
        - (a) Oral contraceptive-associated gingivitis
    - b) Other
  - 4. Gingival disease modified by malnutrition
    - a) Ascorbic acid-deficiency gingivitis
    - b) Other
- B. Non-plaque-induced gingival lesions
  - 1. Gingival diseases of specific bacterial origin
    - a) Neisseria gonorrhea-associated lesions
    - b) Treponema pallidum-associated lesions
    - c) Streptococcal species-associated lesions
    - d) Other
  - 2. Gingival diseases of viral origin
    - a) Herpes virus infections
      - (1) Primary herpetic gingivostomatitis
      - (2) Recurrent oral herpes
      - (3) Varicella-zoster infections
    - b) Other
  - 3. Gingival diseases of fungal origin
    - a) Candida-species infections
      - (1) Generalized gingival candidosis
    - b) Linear gingival erythema
    - c) Histoplasmosis
    - d) Other
  - 4. Gingival lesions of genetic origin
    - a) Hereditary gingival fibromatosis
    - b) Other
  - 5. Gingival manifestations of systemic conditions
    - a) Mucocutaneous disorders
      - (1) Lichen planus
      - (2) Pemphigoid
      - (3) Pemphigus vulgaris
      - (4) Erythema multiforme
      - (5) Lupus erythematosus
      - (6) Drug induced
      - (7) Other
    - b) Allergic reactions
      - (1) Dental restorative materials
        - (a) Mercury
        - (b) Nickel
        - (c) Acrylic
        - (d) Other
      - (2) Reactions attributable to
        - (a) Toothpastes/dentifrices
        - (b) Mouth rinses/mouthwashes
        - (c) Chewing gum additives
        - (d) Foods and additives
      - (3) Other
  - 6. Traumatic lesions (factitious, iatrogenic, accidental)
    - a) Chemical injury
    - b) Physical injury
    - c) Thermal injury
    - d) Other
  - 7. Foreign body reactions
  - 8. Not otherwise specified (NOS)

II. Chronic Periodontitis†
- A. Localized
- B. Generalized

III. Aggressive Periodontitis†
- A. Localized
- B. Generalized

IV. Periodontitis as a Manifestation of Systemic Diseases
- A. Associated with hematological disorders
  - 1. Acquired neutropenia
  - 2. Leukemias
  - 3. Other
- B. Associated with genetic disorders
  - 1. Familial and cyclic neutropenia
  - 2. Down syndrome
  - 3. Leukocyte adhesion deficiency syndromes
  - 4. Papillon-Lefèvre syndrome
  - 5. Chédiak-Higashi syndrome
  - 6. Histiocytosis syndromes
  - 7. Glycogen storage disease
  - 8. Infantile genetic agranulocytosis
  - 9. Cohen syndrome
  - 10. Ehlers-Danlos syndrome (Types IV and VIII)
  - 11. Hypophosphatasia
  - 12. Other
- C. Not otherwise specified (NOS)

V. Necrotizing Periodontal Diseases
- A. Necrotizing ulcerative gingivitis (NUG)
- B. Necrotizing ulcerative periodontitis (NUP)

VI. Abscesses of the Periodontium
- A. Gingival abscess
- B. Periodontal abscess
- C. Pericoronal abscess

VII. Periodontitis Associated with Endodontic Lesions
- A. Combined periodontic-endodontic lesions

VIII. Developmental or Acquired Deformities and Conditions
- A. Localized tooth-related factors that modify or predispose to plaque-induced gingival diseases/periodontitis
  - 1. Tooth anatomic factors
  - 2. Dental restorations/appliances
  - 3. Root fractures
  - 4. Cervical tooth resorption and cemental tears
- B. Mucogingival deformities and conditions around teeth
  - 1. Gingival/soft tissue recession
    - a) Facial or lingual surfaces
    - b) Interproximal (papillary)
  - 2. Lack of keratinized gingiva
  - 3. Decreased vestibular depth

**BOX 2-2 Classification System for Periodontal Diseases and Conditions—cont'd**

4. Aberrant frenum/muscle position
5. Gingival excess
   a) Pseudopocket
   b) Inconsistent gingival margin
   c) Excessive gingival display
   d) Gingival enlargement (see I.A.3 and I.B.4)
6. Abnormal color

C. Mucogingival deformities and conditions on edentulous ridges
1. Vertical and/or horizontal ridge deficiency
2. Lack of gingiva/keratinized tissue
3. Gingival/soft tissue enlargement
4. Aberrant frenum/muscle position
5. Decreased vestibular depth
6. Abnormal color

D. Occlusal trauma
1. Primary occlusal trauma
2. Secondary occlusal trauma

*Can occur on a periodontium with no attachment loss or on a periodontium with attachment loss that is not progressing.
†Can be further classified on the basis of extent and severity. As a general guide, extent can be characterized as Localized = ≤ 30% of sites involved and Generalized = > 30% of sites involved. Severity can be characterized on the basis of the amount of clinical attachment loss (CAL) as follows: Slight = 1 or 2 mm CAL, Moderate = 3 or 4 mm CAL, and Severe = ≥ 5 mm CAL.

**FIG 2-12** Healthy but reduced periodontium. On clinical examination, this 52-year-old female has probing depths of 3 mm or less with no bleeding on probing. Generalized attachment loss and gingival recession are detected. Mobility is present on the mandibular anterior teeth. Through-and-through furcation involvement is noted on some of the molars. The stability of her periodontium has been monitored over the course of the past 3 years. (Courtesy Dr. Jonathan Reside, Chapel Hill, N.C.)

**BOX 2-3 Causes of Attachment Loss**

**Plaque Induced Periodontitis:**
- Patients with a history of treated periodontitis

**Non-Plaque-Induced Periodontitis:**
- Anatomic variations (thin gingival biotype, tooth malpositioning)
- Iatrogenic defects
- Deleterious habits (traumatic tooth brushing, factitial injuries)
- Advanced age

overly aggressive and sometimes too conservative. Both types of error have led to litigation with notable frequency. Overclassifying periodontal disease (incorrectly diagnosing gingivitis as periodontitis) may be seen as insurance fraud. Under diagnosis (failing to identify gingivitis or periodontitis when it is present) has led many patients to pursue litigation when, years later, it becomes apparent that he or she was not informed and/or that the periodontal disease was not effectively managed by the dental team.

## J. PULPAL AND PERIAPICAL DIAGNOSES

**Peter Z. Tawil**

The dentist bases a diagnosis and classification of pulpal disease on patient symptoms and clinical findings. Pain of dental origin may reflect conditions that are reversible or irreversible in nature. **Reversible pulpitis** is a clinical diagnosis based on subjective and objective findings that suggest the inflammation will probably resolve and the pulp return to normal. Reversible pulpitis is usually a temporary condition characterized by pain that is not severe and is associated with a specific stimulus, such as cold. The pain ceases within a short period after removal of the stimulus. In contrast, a constant severe pain that seems to arise without provocation characterizes irreversible pulpitis; the classic presentation for a toothache. **Irreversible pulpitis** is a clinical diagnosis based on subjective and objective findings indicating that the vital inflamed pulp is not capable of healing. Common symptoms are lingering thermal pain, spontaneous pain, and referred pain. The pain may awaken the patient from sleep. Frequently the patient will have been taking analgesics that may or may not have been effective in relieving the pain. A clinical diagnosis of **pulpal necrosis** indicates the death of the dental pulp. This diagnosis is made when pulp testing is negative to thermal and electrical testing. Often, pulpal necrosis will be associated with clinical or radiographic signs of apical pathology or changes in tooth color.

When pulpal inflammation extends to the apical periodontium, it can produce clinical symptoms including a painful response to biting and/or percussion or palpation. This clinical diagnosis, called **asymptomatic apical periodontitis**, may or not be associated with an apical radiolucency area. An asymptomatic apical periodontitis is associated with radiographically evident inflammation and destruction of the apical tissues secondary to pulp necrosis, but without pain or swelling. An **acute apical abscess** (Figure 2-13) is an inflammatory reaction

**FIG 2-13** Acute apical abscess. (From Regezi JA, Sciubba J, Jordan R: *Oral pathology,* ed 6, St. Louis, 2012, Saunders.)

to pulpal infection and necrosis characterized by rapid onset, spontaneous pain, tenderness of the tooth to pressure, pus formation, and swelling of the associated area. Mobility of the affected tooth is sometimes seen.

If the infection is not locally contained, it may progress into a **cellulitis** characterized by painful swelling with diffuse borders and invasion into the subperiosteum or facial spaces. Typically the patient will have signs of elevated temperature, lymphadenopathy, and sometimes malaise. A **chronic apical abscess** is also associated with pulpal necrosis, but is characterized by gradual onset with little or no discomfort and exhibits a usually nonpainful discharge of pus through a sinus tract. **Condensing osteitis** is the clinical designation for a tooth with chronic apical inflammation from a low-grade inflammatory stimulus that will appear on a radiograph as a diffuse opacity (see apical sclerosing osteitis [ASO] subsequently).

Radiographic findings associated with the dental pulp and surrounding tissue may suggest several diagnoses (Table 2-2). The dentist may interpret a missing pulp space as evidence of calcified canals. An irregularly enlarged root canal space suggests **internal resorption**. Resorption of the root from the outside, around the periodontal ligament space, is **external resorption**. Common radiographic periapical diagnoses include **apical rarefying osteitis (ARO), apical sclerosing osteitis (ASO)**, and **apical rarefying and sclerosing osteitis (ARSO)**. Root fractures secondary to trauma are often seen on radiographs.

## K. DENTAL CARIES

**Margherita Fontana**

To diagnose dental caries involves not only an objective determination of whether or not lesions or disease are present (i.e., caries *detection*) and, if present, a characterization of its severity (i.e., caries *assessment*) but, most importantly, a summation of all data available for determination of whether the condition is the result of the dental caries process and whether it is active or arrested. This diagnosis should be a guiding factor for caries risk assessment (i.e., the risk of developing new

## TABLE 2-2 Pulpal and Periapical Diagnoses/Radiographic Findings

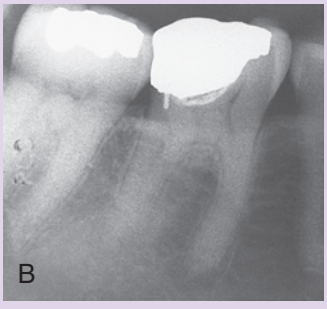
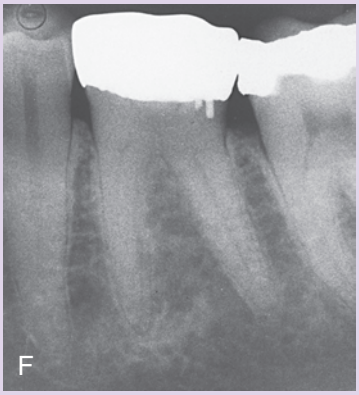
| Common Diagnoses | Description | Illustration |
|---|---|---|
| Apical rarefying osteitis | • Loss of bone density at the apex of the tooth.<br>• The term encompasses the following entities, which are difficult to differentiate radiographically:<br>  • Periapical abscess<br>  • Periapical granuloma<br>  • Radicular cyst | A |
| Apical sclerosing osteitis | • Increase in bone density in the region of the apex of the tooth in response to inflammation.<br>• Frequently described as condensing osteitis. |  B |
| Combination apical rarefying osteitis and apical sclerosing osteitis | • Combination of rarefying and sclerosing osteitis. | C |
| Internal resorption | • Uniform localized widening of the internal aspect of the canal, radiolucency.<br>• Radiolucency confined to internal aspect of the tooth. | D |

**TABLE 2-2 Pulpal and Periapical Diagnoses/Radiographic Findings—cont'd**

| Common Diagnoses | Description | Illustration |
|---|---|---|
| External resorption | • Uniform localized loss of external root surface.<br>• Canal is unaffected.<br>• May occur at apical or lateral aspect of the tooth root.<br>• May affect the adjacent bone. | |
| Canal calcification | • Reparative dentin initially forms and eventually obliterates canal.<br>• Lack of internal verticolinear radiolucent space. |  |

**B, D-F** Images from Torabinejad M, Fouad A, Walton R: *Endodontics: principles and practice,* ed 5, St. Louis, 2014, Saunders; **C,** courtesy Dr. Angela Broome.

lesions in the future) and management (encompassing surgical and nonsurgical care and prevention). Numerous instruments are available to aid the clinician in caries detection and assessment, including radiographs and other technology-based aids (e.g., fluorescence-based methods, electrical conductance methods).

## Some Guiding Definitions[6,10]

- **Caries detection:** A process involving recognition of changes in enamel, dentin, and/or cementum, which are consistent with the caries process. In other words the process involves identifying the signs (consequences) of bacterial destruction of the dynamic caries process. It must be noted, however, that lesion detection, without assessment, is not practical or useful.
- **Caries assessment:** An evaluation of the characteristics of a caries lesion after the lesion has been detected. These characteristics may include visual, physical, chemical, or biochemical parameters, including color, size, and surface integrity.
- **Caries diagnosis:** The professional summation of all the signs (following detection and lesion assessment) and symptoms of the caries disease; arrives at a determination of whether or not the caries lesion is active, progressing rapidly or slowly, or is already arrested. Without this information, a logical decision about treatment cannot be made.

## Caries Lesion Severity

Caries lesion severity is the stage of lesion progression along the spectrum of net mineral loss, from the initial loss at the molecular level to total tissue destruction. Such an assessment involves determination of both the extent of the lesion in a pulpal direction (i.e., proximity to the dentin-enamel junction and the pulp) and the mineral loss in volume terms. Non-cavitated and cavitated lesions are, for example, two specific stages of lesion severity. The ability to detect caries lesions and to differentiate among different levels of severity depends on the caries detection method and/or the clinical criteria being utilized. Many criteria have been developed for the examination of teeth for caries lesion detection and assessment, including visual and/or tactile-based criteria. The International Caries Detection and Assessment System (ICDAS; www.ICDAS.org) is a representative and generally

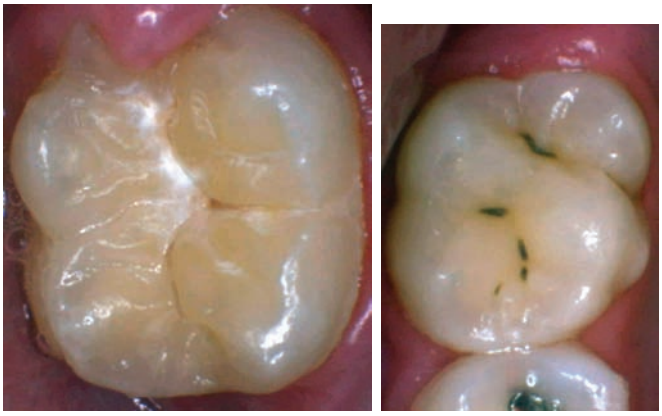


**FIG 2-14** Examples of non-cavitated lesion. (Courtesy Dr. Margherita Fontana, Ann Arbor, Mich.)

**FIG 2-15** Cavity/cavitated lesion. (Courtesy Dr. Margherita Fontana, Ann Arbor, Mich.)

accepted instrument. This instrument is the culmination of an international effort to create a set of harmonized and internationally recognized criteria built on best evidence. To implement this system, the teeth must be clean and dry when examined. The enamel, dentin and cementum are then evaluated using predominately visual, histologically-validated, clinical criteria. This system allows assessment of both caries severity and level of caries activity.

### Non-Cavitated Lesion

This is a caries/carious lesion whose surface appears macroscopically to be intact (Figure 2-14). In other words, it is a caries lesion without visual evidence of cavitation. Such a lesion is still potentially reversible by chemical means or arrestable by chemical (e.g., fluoride) or mechanical (e.g., sealant) means. It is sometimes referred to as an incipient lesion, initial lesion, an early lesion or a white spot lesion. (A color designation is misleading, however, as these lesions can be white, brown, or other colors.) Caries lesions develop in areas of plaque stagnation and may appear as a white/yellow/brown coloration, which may be limited to the confines or bottom of the pits and fissures on occlusal surfaces or extend beyond them into the occlusal planes. On smooth surfaces caries lesions occur cervical to the contact point on interproximal surfaces, or following the gingival contour if occurring buccally or lingually. Initial non-cavitated "white" lesions are only seen visually when the teeth are dried, but more advanced lesions can be seen with the teeth either wet or dry. If a non-cavitated lesion picks up an extrinsic stain (e.g., appears brown), however, it will be visible either wet or dry regardless of whether it is incipient or advanced.[11] In fact, many such stained carious lesions on occlusal surfaces may be confused with noncarious extrinsic stain.

### Cavity/Cavitated Lesion

A cavity/cavitated lesion is a carious lesion whose surface is not macroscopically intact, with a distinct discontinuity or break in the surface integrity, as determined utilizing optical or tactile means (Figure 2-15).

## Caries Lesion Activity (Net Progression Toward Demineralization)

Caries lesion activity is the summation of the dynamics of the caries process resulting in the net loss, over time, of mineral from the tooth enamel (i.e., active lesion progression).

### Active Caries Lesion

An active caries lesion is a caries lesion from which, over a specified period of time, there is net mineral loss (i.e., the lesion is progressing) (Figure 2-16). Clinical observations to be taken into consideration for assessing caries lesion activity include visual appearance, tactile perception, and potential for plaque accumulation. A lesion is likely to be active when the surface of the enamel is whitish/yellowish opaque and chalky (with loss of luster); feels rough when the tip of the probe is moved gently across the surface; is in a plaque

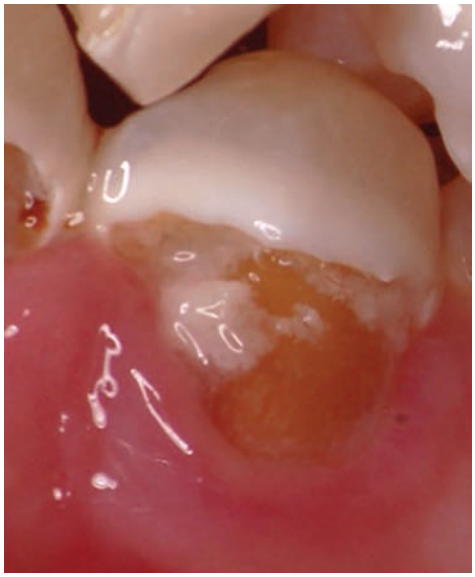


**FIG 2-16** This is an example of a cavitated, active, coronal lesion. Notice plaque within the lesion and inflammation of the gingival lesion. (Courtesy Dr. Margherita Fontana, Ann Arbor, Mich.)

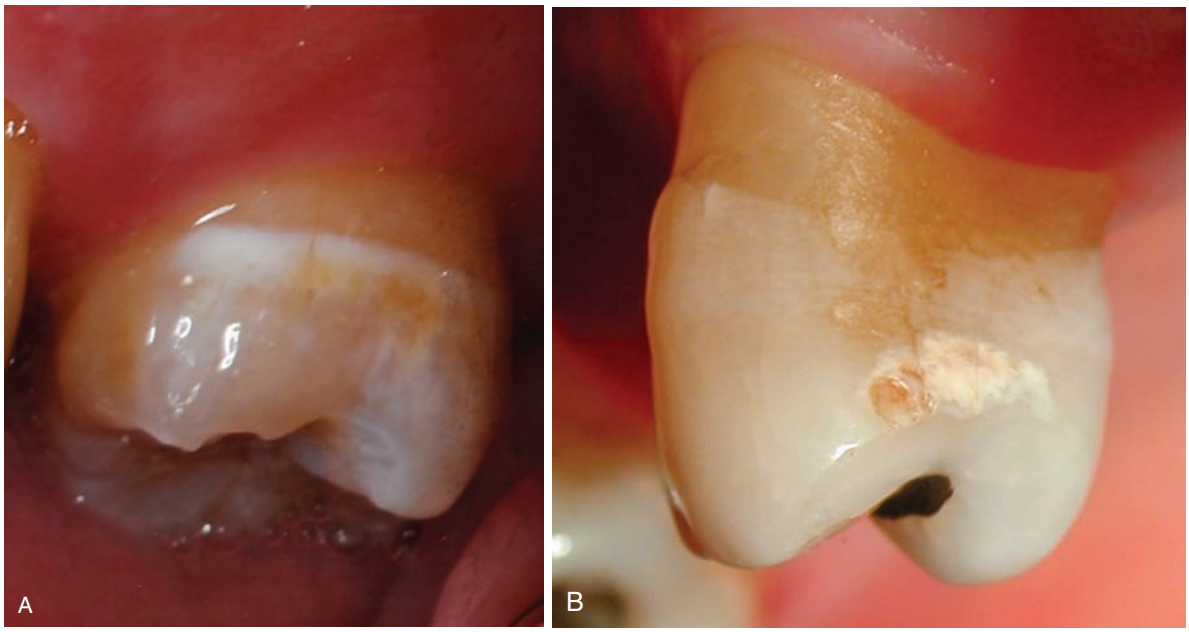



**FIG 2-17** **A** and **B,** Examples of arrested non-cavitated lesions on coronal smooth surfaces (notice the buccal lesion's distance from the gum line; very shiny and smooth). **B,** The proximal lesion probably developed when teeth were in contact. When the neighboring tooth got extracted, the proximal lesion arrested. (Notice it is now NOT in a plaque stagnation area.) (Courtesy Dr. Margherita Fontana, Ann Arbor, Mich.)

stagnation area (i.e., pits and fissures, near the gingival margin, and interproximal surface cervical to the contact point). In dentin the lesion is likely active when the dentin is soft or leathery on gentle probing.

### Arrested or Inactive Caries Lesion

An arrested or inactive caries lesion is not undergoing net mineral loss—that is, the caries process is no longer progressing (Figure 2-17). This lesion represents a "scar" of past disease activity. Clinical observations to be taken into consideration for assessing caries lesion activity will be based on visual appearance, tactile feeling, and potential for plaque accumulation. A lesion is probably inactive when the surface of the enamel is whitish, brownish, or black. The enamel may be shiny and generally feels hard and smooth when the tip of a probe is moved gently across the surface. Caries lesions on smooth surfaces are more likely to be inactive when located in sites without plaque accumulation (i.e., at some distance from the gingival margin following gingival recession). In dentin, the cavity may appear shiny and feel firm on gentle probing.

## Classification of Lesions by Anatomical Location[12]

### Coronal Primary Caries Lesion

A coronal primary caries lesion is produced by direct extension from an external surface in the coronal portion of a tooth (Figure 2-18). Such lesions develop in areas of plaque stagnation; thus they may be located in the pits and fissures of teeth, on interproximal surfaces (cervical to the contact point), or on smooth surfaces (buccal or lingual, following the gingival contour).

**FIG 2-18** Example of coronal primary caries lesions, all likely active; some are cavitated with exposed dentin and some are non-cavitated. (Courtesy Dr. Margherita Fontana, Ann Arbor, Mich.)

### Secondary Caries, Recurrent Caries, or Caries Lesions Associated with Restorations and Sealants (CARS)

Secondary caries are lesions that occur at the margin of, or adjacent to, an existing filling (Figure 2-19). These lesions have classically been described as occurring in two ways: an *outer lesion* or a *wall lesion*. The chemical and histological processes

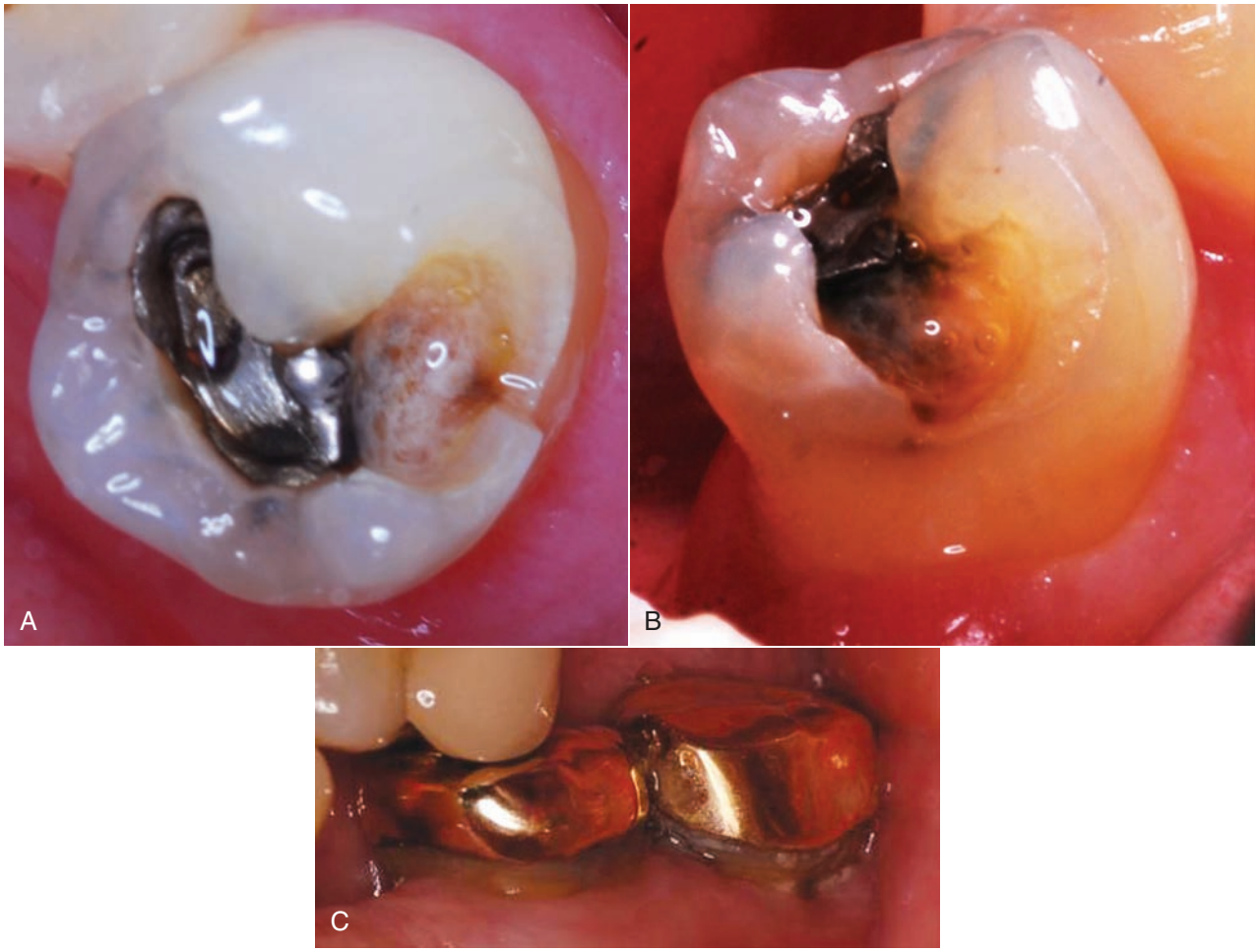



**FIG 2-19** Examples of secondary caries after restoration either broke (**A** and **B** are from the same tooth viewed in different angles), or around the margins of a gold crown **(C).** (Courtesy Dr. Margherita Fontana, Ann Arbor, Mich.)

involved in outer lesions are the same as with primary caries and they may occur as the result of a new, primary, attack on the surface of the tooth adjacent to the filling. Several researchers have suggested that caries identified as "secondary" are quite likely to actually be primary caries adjacent to fillings.[13]

### Root Surface Caries Lesions

Root surface caries lesions are frequently observed near the CEJ, although they may appear anywhere on the root surface (Figure 2-20). Root caries lesions appear as distinct, clearly demarcated circular or linear discolorations at the CEJ or wholly on the root surface.[6,10]

## Radiographic Detection of the Caries Lesion

In clinical practice the diagnosis of caries is made on the basis of clinical signs and symptoms and with the utilization of radiographic imaging aids. Radiographic detection is possible only after sufficient demineralization of the enamel and dentin has occurred. When exposed to the x-rays the demineralized area reduces the beam attenuation in comparison to the sound tooth structure, allowing more x-rays to reach the receptor. The resultant radiographic image

**FIG 2-20** Example of an active cavitated root surface lesion. Notice plaque within the lesion. (Courtesy Dr. Margherita Fontana, Ann Arbor. Mich.)

displays the demineralization as a dark area or radiolucency that is the result of past caries activity. Active areas may not be detectable on the image because of insufficient demineralization of the area.

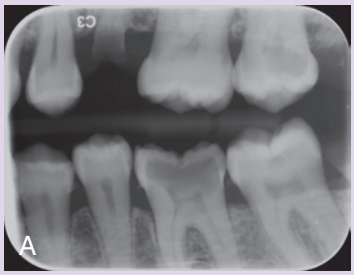
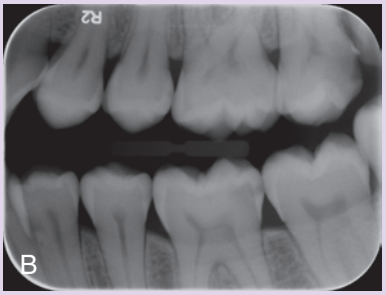
Radiographic images are useful in identifying caries lesions that are not visible clinically, such as approximal primary and secondary caries (Table 2-3). Compared with visual detection alone, images are most useful in detecting approximal and occlusal caries lesions past the dentin-enamel junction.[14,15] Radiographic images are also helpful in determining the depth of the lesion and its proximity to the pulp chamber and pulp horns.

## L. TOOTH CRACKS AND FRACTURES

**Peter Z. Tawil**

When the clinician identifies a fracture or crack in a tooth, it will be important to explore its extent to assess the severity and associated prognosis for the tooth in question. Most fractures

**TABLE 2-3 Dental Caries/Radiographic Findings**

| Caries Detection | Description | Illustration |
|---|---|---|
| Occlusal caries | • Dentinal radiolucency appearing below the pits and fissures of the occlusal surface<br>• Mushroom-shaped radiolucency |  |
| Approximal caries | • Located apical to proximal tooth contact<br>• Triangular-shaped with broad base at external tooth enamel surface<br>• Inside dentin-enamel junction appears as mushroom-shaped or inverted triangular-shaped radiolucency |  |
| Buccal caries | • Well defined<br>• Ovoid-shaped radiolucency<br>• Superimposed over dentinal aspect of tooth | |
| Root caries | • Associated gingival recession<br>• Located coronal to crestal bone<br>• Radiolucency on root surface is diffuse, rounded internal border | |

**A, B,** and **D** , Images courtesy Dr. Angela Broome; **C,** image from Haring JI, Lind LJ: *Radiographic interpretation for the dental hygienist*, Philadelphia, 1993, Saunders.

and cracks occur in the long axis of the crown and/or root. Assessing the extent of the longitudinal fracture will help the clinician decide between treatment alternatives: a root canal, a restoration, or an extraction.

Longitudinal fractures in teeth may grow and propagate apically over time. A crack, once identified, needs to be assessed in terms of location and extent. The major risk is the potential for bacterial penetration, which can lead to inflammation and disease. A crack may not necessarily require treatment—especially in the short term—but nevertheless, the patient needs to be informed of the finding and the attendant risks.

Fractured teeth can present with a variety of symptoms ranging from nonexistent to acute and severe. When the bacteria reach the pulp space of a vital tooth through the fracture line, thermal symptoms will begin. If the fracture line reaches the periodontal ligament, this may cause pain in the "gum" on biting. A displaceable crack in the coronal aspect of the tooth will commonly produce an intermittent pain on biting certain foods when applied in a particular occlusal vector.

The dentist can draw on multiple evaluation techniques to discern the location and extent of the crack. Initially the clinician will proceed with pulp vitality and periapical testing. This should be followed by periodontal probing. A localized deep probing defect is usually indicative of a vertical root fracture. Next, a bite test (with a Burlew wheel, cotton-tipped applicator, or Tooth Slooth device) can be made on each cusp to determine if a specific location triggers more symptoms. At this point, if a fracture is visible, previous old restorations will often need to be removed to assess its full extent. Transillumination can be helpful in visualizing the location and extent of fractures. Staining the fracture with methylene blue is another option. The explorer can also be used for a tactile examination. If the fracture is significant, the segments can be sometimes wedged apart and an explorer catch can be perceived. If the fracture line extends below the gingiva, surgical assessment can be utilized by raising a gingival flap to visualize the longitudinal apical extent and to assess whether or not the tooth can be saved or should be extracted.

## Classifying the Longitudinal Fractures and Cracks

### Craze Lines

Many adult teeth exhibit **craze lines**, especially posterior teeth with large direct fill restorations (Figure 2-21). Craze lines are seen even more frequently with advanced age. Craze lines are usually limited to the enamel and should cause the patient no pain. A craze line can be distinguished from a crack using transillumination. Light will normally penetrate enamel in the presence of a craze line, but will be blocked by a crack line that extends through the enamel to the dentin-enamel junction. No restorative treatment is required.

### Fractured Cusp

A **fractured cusp** is a complete fracture of a cusp initiated from the occlusal surface, usually extending apically from a marginal ridge and a buccal or lingual groove, and wrapping horizontally around a cusp in the cervical area of the tooth (Figure 2-22). The affected cusp may be missing or may be movable while remaining attached to the periodontal tissues. Treatment planning for this condition depends on the amount of tooth structure remaining after removal of the fractured cusp. If the tooth is deemed restorable, a direct or an indirect restoration covering the fractured margin can be used. Root canal treatment will be necessary if the fracture has encroached on the pulp chamber or has caused an irreversible pulpitis.

**FIG 2-21** Craze lines. (From Torabinejad M, Fouad A, Walton R: *Endodontics: principles and practice,* ed 5, St. Louis, 2014, Saunders.)

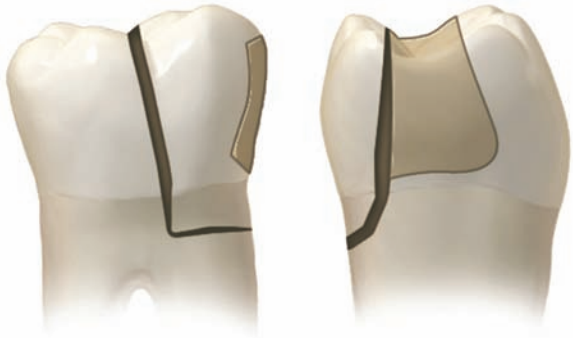


**FIG 2-22** Fractured cusp. (From Torabinejad M, Fouad A, Walton R: *Endodontics: principles and practice,* ed 5, St. Louis, 2014, Saunders.)

### Cracked Tooth

A **cracked tooth** is an incomplete fracture initiated from the crown and extending apically (Figure 2-23). On a posterior tooth the crack commonly extends through either or both marginal ridge(s) and onto the proximal surface(s). The treatment plan will depend on the location and extent of the crack. Removal of an existing restoration or new tooth preparation may be needed to determine the full extent of the crack. A tooth with an extensive crack of long duration is more likely to require root canal treatment, but a thorough and accurate assessment and definitive diagnosis of the pulp and periapical condition is required to confirm whether or not a root canal treatment is indicated.

**FIG 2-23** Cracked tooth. (Courtesy Dr. Peter Tawil, Chapel Hill, N.C.)

**FIG 2-24** Split tooth. (Courtesy Dr. Tam M. Trinh, Chapel Hill, N.C.)

### Split Tooth

A **split tooth** is the evolution (and end result) of a cracked tooth; the fracture is now complete (through and through mesiodistally) (Figure 2-24). The root surface is involved and the two segments are completely separate. The split may occur suddenly but more often results from deterioration of an incompletely cracked tooth. In most instances a split tooth will require extraction.

### Vertical Root Fracture

A true **vertical root fracture** is a complete or incomplete fracture line initiated from the root and running parallel (or slightly oblique) to the long axis of the tooth (Figure 2-25). It occurs most frequently in teeth that have received root canal treatment and in patients over the age of 40. If the fracture extends coronally to the cervical periodontal attachment, a localized narrow deep periodontal defect can be detected. The only predictable treatment for a vertical root fracture is removal of the apical fractured segment or extraction of the tooth. In multirooted teeth, removal of the whole fractured root may be performed by root amputation (root resection) or hemisection.

## M. OTHER NONCARIOUS ABNORMALITIES OF TEETH

There are many common environmentally or functionally induced abnormalities of the teeth (Table 2-4). Dental **erosion**

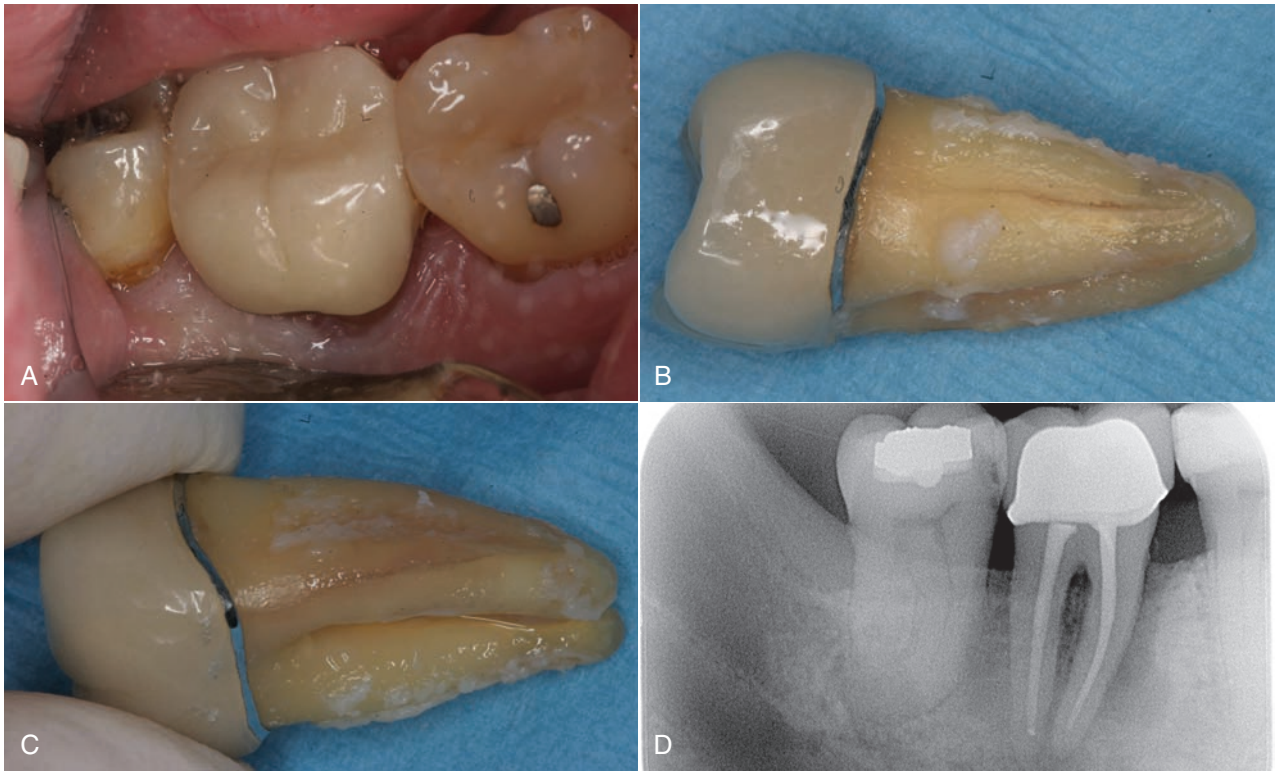


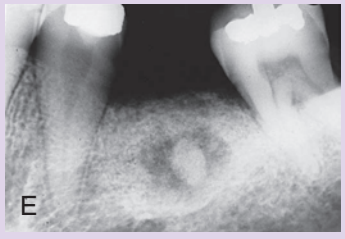

**FIG 2-25** **A-D,** Tooth with vertical root fracture—mesial and the distal roots (**B** and **C**) both exhibit fracture lines. (Courtesy Dr. John Moriarty, Chapel Hill, N.C.)

has become endemic as a result of the increased consumption of widely available acidic drinks including sodas, energy drinks, and sports drinks. **Cervical notching** is often seen in middle-aged and older individuals and may be caused by **abfraction** (occlusal forces), **erosion** (chemical wear), or **abrasion** (mechanical forces such as aggressive and frequent horizontal tooth brushing). **Attrition** is common in individuals who consume a coarse and abrasive diet or those with **parafunctional habits** such as **bruxing** or **clenching**.

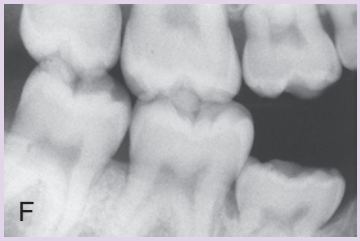
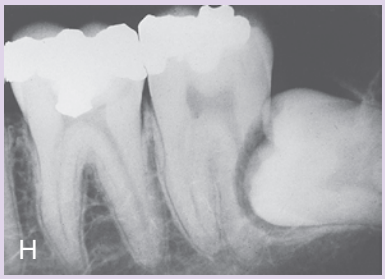
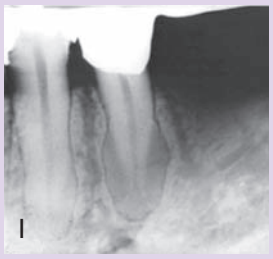
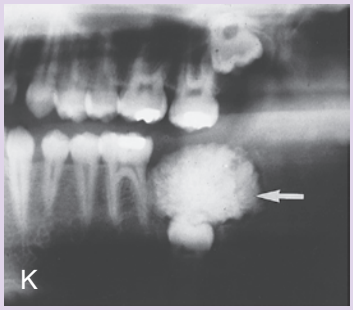
Common developmental anomalies of the teeth include **hypoplasia** and **hypocalcification**, **"fever lines," fluorosis**, **tetracycline stain,** and **amelogenesis imperfecta**. These conditions are evident clinically. **Odontomas** and **hypercementosis** are processes that will be visible on radiographic imaging.

This category also includes abnormalities of tooth number and position including **supernumerary teeth** (paramolar); **impacted teeth**; **ankylosed**, submerged, or **partially erupted teeth**; and **ectopic eruption**.

## TABLE 2-4 Other Noncarious Abnormalities of Teeth

| Diagnosis | Description | Illustration | Potential Clinical Problem(s) |
|---|---|---|---|
| Erosion | Chemically induced wear of exposed enamel and/or dentin; appears as glazed thin enamel, or cupped or notched dentin | A | Tooth sensitivity; loss of tooth volume; darkened tooth enamel; pulpal pathology |
| Abfraction | Cervical notching induced by chronic traumatic occlusal forces | B | Tooth sensitivity; pulpal pathology; tooth fracture; caries |
| Abrasion | Tooth notching or wear caused by mechanical forces (e.g., toothbrush) | C | Tooth sensitivity; pulpal pathology; tooth fracture; caries |
| Attrition | Incisal/occlusal wear induced by mastication and/or bruxism | D | Tooth sensitivity; loss of vertical dimension of occlusion; pulpal pathology |
| Retained root(s) | Decoronated tooth with root or roots remaining in the jaw |  E | Infection; periodontal disease; caries |

## TABLE 2-4 Other Noncarious Abnormalities of Teeth—cont'd

| Diagnosis | Description | Illustration | Potential Clinical Problem(s) |
|---|---|---|---|
| Ankylosed tooth | Tooth root fused to bone; characterized by submersion apical to the occlusal plane, immobility, bright sound on percussion |  F | Malocclusion; hypererruption of opposing tooth; surgical challenge if tooth is extracted |
| Developmental abnormalities (e.g., hypocalcification [pictured], hypoplasia, fever lines, amelogenesis imperfecta, fluorosis, tetracycline stain) | Defects of enamel matrix formation or calcification; commonly appears as mottled, discolored tooth, and/or porous rough tooth surface | G | Patient has esthetic concerns; caries; risk for tooth fracture and enamel shearing |
| Impacted tooth | Tooth (commonly a third molar) incompletely erupted and maintained in an abnormal position by adjacent tooth or teeth |  H | Surgical complications (sinus perforation, paresthesia); potential postoperative complications (infection, dry socket) |
| Hypercementosis | Overgrowth of the cementum layer of a tooth (usually at the apex of the tooth) |  I | Surgical challenge if tooth requires extraction |
| Supernumerary tooth | Tooth additional to the normal complement (e.g., paramolar or mesiodens); commonly diminutive in size | J | May displace surrounding tooth or teeth; malposition of teeth; malocclusion |
| Odontoma | Developmental abnormality of irregular but definable tooth components (compound odontoma), or no defined tooth shape and undifferentiated mass of enamel, dentin, and pulp components (complex odontoma) |  K | May impede normal eruption of adjacent teeth |

**A** and **G,** From Heymann HO, Swift EJ, Ritter AV: *Sturdevant's art and science of operative dentistry,* ed 6, St. Louis, 2013, Mosby; **B-D, F, H, J, K,** from Ibsen OAC, Phelan JA: *Oral pathology for the dental hygienist,* ed 6, St. Louis, 2014, Saunders; **E,** from Costich ER, White RP Jr: *Fundamentals of oral surgery,* Philadelphia, 1971, Saunders; **I,** from White SC, Pharoah MJ: *Oral radiology: principles and interpretation,* ed 7, St. Louis, 2014, Mosby.

## N. OCCLUSAL ABNORMALITIES

**Lee W. Boushell**

Occlusal abnormalities include jaw and skeletal relationships that do not conform to a normal profile such as Angle classification II (maxillary protrusion or "buck tooth") or Angle classification III (mandibular protrusion or "Dick Tracy"). Other common occlusal abnormalities are malpositioned individual teeth within the dental arch and abnormal relationships between approximating teeth; and abnormalities in the interdigitation of the teeth in **maximum intercuspation (MI)** or during excursive jaw movements. This category also includes the ill effects of excessive or otherwise abnormal occlusal forces on the dentition and periodontium. Table 2-5 summarizes the more common occlusal abnormalities.

## O. ESTHETIC PROBLEMS

Patients sometimes present with concerns relating to the appearance of the face, mouth, smile, teeth, or gums. The dental team must be responsive to those concerns and must be able to discern the underlying cause of the patient's perceived problem. Esthetic problems generally can be classified into one of three categories: (1) problems that emanate from

**TABLE 2-5 Occlusal Abnormalities**

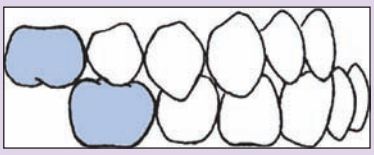
| Diagnosis | Description | Illustration | Potential Clinical Problem(s) |
|---|---|---|---|
| Tooth malalignment/ malpositioning | Crowding, tipping, drifting, rotation | | Esthetic, functional, or periodontal problems |
| Marginal ridge discrepancies | Proximating marginal ridges at differing levels | | Food impaction; periodontal problems |
| Open proximal contacts | Proximating teeth not in contact | | Food impaction; periodontal problems |
| Extrusion/hypererruption | Tooth migrates vertically into space left by missing tooth | | Esthetic problem; unfavorable crown-root ratio; tissue impingement |
| Occlusal plane discrepancies | Irregular or imbalanced occlusal plane (e.g., reverse Curve of Spee; extrusion of tooth or bone base) | | TMD; may require occlusal adjustment or reconstruction prior to fabrication of prosthesis |
| Skeletal malalignment | Maxillary and mandibular jaws incorrectly aligned relative to each other |  | Esthetic or functional problem |

**TABLE 2-5 Occlusal Abnormalities—cont'd**

| Diagnosis | Description | Illustration | Potential Clinical Problem(s) |
|---|---|---|---|
| Reduced vertical dimension of occlusion [VDO] | Reduced interarch space when teeth are occluded in maximum intercuspation | | TMD; impaired function; may require reconstruction prior to fabrication of prosthesis |
| Primary occlusal trauma | Occlusal forces in excess of what tooth or attachment apparatus can tolerate in otherwise healthy periodontium | | Acute symptoms (see Chapter 8); compromised periodontal support; pulpal pathology; tooth fracture; tooth loss |
| Secondary occlusal trauma | Occlusal forces in excess of attachment apparatus tolerance in presence of compromised periodontium (clinical attachment loss) | | Compromised periodontal support; pulpal pathology; tooth loss |
| Clenching/bruxism/parafunction | Occlusal contact that occurs outside of masticatory function | | TMD; pulpal pathology; reduced mastication; risk for tooth fracture |

Image of skeletal malalignment from Proffit WR, Fields HW, Sarver DM: *Contemporary orthodontics,* ed 5, St. Louis, 2013, Mosby. All others courtesy Dr. Lee Boushell, Chapel Hill, N.C.

abnormal skeletal structures or relationships; (2) problems relating to tooth position, form, or color; and (3) problems relating to the periodontium and lips. The following discussion summarizes common esthetic concerns that may be apparent to the patient and/or the dentist.

## Dentofacial Issues

Dentofacial issues usually are esthetic problems caused by abnormal size or contour of the jaw bones, or malposition of the maxilla or mandible relative to the face or to the opposing jaw. Often these problems are developmental in origin and in some cases are part of a syndrome or complex of genetically induced abnormalities. Occasionally these skeletal changes are caused by trauma to the face or as a result of surgical treatment to eliminate cancer of the jaw. The following are brief descriptions of the more common problems in this category:

Lateral facial asymmetry—the left and right sides of the jaws or face are not symmetric

Vertical facial asymmetry—middle and inferior thirds of face are out of proportion with each other

Angle classification II relationship—protrusive (or procumbent) maxilla; "buck teeth"; may be the result of a retruded mandible

Angle classification III relationship—protrusive (or prognathic) mandible and/or retrognathic maxilla; may exhibit anterior crossbite

Narrow maxillary arch development—often this is characterized by excess buccal corridor display; patient may exhibit a bilateral posterior crossbite

Misaligned dental midline—the dental midline is not coincident with the facial midline (note that this can be caused by a malpositioned tooth and/or by a maxillary arch form abnormality)

Tipped frontal occlusal plane—maxillary anterior incisal edge plane is not parallel to the horizontal plane or the plane of the interpupillary line

Dentoalveolar extrusion and vertical maxillary excess—these bony abnormalities may be associated with altered facial profile, malalignment of teeth, or occlusal plane discrepancies

## Tooth-Related Esthetic Issues

The **esthetic zone** is that portion of the dentition that is readily visible to the patient and to other persons. Fractured or missing teeth in the esthetic zone may be a major concern to a patient—and may cause personal embarrassment, loss of self-confidence, or limit social and professional activities. Visible caries lesions can also be of concern. Some patients exhibit discoloration or intrinsic stain of a tooth or teeth caused by tetracycline, hypoplasia, decalcification, pulp necrosis, or **amalgam bluing** (Figure 2-26). Some patients will, in time, decide that restorations are unsightly (Figure 2-27). Composite restorations may develop **microleakage** (Figure 2-28) at the margins, surface degradation, or surface porosity; as a result external or internal stains, changes in hue, or loss of surface luster may develop. Patients may become concerned about teeth that are an unusual size or contour; for example, peg lateral incisors, fan-shaped teeth, microdonts (Figure 2-29), or teeth that are large relative to the size of the jaw or face. Patients may seek correction for teeth or coronal restorations with bulbous contours. Patients may be aware that their teeth appear to be "too high" or "too low," "too far forward" or" too far back," which may or may not reflect an underlying skeletal abnormality. Many patients will be interested in closing **diastemas** (Figure 2-30) or in straightening teeth that are tipped, rotated, crowded, or otherwise misaligned. It is not unusual for patients to seek correction for age- and function-related changes such as craze lines, attrition, incisal chipping, or altered occlusal plane contours. Some patients will raise concerns relating to a tipped occlusal horizontal plane, in which the maxillary incisal edge line is no longer parallel to the horizontal plane, or the mandibular anterior occlusal plane no longer follows the lower lip line.

**FIG 2-26** Amalgam bluing. (Courtesy Dr. Lee Boushell, Chapel Hill, N.C.)

**FIG 2-27 A,** Unesthetic, poorly contoured, and unhygienic full coverage restoration. **B,** Replacement restoration—note the improved shade, incisal contour, and gingival response. (Courtesy Dr. BE Kanoy, Durham, N.C.)

**FIG 2-28** Microleakage. (Courtesy Dr. Lee Boushell, Chapel Hill, N.C.)

## Lip and Gingival Esthetic Issues

Patients may present with esthetic concerns related to the position of the lips or gingival tissues. Common problems in this category include:

- A short upper lip **(lip incompetence)** (Figure 2-31) will cause a larger than normal display of the facial surfaces of the maxillary anterior teeth when the patient's face is at **repose**. Patients may develop the self-conscious habit of rolling the lip down over the incisal edges in response
- Excess lip mobility or **hyperactive lip** (Figure 2-32) is evident when the lip raises above the gingival margins of the maxillary anterior teeth as the patient is speaking or smiling

**FIG 2-29** Microdonts. (Courtesy Dr. Lee Boushell, Chapel Hill, N.C.)

**FIG 2-30** Diastemas. (Courtesy Dr. Lee Boushell, Chapel Hill, N.C.)

**FIG 2-31** Lip incompetence. (Courtesy Dr. Lee Boushell, Chapel Hill, N.C.)

**FIG 2-32** Hyperactive lip. (Courtesy Dr. Lee Boushell, Chapel Hill, N.C.)

**FIG 2-33** Uneven gingival zeniths. (Courtesy Dr. Lee Boushell, Chapel Hill, N.C.)

**FIG 2-34** Black triangles. (Courtesy Dr. Lee Boushell, Chapel Hill, N.C.)

- **Excessive gingival display** of the maxillary anterior teeth can be caused by a prominent maxilla, short upper lip, hyperactive lip, short clinical crowns, or hypertrophic or hyperplastic gingiva
- Gingival scalloping or form irregularities include uneven **gingival zeniths** (Figure 2-33) and other gingival contour disparities with the opposing side of the arch
- **Black triangles** (Figure 2-34) are caused by gingival recession and the exposure of interproximal spaces at the cervical portion of the teeth

## P. SINGLE TOOTH RESTORATION DEFECTS

This section details commonly encountered problems with single tooth restorations (Table 2-6). Some of these issues arise at the time of restoration placement and some will occur years or even decades later. Some are iatrogenic in nature and others are part of the normal life cycle of a restoration.

## Q. FIXED PROSTHODONTIC PROBLEMS

When a patient has a missing tooth or teeth with remaining teeth on both sides of the edentulous space, that area is referred to as a **bounded edentulous space (BES)**. When the BES is in the **esthetic zone,** the patient will often be self-conscious about it and have a strong desire to replace it. The missing tooth or teeth may result in an altered chewing pattern, loss of lip support, lip or cheek biting, or recurring trauma to the edentulous

ridge. In time the BES may result in extrusion of an opposing tooth or tipping of the adjacent teeth. If the patient wishes to replace the missing tooth or teeth, several treatment options are available. These options, and their indications and contraindications, are discussed in detail in Chapter 10.

When the BES has been restored, multiple other problems may arise that the dentist will be called upon to address. If the fixed prosthesis has natural tooth abutments, the abutment teeth are subject to secondary caries, advancing periodontal disease, tooth fracture, pulpal necrosis, occlusal trauma, and fracture of the various materials and components of the prosthesis. The role of the dentist in such cases is to diagnose the nature of the problem or defect, determine the underlying cause, discern the available treatment alternatives, and explain those alternatives to the patient with sufficient detail that he or she is prepared to make an informed treatment decision. Table 2-7 describes common problems associated with fixed dental prostheses.

## R. REMOVABLE PROSTHODONTIC PROBLEMS

If there are no remaining natural teeth in the mouth, the patient is categorized as **edentulous** or **edentate**. If a dentate

**TABLE 2-6 Single Tooth Restoration Defects**

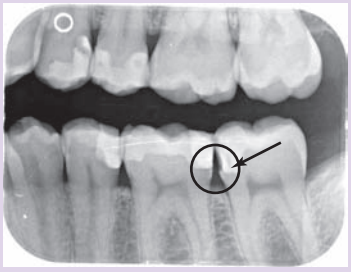
| Diagnosis | Description | Illustration | Possible Significance |
|---|---|---|---|
| Overhang | Margin of restoration extends outside the confines of the tooth contour | | Food impaction; acute or chronic periodontal disease; secondary caries |
| Underhang | Margin of restoration is closed but undercontoured |  | Food impaction; acute or chronic periodontal disease; secondary caries |
| Discoloration (body of restoration) | Restoration shade does not match shade of adjacent tooth | | May need veneer or replacement (patient discretion) |
| Marginal defects (gaps) | Extrinsic stain or microleakage at restoration margin; visual and tactile discontinuity at the tooth-restoration interface | | May require restoration, repair, or replacement |

TABLE 2-6 **Single Tooth Restoration Defects—cont'd**

| Diagnosis | Description | Illustration | Possible Significance |
|---|---|---|---|
| Fractured (amalgam/ composite/ porcelain) | Bulk fracture; fractured isthmus; missing sliver of restorative material | | May require restoration, repair, or replacement |
| Contour defects | Restoration overcontoured (proud) or undercontoured (depressed or cavitated) | | May require restoration, repair, or replacement |
| Perforation | Visible hole or discontinuity in the surface of the restoration | | Acute symptoms; secondary caries; pulpal pathology |
| Loss of restoration | Restoration debonded, fractured, or worn away, or otherwise missing | | Acute symptoms; secondary caries; pulpal pathology |

Images courtesy Dr. Lee Boushell, Chapel Hill, N.C.

patient has missing teeth with no teeth remaining posterior to the edentulous space, that area is referred to as an **unbounded edentulous space (UES)**. As with a BES, when the UES is in the esthetic zone, the patient will usually be concerned about it. In addition, an edentate patient or a patient with an UES has the potential for significantly compromised function, reduced chewing ability, and loss of **vertical dimension of occlusion (VDO)**, with accompanying changes in facial profile and contour and lip support. The UES patient may also be subject to lip or cheek biting, trauma to the tissues of the edentulous ridge, and in time, extrusion of any teeth opposing the space. Treatment options for edentate and

## TABLE 2-7 Fixed Prosthodontic Problems

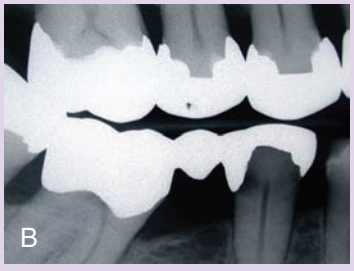
| Diagnosis | Description | Illustration | Possible Significance |
|---|---|---|---|
| Partial edentulism—bounded edentulous space | Tooth or teeth missing with tooth or teeth present on both sides of the edentulous space | A | Esthetic or functional problem; malposition of adjacent or opposing tooth; trauma to gingiva, lip, or cheek |
| Fractured abutment tooth | Includes cracked tooth, split tooth, vertical root fracture See Section L, *Tooth Cracks and Fractures* | | Extraction usually necessary |
| Recurrent caries | Secondary caries |  B | Restoration or extraction required; root canal treatment may be necessary; if crown, may need replacement; may cause premature tooth loss |
| Occlusal trauma | See Section N, *Occlusal Abnormalities* | | Attrition, tooth fracture; premature tooth loss |
| Broken connector/pontic | Material fracture or loss; separation of the FPD components | C | Loss of prosthesis (repair usually not feasible) |
| Debonded retainer | Retainer now can be separated from the abutment tooth | D | Need section and remove retainer; loss of prosthesis |
| | | E | |
| | | F | |

**TABLE 2-7 Fixed Prosthodontic Problems—cont'd**

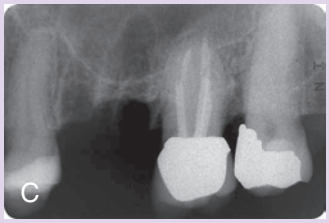
| Diagnosis | Description | Illustration | Possible Significance |
|---|---|---|---|
| Fractured restorative material | Portion of restoration (usually porcelain) detached from the remainder of the crown restoration or tooth | | Esthetic problem; deficient tooth form; trauma to oral tissues; repair or replace restoration |
| Esthetic issues | Secondary caries, poor shade match, black triangles<br>See Section O, *Esthetic Problems* | | Requires repair or replacement of prosthesis |

**A, B,** and **G,** Courtesy Dr. Carlos Barrero, Chapel Hill, N.C.; **C,** courtesy Dr. Sompop Bencharit, Chapel Hill, N.C.; **D-F,** courtesy Dr. Elana Celliers, Chapel Hill, N.C.

partially dentate patients, and their indications and contraindications, are detailed in Chapter 10.

Patients will often present to an initial appointment with an existing denture or removable partial denture. Common problems with a removable prosthesis include lack of retention; denture sores (traumatic ulcers); excessive occlusal wear or occlusal disharmony; and fractures of the denture base, denture teeth, clasps, or other framework components. If the prosthesis utilizes natural tooth abutments, the abutment teeth are subject to secondary caries, advancing periodontal disease, tooth fracture, pulpal necrosis, occlusal trauma, or fracture of the various materials or components. Table 2-8 outlines common problems associated with removable dental prostheses.

**TABLE 2-8 Removable Prosthodontic Issues**

| Diagnosis | Description | Illustration | Possible Significance |
|---|---|---|---|
| Edentate | All teeth missing (maxillary and/or mandibular arch) | | Impaired mastication and digestion; compromised esthetics; altered self-image |
| Partial edentulism—unbounded edentulous space | Teeth missing; no tooth present distal to the edentulous area | | Reduced function; decreased VDO; extrusion of opposing teeth; occlusal plane abnormalities; esthetic problems |
| Alveolar resorption | Loss of vertical bone height in an edentulous area |  | May require ridge augmentation prior to placement of implants and/or prosthesis |

*Continued*

TABLE 2-8 **Removable Prosthodontic Issues—cont'd**

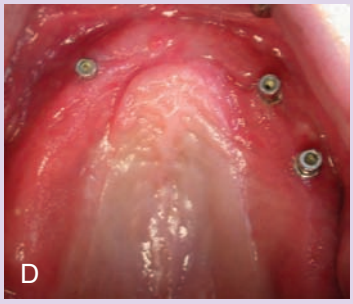
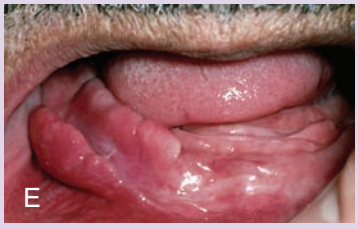
| Diagnosis | Description | Illustration | Possible Significance |
|---|---|---|---|
| Dry mouth or xerostomia | Intraoral tissues dry and inflamed; cheeks and lips adherent to teeth; gingiva and mucosa friable and easily traumatized | | Caries; periodontal disease; impaired retention of prosthesis; denture sores; candidiasis |
| Denture stomatitis | Inflammation with erythema and edema of gingiva or mucosa underlying denture base |  D | May need to alter VDO of existing prosthesis; may need reline or rebase of prosthesis; candidiasis |
| Inflammatory fibrous hyperplasia (epulis fissuratum) | Fibrous hyperplasia adjacent to the periphery of a denture flange |  E | May require surgical correction |
| Denture sore (frictional or decubitous ulcer) | Traumatic ulcer under the base or periphery of a denture | F | May need to adjust occlusion and/or denture base |
| Denture base defects | Visible but nondisplaced crack, fracture with partial separation, or portion of denture base fractured and disconnected | G | May require repair or replacement |
| Denture tooth defects | Denture teeth severely worn (attrition), broken, or missing | H | Individual teeth can be replaced; generalized tooth wear often requires new prosthesis |

**TABLE 2-8 Removable Prosthodontic Issues—cont'd**

| Diagnosis | Description | Illustration | Possible Significance |
|---|---|---|---|
| Partial denture clasp defects | Clasp tip does not engage undercut (not retentive); broken clasp | I | Clasp adjustment or repair necessary, or prosthesis replacement |
| Prosthesis in Infraocclusion | Single tooth or multiple teeth not in contact with the opposing tooth or teeth; severe occlusal wear of denture teeth | J | Restoration of natural or denture teeth needed |
| Complications with abutment teeth | Caries, periodontal disease, pulpal pathology, inadequate crown:root ratio | K | Extensive treatment may be required to retain tooth; tooth loss |
| Esthetic issues | Unesthetic clasp display; poor prosthetic tooth shade, alignment or position; midline or occlusal plane discrepancy | L | New prosthesis needed to resolve many of these problems |
| Maladaptation to prosthesis | Patient unable to accept and effectively use the prosthesis | | May be resolved with implant-retained prosthesis |
| Prosthesis has excessive or deficient vertical dimension of occlusion (VDO) | Reduced VDO (too much freeway space) or increased VDO (insufficient freeway space) | H | New prosthesis necessary to resolve this problem |

**A, B, D, F, H-L,** Courtesy Dr. Carlos Barrero; **C,** from Geminiani A, Papadimitriou DEV, Ercoli C: Maxillary sinus augmentation with a sonic handpiece for the osteotomy of the lateral window: a clinical report, *J Prosthet Dent* 106(5):279-283, 2011; **E,** from Sapp JP, Eversole LR, Wysocki GW: *Contemporary oral and maxillofacial pathology,* ed 2, St. Louis, 2004, Mosby; **G,** courtesy Gary Meacham, CDT, Chapel Hill, N.C.

## S. IMPLANT-RELATED DIAGNOSES

Common clinical problems may arise as a result of implant placement, or may develop with the implant fixture or the implant-retained prosthesis in subsequent months and years. Implant site excavation that invades the mandibular canal space may cause paresthesia. Implant fixture placement may infringe on the floor of the maxillary sinus, necessitating a nonsurgical (**osteotome sinus lift**) or surgical (**lateral window sinus lift**) procedure. Postoperative infection may occur. **Site preservation** procedures are not always successful in achieving the desired bone shape and height.

After initial healing and in the years that follow, the implant fixture may be susceptible to **peri-implantitis**. When peri-implantitis occurs shortly after cementation of an implant crown, the most probable cause is retained excess cement. When the peri-implantitis affects the **osseointegration** of the embedded portions of an implant fixture, the fixture may become mobile and removal may be necessary. Implant fixtures may fracture, and if the implant is critical to the retention of the prosthesis, the broken implant must be removed and replaced. Alternatively, a substitute implant may be placed in another location.

A variety of problems may occur with implant restorations. The most frequent occurrence is the debonding of a cemented prosthesis. Fracture of porcelain on an implant-retained **porcelain-fused-to-metal crown** (**PFM**) is not unusual. Abutments may fracture. The screw on a screw-retained abutment or crown may break or loosen. Implant-retained removable prostheses are subject to the same problems as described earlier for nonimplant retained dentures and removable partial dentures.

Table 2-9 summarizes common clinical problems associated with implants and implant-retained prostheses—and their possible significance.

**TABLE 2-9 Implant-Related Diagnoses**

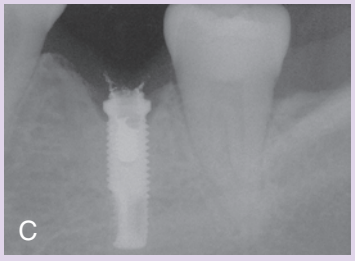
| Diagnosis | Description | Illustration | Possible Significance |
|---|---|---|---|
| Paresthesia | Iatrogenic damage to nerve during implant placement | | Prolonged or permanent paresthesia |
| Peri-implantitis | Infection of the peri-implant tissues | A | May require surgical therapy to resolve; loss of the implant |
| Fractured fixture | Angular or horizontal fracture of the implant fixture; often appears as isolated deep pocket | B | Loss of implant |
| Fractured abutment | Angular or horizontal fracture of the implant abutment |  C | Need to replace abutment; if custom abutment, will also need to replace the coronal restoration |
| Debonded cement-retained crown | Crown separated from the abutment (abutment still attached to implant fixture) | | Usually possible to re-cement the crown or retainer |
| Loose solid abutment | Crown still attached to abutment; abutment can be rotated | | Crown must be removed and abutment re-torqued or replaced; replacement of the coronal restoration may be necessary |

**TABLE 2-9 Implant-Related Diagnoses—cont'd**

| Diagnosis | Description | Illustration | Possible Significance |
|---|---|---|---|
| Mobile screw-retained abutment or crown | Crown no longer firmly attached to abutment; loose or broken screw | D | Occlusal access to screw necessary—if screw is broken, remove remaining portion; re-torque or replace screw; crown or retainer replacement may be necessary; if screw cannot be removed without damaging fixture threads, may need replace implant fixture |
| Fractured implant-retained crown | Portion of crown restoration (usually porcelain) detached from the remainder of the crown restoration or abutment | E | Esthetic problem; deficient tooth form; trauma to oral tissues; loss of restoration; need replace crown |
| Worn or dislodged locator or ERA retention cap | Compromised denture retention | | Replace retention cap |

**A,** Ascenzi M, Reilly GC: Bone tissue: hierarchical simulations for clinical applications, *J Biomech* 44(2):211–212, 2011; **B,** Conrad HJ, Schulte JK, Vallee MC: Fractures related to occlusal overload with single posterior implants: a clinical report, *J Prosthet Dent* 99(4):251–256, 2008; **C,** Pow EHN, Wat, PYP: A technique for salvaging an implant-supported crown with a fractured abutment screw, *J Prosthet Dent* 95(2): 169–170, 2006; **D,** courtesy Dr. Carlos Barrero; **E,** courtesy Dr. Ibrahim Duqum.

## REVIEW QUESTIONS

- What are the benefits of creating a diagnosis list?
- What is the relationship between the patient's diagnosis and their treatment plan?
- What should be included in a patient's diagnosis?
- What are common patient factors that will shape the patient's treatment plan?
- What are the categories of jaw abnormalities? What radiographic signs differentiate the categories?
- What are the signs and symptoms commonly associated with TMD?
- What are the findings associated with plaque-induced gingival diseases? What are the findings associated with chronic periodontitis? What is meant by reduced periodontium and how is it related to a periodontal diagnosis?
- Define and describe the diagnoses for pulpal and apical tissues in the American Association of Endodontists (AAE) classification system.
- How are caries lesions identified and classified?
- Identify and describe the common types of tooth cracks and fractures.
- What occlusal problems are commonly encountered in patients? How are each of those problems recognized and diagnosed?
- What dental and facial esthetic problems are commonly encountered in patients? How are each of those problems recognized and diagnosed?
- List single tooth restorative defects commonly found in patients. How might each of these cause problems for the patient?
- What are some common problems that may occur in conjunction with fixed dental prostheses? What impact might each of these have on the patient?
- What are some common problems that can occur in conjunction with removable dental prostheses? What impact might each of these have on the patient?
- List common problems associated with implants. Describe the possible negative outcomes that can arise with each of these problems.

## REFERENCES


1. Han MJ, Bidinger JJ, Hivnor CM: Photo quiz. Asymptomatic linear hemorrhages. Splinter hemorrhages, *Am Fam Physician* 81(11):1375–1376, 2010.
2. Pindborg JJ, Renstrup G, Poulsen HE, et al: Studies in oral leukoplakias. V. Clinical and histologic signs of malignancy, *Acta Odontol* 21(5):407–414, 1963.
3. Waldron CA, Shafer WG: Leukoplakia revisited. A clinicopathologic study 3256 oral leukoplakias, *Cancer* 36(4):1386–1392, 1975.
4. Warnakulasuriya S, Johnson N, Van der Waal I: Nomenclature and classification of potentially malignant disorders of the oral mucosa, *J Oral Pathol Med* 36(10):575–580, 2007.
5. Kramer IR, Lucas RB, Pindborg JJ, et al: Definition of leukoplakia and related lesions: an aid to studies on oral precancer, *Oral Surg Oral Med Oral Pathol* 46:518–539, 1978.
6. Fontana M, Young DA, Wolff MS, et al: Defining dental caries for 2010 and beyond, *Dent Clin North Am* 54(3):423–440, 2010.
7. Armitage GC: Development of a classification system for periodontal diseases and conditions, *Ann Periodontol* 4(1):1–6, 1999.
8. Albandar JM, Kingman A: Gingival recession, gingival bleeding, and dental calculus in adults 30 years of age and older in the United States, 1988-1994, *J Periodontol* 70(1):30–43, 1999.
9. Eke PI, Dye BA, Wei L, et al: Prevalence of periodontitis in adults in the United States: 2009 and 2010, *J Dent Res* 91(10):914–920, 2012.
10. Longbottom C, Huysmans M-Ch, Pitts N, Fontana M: Glossary of key terms, *Mongr Oral Sci* 21:209–216, 2009.
11. Fontana M, Cabezas CG, Fitzgerald M: Cariology for the 21st century: current caries management concepts for dental practice, *J Mich Dent Assoc* 95(4):32–40, April 2013.
12. International Caries Detection and Assessment System Coordinating Committee: The International Caries Detection and Assessment System (ICDAS II), Workshop sponsored by the NIDCR, the ADA, and the International Association for Dental Research. https://www.icdas.org/. Accessed February 2010.
13. Kidd EAM, Beighton D: Prediction of secondary caries around tooth-colored restorations: a clinical and microbiological study, *J Dent Res* 75(12):1942–1946, 1996.
14. Wenzel A: Current trends in radiographic caries imaging, *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 80(5):527–539, 1995.
15. Wenzel A: Bitewing and digital bitewing radiography for detection of caries lesions, *J Dent Res* 83(Suppl 1):C72–C75, 2004.


## SUGGESTED READINGS


### D. Extraoral Diagnoses

Malamed SF: *Medical emergencies in the dental office*, ed 7, St. Louis, 2014, Elsevier.

Neville BW, Damm DD, Allen CM, Bouquot J: *Oral and maxillofacial pathology*, ed 3, St. Louis, 2008, Elsevier.

Regezi JA, Sciubba J, Jordan RC: *Oral pathology: clinical-pathological correlations*, ed 6, St. Louis, 2011, Elsevier.

Scully C: *Oral and maxillofacial medicine*, ed 3, St. Louis, 2013, Elsevier.

### E. Intraoral Soft Tissue Diagnoses

Neville BW, Damm DD, Allen CM, Bouquot J: *Oral and maxillofacial pathology*, ed 3, St. Louis, 2008, Elsevier.

Regezi JA, Sciubba J, Jordan RC: *Oral pathology: clinical-pathological correlations*, ed 6, St. Louis, 2011, Elsevier.

Scully C: *Oral and maxillofacial medicine*, ed 3, St. Louis, 2013, Elsevier.

### F. Salivary Gland Abnormalities

Neville BW, Damm DD, Allen CM, Bouquot J: *Oral and maxillofacial pathology*, ed 3, St Louis, 2008, Elsevier.

Regezi JA, Sciubba J, Jordan RC: *Oral pathology: clinical-pathological correlations*, ed 6, St Louis, 2011, Elsevier.

### G. Abnormalities of the Jaws

Neville, B, et al: *Oral and maxillofacial pathology*, ed 3, St. Louis, 2008, Saunders.

White SC, Pharoah M: *Oral radiology: principles and interpretation*, ed 7, St. Louis, 2014, Mosby.

### H. Temporomandibular Joint Diseases: Neuropathic Pain and Neurovascular Pain

De Leeuw R, editor: *American Academy of Orofacial Pain: Orofacial pain—guidelines for assessment, diagnosis and management*, ed 4, Chicago, 2008, Quintessence.

Koenig LJ: *Diagnostic imaging: oral and maxillofacial*, Salt Lake City, 2011, Amirsys.

Okeson JP: *Management of temporomandibular disorders and occlusion*, ed 7, St Louis, 2012, Mosby.

White SC, Pharoah M: *Oral radiology: principles and interpretation*, ed 7, St. Louis, 2014, Mosby.

Zakrewska JM: *Orofacial pain*, Oxford, 2009, Oxford Press.

### I. Periodontal Diseases

Armitage GC: Periodontal diseases: diagnosis, *Ann Periodontol* 1(1):37–215, 1996.

Newman MG, Takei HH, Klokkevoid PR, Carranza FA: *Carranza's clinical periodontology*, ed 12, St. Louis, 2014, Saunders.

### J. Pulpal and Periapical Diagnoses

Glickman GN: AAE Consensus Conference Recommended Diagnostic Terminology: background and prespectives, *J Endod* 35(12):1619–1620, 2009.

Hargreaves KM: *Cohen's pathways of the pulp*, ed 10, St. Louis, 2010, Mosby.

Koenig L: *Diagnostic imaging: oral and maxillofacial*, Salt Lake City, 2011, Amirsys.

Torabinejab M, Walton RE, Fouad A: *Principles and practice of endodontics*, ed 5, St. Louis, 2015, Saunders.

### K. Dental Caries

American Academy of Pediatric Dentistry: *Guideline on caries-risk assessment and management for infants, children, and adolescents*, 2014.

Cochrane Collaboration. http://www.cochrane.org/reviews/clibintro.htm/. (see Oral health: caries).

Doméjean S, White JM, Featherstone JD: Validation of the CDA CAMBRA caries risk assessment—a six-year retrospective study, *J Calif Dent Assoc* 39(10):709–715, 2011. Caries Management by Risk Assessment (CAMBRA) group.

Fejerskov O, Kidd E: *Dental caries: the disease and its clinical management*, Oxford, 2008, Blackwell.

Heymann HO, Swift EJ, Ritter AV: *Sturdevant's the art and science of operative dentistry*, ed 6, St. Louis, 2012, Mosby.

Young DA, Fontana M, Wolff MS: *Current concepts in cariology: dental clinics of North America*, St. Louis, 2010, Elsevier.

### L. Tooth Cracks and Fractures

American Association of Endodontists: *Endodontics: colleague for excellence. Cracking the cracked tooth code: detection and treatment of various longitudinal tooth fractures, Summer 2008*, 2008. http://www.aae.org/uploadedfiles/publications_and_research/endodontics_colleagues_for_excellence_newsletter/ecfesum08.pdf/. Accessed February 20, 2015.

### N. Occlusal Abnormalities

Dawson PE: *Functional occlusion: from TMJ to smile design*, ed 1, St. Louis, 2006, Mosby.

Proffit W, Fields H: *Contemporary orthodontics*, ed 5, St. Louis, 2012, Mosby.

### O. Esthetic Problems

*American Academy of Cosmetic Dentistry*. http://www.aacd.com/. Accessed February 20, 2015.

Aschheim KW: *Esthetic dentistry, Pageburst E-Book on VitalSource: a clinical approach to techniques and materials*, St. Louis, ed 3, 2014 Elsevier.

Chu SJ, Devigus A, Paravina R, Mieleszko A: *Fundamentals of color: shade matching and communication in esthetic dentistry,* Chicago, 2011, Quintessence.

El Askary A E-S: *Fundamentals of esthetic implant dentistry*, ed 2, Oxford, 2008, Blackwell.

Freedman GA: *Contemporary esthetic dentistry*, St. Louis, 2012, Elsevier.

Geissberger M: *Esthetic dentistry in clinical practice*, Oxford, 2010, Blackwell.

Goldstein R: *Esthetics in dentistry (2 vols), Google eBook*, 2014.

Mistry S: Principles of smile demystified, *J Cosmetic Dent* 28(2):116–124, 2012.

Terry DA, Geller W: *Esthetic and restorative dentistry: material selection and technique*, ed 2, Chicago, 2013, Quintessence.

### S. Implant-Related Diagnoses

Hughes F, Seymour K, Turner W, et al, editors: *Clinical problem solving in periodontology and implantology*, St. Louis, 2012, Elsevier.

Lindhe J, Karring T, Lang NP, editors: *Clinical periodontology and implant dentistry*, ed 5, Oxford, 2008, Blackwell.

# SECTION 2

# The Treatment Planning Process

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3

# Evidence-Based Treatment Planning: Assessment of Risk, Prognosis, and Expected Treatment Outcomes

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http://evolve.elsevier.com/Stefanac/diagnosis/

## OUTLINE

**Definition of Evidence-Based Dentistry, Risk Assessment, Prognosis, and Treatment Outcomes**
- Evidence-Based Dentistry
- Risk Assessment
- Prognosis
- Treatment Outcomes

**Traditional Model for Dental Treatment Planning**

**Professional Variability and Disagreement in Treatment Planning**
- Why Dentists Disagree in Treatment Planning
- Need for More and Better Information on Which to Base Decisions

**Evidence-Based Decision Making**

**Risk Assessment**
- Risk Assessment and Dental Treatment Planning
- Oral Cancer Risk Assessment
- Caries Risk Assessment
- Periodontal Disease Risk Assessment
- Occlusal/Functional Risk Assessment

**Prognosis**
- Descriptors of Prognosis
- Domains of Prognosis
- Application and Use of Prognosis in Treatment Planning

**Outcomes and Outcomes Measures**
- Role of Outcomes Measures
- Using Outcomes Information in the Treatment Planning Process

**Changing the Treatment Planning Paradigm**
- Clinical Recommendations and Guidelines

**Conclusion**

Health promotion and disease prevention have received increasing emphasis in the health sciences, and have become a particular focus in dentistry. Programs and practices put into place to promote these goals must be based on appropriate evidence if they are to have any reasonable likelihood of success. The emergence of **evidence-based dentistry** (**EBD**) has significant implications for the dental treatment planning process for individual patients as well as for the design of parameters that will support decision making in the delivery of dental healthcare. Treatment planning with a focus on health promotion and disease prevention must include a careful assessment of both the patient's **disease risk** and potential treatment outcomes. Analyses of both *disease* prognosis (with or without treatment) and *treatment* prognosis will also be integral to this process.

The intent of this chapter is to frame the context for decision making in dentistry. A perspective on how dental treatment planning decisions have typically been made will be included, as will a discussion of the limitations of that process. Recognizing that there is often inadequate information at the dentist and patient level on which to base treatment decisions, there is a call for meaningful clinical investigations to support clinical decision making. The concepts of risk assessment, outcomes assessment, and prognosis determination will be defined and described, and their relevance to dental treatment planning will be discussed. Findings from research in these areas can be expected to improve future dental treatment planning and to have a positive effect on the oral health of patients. In the meantime, the concepts themselves offer the practicing dentist a systematic approach to organizing the process of assessing clinical problems and possible solutions. In addition, these concepts provide a useful framework for presenting and discussing treatment options with the patient.

In summary, the purposes of this chapter are to discuss the kinds of information dentists need to help patients make informed decisions and to review some related areas of dentistry in which progress in this area has been made. We will also provide a template for dentist and patient decision making as more information becomes available. This chapter provides the foundation for the detailed process of treatment planning, which is delineated in Chapter 4 and then applied repeatedly throughout the subsequent chapters of this textbook.

## DEFINITION OF EVIDENCE-BASED DENTISTRY, RISK ASSESSMENT, PROGNOSIS, AND TREATMENT OUTCOMES

### Evidence-Based Dentistry

The concept of evidence-based decision making is well established in all of the health sciences and is a core element in contemporary dental treatment planning. It has been defined as "the integration of best research evidence with clinical expertise and patient values."[1] EBD requires a careful assessment of clinically relevant scientific evidence in light of:

- the patient's oral and general health
- the dentist's clinical expertise, and
- the patient's treatment needs and preferences

EBD is based on scientific principles and treatment regimens that have been tried, tested, and proven worthy by accurate, substantiated, and reproducible studies. Ideally, any treatment method, whether in dentistry or medicine, should be supported by current, controlled, blinded, prospective longitudinal studies. Unfortunately, for many, if not most, clinical treatments, this type of evidence is not yet available.

Where valid current applicable research exists, it can affirm or disprove the efficacy of various dental treatments and thereby provide compelling guidance to the patient and practitioner on the "treat versus not treat" question. In other situations, when several different viable alternatives are being weighed, it can provide the basis for moving to a specific decision. The strength of the evidence needs to be considered as it is factored into the decision making. The stronger the evidence, the more seriously it should be weighed. Conversely, the weaker the evidence, the less likely that it will drive or influence decision making.[2]

Although the use of EBD has become an integral component of the treatment planning process, other factors must also be considered. The application of dental research and published studies must be tempered by an understanding of the limitations of these resources:

- Many treatments remain to be analyzed, especially in the long term
- There is insufficient evidence to determine the viability of many treatments
- Many treatments do not have strong evidentiary support, but may still be viable (especially compared with other, even less attractive, alternatives)
- The relevant studies may not be applicable to individual patient circumstances (e.g., general health; immune response; condition of the oral cavity, tooth, tooth surface; disease risk)
- Most studies do not address patient factors (e.g., patient's prior experience) as described throughout this text
- Most outcomes studies look exclusively at treatment efficacy and rarely correlate that efficacy with patient preferences and desires

How then does the dentist make decisions and recommend treatment when the evidence is not strong? To make a treatment planning decision, the dentist and patient may need to rely more heavily on other professional (what has your experience revealed?), or patient driven (what has been the patient's previous experience with a similar procedure?) parameters. The range of treatment options may have to be expanded to accommodate other treatment approaches that may be similarly unproven, but that may be viable in this situation. In any case, it is incumbent on the dentist to ensure that the patient is informed about the limits of our evidence-based knowledge. In the end, it is essential for the patient to be an informed and active partner in the decision making. When there is a limited evidence base for treatment planning, the dentist has an obligation for wider, not narrower, disclosure in achieving informed consent.

### Risk Assessment

Risk assessment is the determination of the likelihood of a patient's acquiring a specific disease or condition. Not all patients are equally likely to develop a particular disease. Some patients, because of heredity, environment, diet, personal habits, systemic health, medications, or other factors, are more likely than others to develop and/or continue to be afflicted by certain conditions. Those patients who have predisposing conditions or who engage in behaviors known to promote a particular disease are described as **at increased risk**. This differs from the epidemiologic definition of "at risk." In epidemiology, anyone who could potentially develop the condition is "at risk"; and individuals who could not develop the condition are "not at risk." Edentulous patients, for example, are not at risk for caries development, but everyone who has at least one natural tooth is at risk for caries development. This distinction is important in determining the denominator for incidence and prevalence estimates. In both realms, however, clinical and epidemiologic, someone who has a strong probability of developing the condition is "at high risk."

### Prognosis

A **prognosis** is a prediction, based on present circumstances, of the patient's future condition. It is usually expressed in such general terms as "excellent," "good," "favorable," "unfavorable," "fair," "poor," "questionable," or "hopeless." A prognosis can be made for an individual tooth, for various oral conditions (e.g., oral cancer, periodontal disease), for the various treatment disciplines, or for the patient's overall prognosis. An essential difference between risk assessment and prognosis is that the former focuses on the propensity to *develop* a disease; the latter predicts the *future course of the disease* (progression or regression), both with and without treatment.

For a specific patient, varying prognoses can be determined for multiple disease processes, as well as for recommended treatments. Although the prognosis for the disease and the treatment may be related, they are not necessarily the same. For example, a patient with moderate periodontitis may have a good prognosis for control of the disease, but a poor or questionable prognosis for a long span, fixed partial denture that is anchored on the involved teeth. Conversely, a patient with severe periodontitis may be described as having

a poor prognosis for control of the disease, but a good prognosis for a related treatment, an implant-retained removable partial denture.

### Treatment Outcomes

**Outcomes,** in the specific context of this discussion, are the specific, tangible results of treatment. The results that a patient and practitioner anticipate receiving as a result of a course of treatment are **outcomes expectations.** An outcome expectation will be closely linked to both risk assessment and prognosis determination. For example, if the patient remains at increased risk for new caries and the prognosis for control of the caries is poor, then it follows that the outcomes of treatment can be expected to be unfavorable. But the two differ fundamentally in that although prognosis always looks to the patient's future condition, outcomes assessment looks at past performance (both individual and group) and, even when the outcomes measures are used to estimate future success, those expectations are still predictions based on past performance.

Expected outcomes are usually expressed in quantifiable terms based on sound clinical research, such as the *average life expectancy* of a restoration. Although outcome measures for the complete range of dental treatment procedures are not yet available, some meaningful work has been published, and examples of selected findings are discussed later in this chapter.

## TRADITIONAL MODEL FOR DENTAL TREATMENT PLANNING

Traditionally, dental students have been taught that before initiating anything other than emergency/urgent dental treatment, every patient must have a comprehensive "ideal" treatment plan that is based on a stepwise process: first, a thorough evaluation and examination of the patient is conducted; next, diagnoses are made and/or a problem list is developed; and finally, a series of treatments is constructed and presented by the dentist and agreed to by the patient.[3] This model has stood the test of time and has significant merit. Its rationale and virtues are discussed at length in other chapters, and it is the basis for the treatment planning process described throughout this text.

In practice, however, many dentists often do not follow the stepwise model when treatment planning for their patients. Often, an individual tooth condition or other oral problem is evaluated and the dentist makes an immediate recommendation to the patient about what should be done to resolve the problem.[4] This may be an expedient way for the practitioner to gain a modicum of consent from the patient to begin treatment. However, a clearly articulated diagnosis and prognosis often are not made, and even in those cases in which the dentist makes a mental judgment about the rationale for treatment, the diagnosis may not be explicitly stated to the patient. Thus the patient may remain relatively uninformed about the nature of the problem and the rationale for a particular treatment.

It is also unlikely in this situation that the patient will be presented with more than one option for treatment. Even when the patient is given options, the choices are stated in a perfunctory way, and the patient is given minimal information from which to make a well-reasoned, thoughtful decision. Given the time pressures of a daily dental practice, these omissions can evolve to become the routine rather than the exception. The patient who remains relatively uninformed about diagnoses and treatment options, however, is ill prepared to provide meaningful **informed consent** for treatment. This can be both unwise and hazardous from a risk management perspective (see Chapter 6). The need to achieve fully informed consent is a central theme of this text.

Another concern associated with focusing on individual tooth problems and failing to follow a stepwise comprehensive approach to treatment planning is that the dentist does not have the opportunity to factor in where that particular problem fits in the overall context of the patient's oral condition. When used to its fullest, the stepwise model helps ensure that the dentist considers—and the patient is informed about—all diagnoses and treatment options and their associated prognoses.

Few experienced dentists have difficulty making treatment recommendations for their patients. Typically, those recommendations are based on what the dentist learned in dental school and what has been gleaned since, from continuing education courses, participation in study clubs, reading dental journals, and discussions with peers. In addition, dentists are commonly exposed to other, less objective sources of information. Examples include marketing of products and services via advertising in journals or on the Internet, or through corporate sales or dental supply representatives selling products or promoting techniques that may or may not have valid evidence to support their use. In the absence of such evidence, treatment outcomes may not be as the patient or dentist would expect, and there is greater potential for premature failure, a shortened lifespan for a restoration or prosthesis, and even harm to the patient.

For many dentists, the most important foundation on which treatment planning recommendations are made is the individual clinician's own personal experience with a specific approach or technique.[5] From a psychological perspective, there is often a powerful pull for practitioners to stay within their own comfort zone and continue to recommend treatments and perform procedures that are "tried and true." The wise dentist will recognize the limitations and hazards of this approach. In the absence of scientific scrutiny, outdated, sometimes misguided, approaches have been perpetuated, whereas new and untried (by the practitioner) approaches are rejected out of hand. When the dentist fails to offer and make available a full range of treatment options to patients, or to accurately characterize the viability of each option, the quality of care provided to patients may be diminished.

The reality is that many treatment decisions in dentistry must be made in an environment of uncertainty, or in some situations, *misplaced* certainty. (For an example of the latter, see the section, *When Should a Heavily Restored Tooth Be*

*Crowned?* later in this chapter). The ability to make an accurate diagnosis, realistically predict outcomes of treatment, and delineate with precision the course of the disease with or without treatment is, in many cases, limited. That being the case, it behooves the dentist to place the ethical principle of nonmaleficence, or "do no harm," in a position of preeminence. When the reasons for intervening are not compelling or when the risks of "no treatment" (i.e., watchful waiting) are not significant, then conservative therapy or no treatment should usually be recommended over aggressive therapy or treatment. The nature of the disease process certainly has a bearing on this analysis. Where there is diagnostic and/or treatment uncertainty, but the disease may have significant morbidity or mortality, as with oral cancer, aggressive intervention is generally warranted. On the other hand, when there is similar diagnostic uncertainty (as with incipient dental caries in a patient at low risk for new caries), and the short-term probability of negative sequelae (fracture, pulpal disease, or periapical disease) is low, then intervening conservatively and at a measured pace is more professionally reasonable.

## PROFESSIONAL VARIABILITY AND DISAGREEMENT IN TREATMENT PLANNING

It is well established that dentists frequently differ with one another on specific diagnoses and, therefore, plans for treatment.[5-8] Studies have shown that when several dentists examine the same patient under the same conditions (even in controlled experimental or teaching conditions), they often disagree on which teeth should be treated and how they should be treated.[9] These differences are not limited to restorative treatment. Dentists disagree on how to manage and treat many oral problems, including periodontal disease, soft tissue lesions, and malocclusion. This is not necessarily a problem. If different practitioners can demonstrate with comparable positive outcomes measures that their varying plans are equally effective, there would be no reason for concern. Theoretically (as it is often impossible to measure), one treatment plan would be found to have a better outcome than the others if all could be followed over an extended period of time. In reality, it is probably the case that various approaches may each yield acceptable results, whereas some others would definitely be inferior. The appropriate goal, then, should be to ensure that the inappropriate plans can be identified. Before discussing ways to achieve this goal, the reader should have a clear understanding of why clinicians disagree.

### Why Dentists Disagree in Treatment Planning

#### Inaccuracy of Diagnostic Tests

Even with conditions as pervasive as dental caries, our diagnostic tests are imperfect. Bader and Shugars, in their systematic review of dental caries detection methods, found relatively low mean sensitivity (true positive) and low mean specificity (true negative) for the visual detection of occlusal carious lesions, irrespective of lesion size, and very low mean sensitivity and high mean specificity for visual, tactile detection of occlusal carious lesions, irrespective of lesion size. A low mean sensitivity and good mean specificity for radiographic detection of proximal carious lesions, irrespective of lesion size, was also very wide.[10] Newer diagnostic techniques (DIAGNOdent, VistaProof, CarieScan) may improve those numbers but may result in notable error rates. In one study on the detection of occlusal carious lesions, a laser fluorescent measuring device yielded improved sensitivity (94%) but lower specificity (82%) compared with expert examiners using conventional diagnostic techniques.[11] At best, although some of these caries detection devices may be useful in complement with other approaches, as the researchers who have studied them suggest, they are as yet insufficient to support development of treatment plans without use of other examination resources.[12] As new technologies and products emerge, clinicians must evaluate their effectiveness carefully when deciding whether or not to use them even as adjunctive tools.[13,14] Statistical measures of diagnostic accuracy (e.g., sensitivity/specificity ratio, percent of false positives) are also not ideal for commonly used clinical and radiographic caries detection methods. False-positive diagnoses for caries are particularly troubling, as they may lead to unnecessary treatment.

#### Misdiagnosis and Disagreement on Diagnosis

Dentists may disagree about diagnoses for a particular patient. These differences sometimes involve how certain sets of symptoms should be categorized. For example, there has been significant disagreement among dentists as to how temporomandibular disorders (TMDs) should be assessed, diagnosed, and managed. As an example of a different type of problem, general dentists have sometimes underdiagnosed the occurrence of periodontal disease in their patients—which has, in some instances, resulted in malpractice litigation. Even more dangerous are missed diagnoses of oral cancers. Differences may also exist at a patient, tooth, or surface-specific level.[5,15] Different practitioners examining the same patients frequently differ in their diagnoses of caries and restoration defects. Multiple reasons for these differences can be noted—the information base collected by each dentist may differ, the interpretations may differ, and the diagnostic options considered by each dentist also may differ.

Regardless of the reasons, if dentists cannot agree on the diagnosis for a patient, then inevitably consensus concerning the best treatment option or recommendation will not be possible.

#### Lack of Risk Assessment

With some oral conditions, an assessment of the patient's risk can have a compelling influence on the overall treatment plan. Caries is a notable example. Caries risk assessment forms the cornerstone of the successful application of a minimalist intervention philosophy in the management of dental caries. A baseline caries risk assessment to identify those factors that will most likely contribute to the progression of the carious disease process is crucial for patients with evidence of active dental caries. Each individual presents with a slightly different caries risk profile, and the principles of a

patient-centered approach to managing each case should also be applied to the individual diagnostic and treatment planning phases of dental care.

In spite of well-defined caries risk instruments (discussed later in section, *Caries Risk Assessment*), there may be disagreements among practitioners about the patient's level of risk. Even more problematic is the situation in which the dental team fails to assess risk altogether. When tooth-specific restorative treatment is planned for a low-risk patient, there is a tendency to over treat, placing restorations whether or not they are needed or indicated. Conversely, failure to recognize that a patient is at high risk will often lead to failure to address underlying causes of the disease, allowing the condition to progress unchecked.[16]

### Uncertain Prognosis

In the absence of accurate patient, disease, tooth, and treatment-specific prognoses, treatment planning depends on individual clinical experience, and the determining factor becomes "what works in my hands." This is an unstable and irreproducible base on which to build consensus on treatment planning. The lack of evidence-based prognosis determination leads to errors in planning for the individual patient and impairs profession-wide attempts to establish treatment parameters.

### Limited Availability or Use of Outcomes Measures

An **outcome of care** is defined as the health state of a patient as a result of some form of medical or dental intervention. Outcomes measures provide a quantifiable and standardized method for comparing treatments. This is especially helpful in relation to oral conditions, such as TMDs, for which many different and sometimes conflicting treatment modalities have been described. Unfortunately, for many dental procedures, outcomes data are not available. Even when available, many practitioners do not choose to make use of them. In either situation, the dentist will have no dependable method of judging which treatment is most reliable and most likely to function the longest. Attempts to develop profession-wide treatment parameters have been slow to emerge. As a result, the individual dentist is often placed in the position of making judgments based primarily on personal experience, drawn from what has worked best in the past in his or her own practice.

### Dentists' Varying Interpretations of Patient Expectations

It has been confirmed that when several dentists each independently examine the same patient under controlled conditions, each may interpret findings and the patient's wishes regarding treatment differently.[17] Several plausible explanations for this variability can be noted. The dentist may be making assumptions about the patient's wishes and listening selectively, or the dentist may have a preconceived idea about what the ideal treatment should be and then may present that plan in a more favorable light.

A related issue is the frequent disparity between the perceptions of the dentist and those of the patient. Patients' expectations before treatment, and their satisfaction after treatment, differ significantly from those of the dentist.[18] Patients and their dentists, in many cases, probably also have differing perspectives on what will be an acceptable or good result. If the expectations of the patient and the dentist are not in alignment, it is not surprising that different dentists will perceive a given patient's expectations differently. The important take-home message here is for us to listen carefully to our patients to discern their particular needs and expectations during the process of developing the treatment plan.[18]

## Need for More and Better Information on Which to Base Decisions

If the reader accepts the premise that more and better evidence will assist the dentist and patient in making sound treatment decisions, achieving truly informed consent and resulting in higher-quality care, then the question becomes, "What information is needed to achieve these ends?" A series of questions can be developed that, when addressed, will meet the needs of patients and practitioners. The questions are framed here from the patient's perspective, but each can also be asked from the perspective of the dentist as the care provider for a specific patient.

Each patient has the right to ask and deserves to receive answers to questions such as the following:

- What specific problems do I have?
- What ill effects can these problems cause?
- Can the problems be controlled or eliminated?
- What treatment options are available to address these problems?
- What are the advantages and disadvantages of carrying out treatment X, treatment Y, or no treatment?
- What results can I expect from the various possible treatment options?
- What may happen if no treatment is performed?
- Am I at risk for ongoing or new disease?

To answer these questions, it will be useful to know the following:

- *On the professional level*: What is the general success rate for a particular procedure; what is the population-wide expected longevity of a particular type of treatment or restoration?
- *On the provider level*: What level of success has the individual dentist experienced with the procedure?
- *On the patient level*: What is the likely outcome for this procedure when it is implemented on this particular individual?

Unfortunately, these pieces of information are rarely available for any particular treatment option, not to mention for all possible options in a given clinical situation. Often there is available evidence to at least partially answer some of these questions, but where evidence does not exist, or if it exists but is not applicable to the patient-specific circumstances, the dentist must recommend treatment based on his or her own knowledge and personal experience, and the patient must make a corresponding decision based on that limited information.

## EVIDENCE-BASED DECISION MAKING

Although the concept of evidence-based healthcare has been frequently discussed in the health sciences literature in the past few decades, an understanding of the importance of basing the practice of clinical treatment on research findings dates from at least the early twentieth century.[19,20] In the 1990s, the concept was formalized and reemphasized in the work of David Sackett, who defined evidence-based practice as "integrating individual clinical expertise with the best available external clinical evidence from systematic research."[21] Although Sackett wrote about the practice of medicine, his views apply equally as well to dentistry. Many dentists have been slow to integrate clinical epidemiology along with their own practice experiences and patients' values in their treatment planning. David Chambers has contended that there is no systematic, high-quality, conclusive evidence to demonstrate the inherent benefit of evidence-based treatment planning.[22] Nevertheless, it remains a critical part of our healthcare delivery system, and organized dentistry has taken a strong position in support of EBD. The American Dental Association (ADA) has reaffirmed the importance and role of EBD in its Code of Ethics, and the concept has been codified in the accreditation standards of North American dental education programs.[23,24] See eBox 3-1 for suggestions on how to find the best evidence.

## RISK ASSESSMENT

### Risk Assessment and Dental Treatment Planning

**Risk indicators** are identifiable conditions that, when present, are known to be associated with a higher probability of the occurrence of a particular disease. **Risk factors** are conditions for which a demonstrable *causal* biologic link between the factor and the disease has been shown to exist. Risk factors are best confirmed by **longitudinal studies** during which patients with the hypothesized risk factor are evaluated over sufficient time to determine whether they do or do not develop the specific disease or problem in question. Risk indicators may be identified by taking a cross section, or sample, of individuals and looking for instances of the risk indicator and the disease occurring together.[25] Although risk and causality may be linked, they are not the same. For example, a diet that is heavily laden with refined sugars constitutes a risk indicator (and a risk factor) for caries. However, a specific patient who consumes a highly cariogenic diet may never be afflicted with caries.

Another categorization that is particularly useful to keep in mind in the dental setting is the distinction between **mutable** (modifiable) and **immutable (nonmodifiable) risk factors** or risk indicators. Mutable risk indicators—such as diet, oral self-care, smoking, poorly contoured restorations—can be changed, whereas immutable risk indicators, such as age, genetics, or fluoride history, are factors that cannot be changed. The dental team can and should use any and all reasonable interventions that have the potential to mitigate or eliminate mutable risk indicators. In the case of immutable risk indicators, however, the value of their identification may be limited to risk assessment and guiding the prescription of preventive therapy—which can be useful tools in health promotion and oral disease prevention.

Assessing risk assists the dentist in identifying which patients are more likely to develop a particular disease or condition or to have recurrence of the disease. When that identification has been made, the patient can be informed about the risks and, when feasible, efforts can be made to eliminate or mitigate the specific cause or causes of the disease. When successful, such efforts help the patient preserve his or her dentition. Elimination of a specific cause or causes of an oral disease early in the progression of the condition can, in some cases, reduce the severity and the duration of the disease (e.g., periodontal disease). Once the disease process is initiated, however, removal of a risk indicator or indicators that are not known to be direct causes of the disease may have no effect on the duration or course of the disease (e.g., oral cancer).

To describe the strength of the relationship between risk and future disease occurrence, it is often helpful to specify the *degree* of risk with terms like "high," "moderate," or "low." Defining the degree of risk varies with the clinical context or with the parameters of the individual study or protocol. In any setting, it can be assumed that the higher the risk, the more likely the occurrence or recurrence of the disease. In the presence of multiple risk indicators and/or strong risk indicators, the occurrence of disease is also more likely. For example, in general, the patient who has multiple risk indicators for dental caries (e.g., lack of previous and current fluoride exposure, and a cariogenic diet) is more likely to be afflicted by dental caries than a patient with only one or no known risk indicators. Also, as discussed later in this text, an older adult patient with a strong risk indicator (e.g., **xerostomia**) is more likely to develop dental caries than a similar patient with a less strong risk indicator, such as lack of fluoride exposure as a child.

Eight categories of conditions or behaviors that may be risk indicators for oral disease can be described and are discussed in the following sections. It must be noted that, although the categories and their relevance to treatment planning are presented here as distinct entities, many potential risk indicators do not fit neatly into a single category, but may appropriately be placed in two or more.

#### Heritable Conditions

Heritable conditions include the genetic predisposition for specific tooth abnormalities, such as amelogenesis imperfecta, dentinogenesis imperfecta, dentinal dysplasia, or extradental abnormalities, such as epidermolysis bullosum, a palatal cleft, or a skeletal deformity. Recent genome-wide association studies have found potential genetic components to caries, which heretofore had not been thought to exist.[26,27]

The presence of a genetic marker for any hereditary or developmental oral abnormality would certainly be an indicator of risk. Knowledge of such risk indicators can be useful to the dentist and patient in the following ways:

- *Genetic counseling:* The dentist plays a role in identifying oral conditions and anomalies that may be heritable.

## eBOX 3-1 How to Find the Best Evidence

In any discipline of medicine or dentistry, students and practitioners should recognize and be familiar with the sentinel research—whether described in journal articles or textbooks—that has shaped development of the discipline and guided decision making in that field. The value of such work is demonstrated as it is cited in lectures, courses, teaching manuals, clinical protocols, policy statements, and published professional guidelines. Such work will also be referenced in subsequent studies that derive from the original work. These works have been recognized to advance knowledge on the topic, and in some cases, to establish or redefine foundational concepts of the practice of dentistry.

Developing a regular routine for reviewing and analyzing the dental literature is an important activity for the clinician who wishes to provide the best possible care to his or her patients. Scholarly journals are the most important source of current information about clinical care. Most disciplines have one or more associated periodic publications that review and publish current studies that have met established peer review standards. For the specialist, or for the generalist seeking current knowledge in a specific area, these journals are an important source of contemporary and authoritative information. The judicious reader will select high-quality peer-reviewed journals, recognizing that the manuscripts selected for publication in such journals have been reviewed by several experts in the subject area.

Although reports of controlled randomized clinical trials provide the most clinically relevant information, such studies are not always available (or even feasible) on a topic of interest, and less global reports must be used. Once the desired literature is obtained, it is up to the clinician to critically evaluate the report. It is not always easy to distinguish high quality from poor research, but given time and experience, practitioners will gain skill in evaluating the evidence. Good articles exist on how to critically analyze healthcare literature, and the new dentist should hone these skills.[1,2]

In a given year, there will be a wide range of publications in the dental literature, and the general dentist will have time to critically read only a small portion of these. It will be important to be selective, choosing the most relevant and most highly regarded scholarly publications. One way to stay abreast of the breadth of the new literature is to locate and review articles and reports that identify, describe, and summarize the literature on a particular topic. Such reviews provide the reader with a summation of the findings from studies on the topic to date and may also include the author's summary and evaluation of what the literature does and does not demonstrate, in what areas information is insufficient, and where more research is needed.

Published systematic reviews are a relatively recent addition to the dental literature. The authors of such reports critically review the literature on a particular topic. The systematic review includes a formal process for assessing the quality of research reported in a set of articles, analyzing and synthesizing findings according to specifically defined, predetermined criteria, and then, finally, drawing conclusions for clinical practice based on that careful and systematic assessment. When there is demonstrable evidence that meets established criteria, systematic reviews provide the most compelling support for clinical decision making in dentistry. Some notable repositories for EBD in general, and systematic reviews in particular, are:

- The ADA's Center for Evidence-Based Dentistry at http://ebd.ada.org/Default.aspx
- The Cochrane Library, which has a dentistry and oral health section, at http://www.thecochranelibrary.com/view/0/index.html. Most Cochrane reviews are current, and topics are often updated as additional research on the topic becomes available.
- PubMed. For the dentist in clinical practice, PubMed can provide an efficient way to find articles on a specific topic. Found at http://www.ncbi.nlm.nih.gov/pubmed, PubMed is a free database produced by the National Library of Medicine (NLM)[3] and draws on the resources of the MEDLINE database, an online index to the world's health sciences journal literature since 1966. Many dental journals, in additional to traditional paper versions, are now also available as online subscriptions.
- Google Scholar (http://scholar.google.com) is an easy-to-use search engine based on a popular operating system.
- TRIP (http://www.tripdatabase.com) is an easy-to-use clinical search engine with a dental section that has been online since 1997. TRIP originally stood for Turning Research Into Practice.

Two English-language journals focus specifically on EBD: *Evidence-Based Dentistry*, published in Britain[4], and the *Journal of Evidence-Based Dental Practice (JEBDP),* published in the United States.[5] These journals publish what they term "summaries" and "analysis and evaluation" pieces. The *Journal of the American Dental Association (JADA)* publishes "critical summaries" of systematic reviews and 2- to 3-page peer-reviewed articles summarizing a systematic review, along with a critical appraisal of its methods and conclusions. For the busy practitioner, regular use of such journals is often the best way to efficiently and reliably stay current in evidence-based information in dentistry.

One must be aware, however, that just because a systematic review has been published on a particular subject, it may not necessarily provide the information needed to make a clinical decision. Any review may conclude with the statement that there is insufficient evidence to form a recommendation, or to distinguish between alternative treatments, and that further research is needed.

**References**


1. Prato GP, et al: Evaluation of the literature: evidence assessment tools for clinicians, *J Evid Based Dent Pract* 13(4):130-141, 2013.
2. Barnett ML, Pihlstrom BL: A practitioner's guide to developing critical appraisal skills interventional studies, *J Am Dent Assoc* 143(10):1114-1119, 2012.
3. National Library of Medicine: PubMed. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi/. (Accessed February 19, 2015.)
4. Evidence-Based Dentistry. http://www.nature.com/ebd/index.html/. (Accessed February 19, 2015.)
5. Journal of Evidence-Based Dental Practice. http://www.journals.elsevier.com/journal-of-evidence-based-dental-practice/. (Accessed February 19, 2015.)

When such conditions are recognized, the patient as a potential parent can be encouraged to seek genetic counseling. Also, parents who have had one child with a genetic disorder will be very interested in the probability that other progeny will be similarly affected.

- *Patient education:* With awareness that a patient is at risk for developing an oral disease, it becomes part of the dentist's role to educate the patient about the true cause of that process. Some patients may mistakenly think that the heritable condition is caused by factors that *are* in their control and will go to unusual lengths in a misguided and sometimes harmful effort to control the disease. Taking antibiotics to control the "infection" associated with a normally erupting tooth is one such example. Conversely, some patients assume that certain conditions, such as "soft teeth," are totally controlled by "genes" and that they can do nothing to prevent caries. Educating patients about the multiple contributing causes of dental caries can be helpful in leading to effective means of controlling the caries and giving the patient a clear sense that his or her condition is not hopeless.
- *Disease prevention:* If a family history of a heritable oral condition is known, it may be possible for measures to be taken to prevent or at least mitigate the occurrence of the disease in susceptible individuals. Eliminating other risk factors and/or known causes of the disease would be one such strategy.
- *Early recognition:* With awareness that a patient is at risk for a heritable oral condition, the dentist and patient can carefully monitor for early signs or symptoms of change. Through such efforts, laboratory tests or other confirmatory information can be obtained at an early point and a timely diagnosis made.
- *Early intervention:* Early intervention by the dentist may be effective in preventing full manifestation of the inherited condition and reducing morbidity. Intensity and/or the longevity of the outbreak may be decreased and recurrence prevented. Aggressive periodontitis is an example of a sometimes heritable oral disease that, if treated early, has a much improved prognosis.

## Systemic Disease as a Risk Indicator for Oral Health Problems

Patients with gastroesophageal reflux disease (GERD) are at significantly increased risk of developing dental erosion.[28,29] Similarly, patients who are afflicted with bulimia are also much more likely to have dental erosion.[30] Leukemia may cause a wide variety of intraoral soft tissue abnormalities. Advanced liver disease is a risk factor for intraoral ulceration, petechial formation, ecchymosis, and bleeding. Systemic diseases such as diabetes can be risk factors, predisposing the patient to significant oral problems, such as oral ulceration, stomatitis, infection, and poor wound healing. The poorly controlled diabetic patient is more likely to develop and exhibit progression of periodontitis.[31] Some evidence suggests that periodontal disease is modestly associated (10%-50% increase in risk) with atherosclerotic vascular disease and clinical events, and that this association is independent of other shared risk factors. Some uncertainty remains, however, about the existence of such independent associations between periodontal disease and atherosclerotic vascular disease.[32] A systematic review suggests that treatment of periodontal disease improves endothelial function and reduces biomarkers of atherosclerotic disease, especially in those already suffering from cardiovascular disease and/or diabetes.[33]

Many other general health problems are risk factors for intraoral pathology. Some of these are detailed in Chapter 7, and a range of medical issues that place a patient at risk for oral pathology is addressed in the suggested readings accompanying that chapter. When the patient has a systemic disease, the dentist must be aware not only of related risks for developing oral disorders; but also the possible need for antibiotic premedication, the advisability of modifying or postponing dental treatment, and, in some cases, the need to be prepared for a medical emergency in the dental office.

## Dietary and Other Behavioral Risk Indicators

If the patient's behavior, diet, or habits contribute to an increased risk for the development of oral disease, then it is appropriate for the dentist to educate the patient about those risks and encourage modification or elimination of the behavior. Use of tobacco products, excessive alcohol consumption, oral use of cocaine or methamphetamines, or frequent ingestion of cariogenic foods and beverages are examples of behavior that can be deleterious. On occasion, overuse or misuse of normally beneficial habits may cause significant problems. One example is the frequent use of low-pH and/or high-alcohol-percentage mouth rinses by a xerostomic patient. The dentist has the responsibility to recognize the problem, inform the patient of the risks (i.e., possible negative consequences of continuance), and to remain vigilant for the occurrence of signs suggestive of pathologic developments, such as dental erosion or oral cancer.[34,35] An example of a psychological and behavioral problem linked to an oral pathologic condition is the patient with obsessive-compulsive disorder who is at risk for the development of severe dental abrasion and other traumatic or factitious injuries.

## Risk Indicators Related to Stress and Anxiety

Patients can be at risk for many forms of oral pathologic conditions because of significant life stresses or other environmental influences. Erosive lichen planus is an example of an oral condition for which stress is a strong risk factor. An all-too common problem is the patient whose anxiety about going to the dentist leads to avoidance of needed treatment. As discussed in Chapter 14, the implications for the anxious patient of the development of oral problems and the potential effect on the way dental treatment will be planned and carried out can be enormous. The dentist has the obligation to identify these risk indicators, inform the patient of their deleterious potential, and mitigate them whenever possible.

## Functional or Trauma-Related Conditions

Functional or trauma-related conditions also incur risk. For example, the patient who bruxes and has fractured teeth in

the past should be assessed for current and future risk of recurrence. If the patient continues to be at risk, then appropriate reconstructive and/or preventive measures should be considered. For the patient with severe attrition, large existing amalgam restorations, and a history of fractured teeth, sound recommendations may be crowns and an occlusal guard. If new restorations are warranted, but the patient cannot afford crowns, using a protective cusp design rather than a conventional preparation design for **direct fill restorations** may be a reasonable alternative. Another example: When a tooth is acutely traumatized, it is not uncommon to later develop pulpal necrosis, periapical pathology, and/or tooth or root resorption.

### Environmental Risk Indicators

Food service workers, who have constant and unlimited access to sweetened and carbonated beverages, are at increased risk for both dental caries and dental erosion. Frequent swimming in pools with chlorinated water can cause significant dental erosion in susceptible individuals.[36] Patients who are allergic to certain foods, latex, metals, or other environmental agents may develop ulceration, stomatitis, hives, or, less commonly, an anaphylactic reaction. Obviously, the best strategy in managing these patients is to eliminate exposure to the allergen or allergens. Sometimes this can be difficult. For example, because peanuts and peanut products are ubiquitous in the North American processed food chain, the patient who is very reactive to peanuts may have difficulty in avoiding exposure.

### Socioeconomic Status

The validity of socioeconomic status as a risk factor in oral health problems is uncertain. Although caries, periodontal disease, and tooth loss are more prevalent in individuals from lower-income groups, it often remains unclear whether the disease process is the consequence of poor nutrition, low self-esteem, lack of health literacy, or lack of access to healthcare. Even if one accepts low socioeconomic status as a risk indicator for certain oral conditions on a population-wide basis, there is little support for the assertion that it is a risk factor for a specific patient's disease state. For the individual patient, socioeconomic status must always be considered to be a mutable, never an immutable, factor. (See Chapter 18 for a more specific discussion of the needs of patients who are motivationally compromised or who have limited financial resources.) The important take-home message here is that socioeconomic status should not be seen as a limitation to treatment, but rather as a window of opportunity to help the patient achieve a more optimal state of oral health. An open and honest conversation with the patient about his or her personal challenges and difficulties will often provide an opportunity to build rapport and help to ensure that the treatment plan will be relevant and appropriate.[37-41]

### Previous Disease Experience

Previous disease experience can be a strong predictor—in some cases, the single best predictor—of future disease. For many oral conditions, including dental caries, periodontal disease, oral cancer, and tooth fracture, if the patient has experienced the problem in the past, the probability is greater that the same problem will arise again in the future.[42-44]

Because past disease experience is an immutable risk indicator, the best management strategy is to identify other causes of the condition and mitigate or eliminate those whenever possible. Treatment interventions should be recommended and instituted to prevent recurrence. Placement of a cusp protective restoration on a tooth at high risk for fracture is one such example.

To summarize, risk assessment can be a useful adjunct to the dental treatment planning process in the following ways:

- Identifying the need for counseling the patient, spouse, or offspring about heritable oral conditions and diseases
- Working to eliminate recognized causes of oral disease when the patient is known to be at risk
- Initiating preventive measures to forestall the occurrence of oral disease when potential causes of oral disease cannot be eliminated
- Providing prophylactic behavioral, chemotherapeutic, and restorative intervention to prevent an undesirable outcome
- Providing early restorative intervention in situations in which delayed treatment would put the patient at risk for requiring more comprehensive treatment in the future

In theory, with a complete understanding of the patient's risk for oral disease, any oral disease for any patient could be prevented or, at least, managed more effectively. In clinical practice, this is not feasible or practical. Time would not permit so exhaustive a review for every patient, and our present scientific base is insufficient to support such an undertaking. Nevertheless, assessing risk provides a valuable resource in treatment planning. In the following discussion, four oral conditions are described in which risk assessment should be critically linked to shaping the patient's plan of care.

## Oral Cancer Risk Assessment

Oral cancer is a generic term applied to any malignancy affecting the oral cavity and/or jawbones. The majority of primary malignancies occurring in the mouth derive from the surface stratified squamous epithelium of the oral mucosa. Other primary oral cancers include malignant neoplasms of salivary gland origin, sarcomas in soft connective tissue or bone, lymphomas, melanomas, and odontogenic carcinomas. Secondary or metastatic cancers, originating from any distant organ or tissue (e.g., breast, prostate, colon, liver), may also occur in the mouth. The following discussion focuses on oral squamous cell carcinoma, because this diagnosis represents more than 80% of cases of oral cancer.[45]

Oral squamous cell carcinoma (OSCCA) is the result of the malignant transformation of keratinocytes in the surface epithelium. The epithelium usually undergoes a progressive transformation from normal, to dysplastic, to invasive carcinoma. However, such a progression may be very rapid and the dysplastic changes may not be detected early or are only recognized after invasive carcinoma ensues. Dysplasia or

carcinoma may present clinically as a white, red, white-red, ulcerated, verrucous lesion, or as a combination of these characteristics. Sometimes patients will develop more than one lesion with dysplasia.

Several substances and behaviors are known to contribute to the initial formation of OSCCA. Even with eradication of the lesion by surgical excision or other means, the patient remains vulnerable. In particular, if exposure to carcinogens continues, the patient is at risk of cancer recurrence or development of additional lesions in other oral sites (second primary tumors).[46]

## Risk Factors for Oral Cancer

***Tobacco.*** Any form of tobacco has the potential to induce carcinogenesis of the oral epithelium.[47] This is a dose-dependent phenomenon. Patients with a history of having used any tobacco products within the last 10 years should be considered at relatively high risk for OSCCA. The type of tobacco, frequency of use, and duration of use must be documented and monitored. Patients who are exposed to tobacco, including second-hand smoking, should be counseled to avoid it.

***Alcohol.*** Ethanol use is believed to be a cofactor for OSCCA through altering the local environment of the oral mucosa to favor carcinogenesis, by inducing genetic alterations in the cells at the local level, and also by changing the systemic processing of other carcinogens and altered cells in the liver and the entire organism.[48,49] The type, amount, and frequency of alcohol consumption should be documented, monitored, and discouraged if it is determined to be excessive.

***High-risk human papillomavirus infection.*** Recently, the association of high-risk subtypes of human papillomavirus (HPV; example, HPV 16 and HPV 18) has been linked to oral cancer.[50] The profile of the patient who develops OSCCA in the presence of HPV is different (often nonsmoker, nondrinker, educated, middle aged, male homosexual, or partner with HPV), the lesions tend to be found in a different location (oropharynx), and the OSCCA generally responds more favorably to treatment.[51]

***Trauma.*** Although trauma *per se* does not cause carcinogenesis, it may induce epithelial damage and subsequent repair. The repair of epithelium demands cell duplication and, by increasing the cells that undergo division, the possibility that one of those cells will develop mutations and undergo neoplastic transformation is increased. Lesions that are determined to be of traumatic etiology must be resolved and the source of trauma eliminated to avoid unnecessary cell division and the possible increased risk of neoplastic change.

***Immune system compromise and immunosuppression.*** If the immune system of a patient is compromised (as with a debilitating disease) or suppressed (as caused by taking corticosteroid drugs), its ability to destroy transformed neoplastic cells is decreased, allowing tumors to grow unchecked. As a result, patients who are immunocompromised or immunosuppressed are at greater risk of developing oral cancer.[52]

***Radiation treatment.*** Patients undergoing radiation therapy for head and neck malignancies often experience multiple side effects (see Chapter 5). Several of these, including xerostomia dermatitis, mucositis, tissue atrophy, and hypovascularity, may be contributing factors to new or recurrent cancer development. In some cases, radiation induces malignant transformation or de-differentiation of preexisting tumors. Common neoplasms that develop owing to radiation include osteosarcoma and fibrosarcoma.[53] The damage induced by radiation is dose dependent.

***Xerostomia.*** Xerostomia may contribute to mucositis and traumatic lesions (micro- and macroulceration). Although some authors have associated the presence of chronic candidiasis with oral cancer, the evidence is not definitive on this issue.

***Antineoplastic chemotherapy.*** Antineoplastic agents can affect the oral cavity in a variety of ways. Common complications in patients undergoing chemotherapy are dry mouth and mucositis. Some chemotherapy protocols include agents that also severely suppress the patient's immune system, in which case the risk for oral cancer may be increased. Other types of chemotherapy, although not directly associated with increased risk of oral cancer development, may still result in significant undesirable side effects to the oral mucosa or jawbones, such as thinning of the oral mucosa, which may indirectly contribute to carcinogenesis.

***Malnutrition.*** Malnutrition can be associated with delayed wound healing, immune system malfunction, or decreased cellular repair. Patients with poor nutritional status may have an increased risk for development of oral cancer.

***Previous history of oral cancer.*** Patients with previous histories of oral cancer should be monitored carefully for recurrences or second primaries.[54] In the patient with a history of cancer at a site other than the oral cavity, the possibility of metastatic disease should always be considered in the differential diagnosis of any oral lesion that cannot be diagnosed clinically. Therefore, in the patient with a history of any type of cancer, any and all oral lesions should be biopsied unless the clinician can be certain of its diagnosis based on clinical evaluation alone.

With the identification of risk factors or risk indicators for oral cancer, every effort should be made to eliminate those factors and educate the patient about oral cancer. Strategies for smoking cessation are presented in Chapter 9, and management of alcohol abuse is discussed in Chapter 13. When the discovery is made by the dentist at the initial oral examination, it is imperative that the dentist evaluate additional specific areas of vulnerability during the course of the clinical examination (e.g., area of the lip where cigarette is held, vestibular site where snuff or chew is harbored, site of buccal mucosa adjacent to a sharp tooth fragment or broken restoration, floor of the mouth/ventral tongue in smokers, pharyngeal area in cases of HPV risk). When it is possible to eliminate local sources of tissue trauma (e.g., a defective restoration), that should be accomplished early in the treatment plan. Any lesion that cannot be clinically diagnosed or unequivocally associated with trauma must be biopsied for diagnostic pathology. Management of other questionable lesions is discussed in Chapter 1. If the risk indicator(s) for oral cancer cannot be eliminated, then the patient must be carefully monitored as long as the

individual remains in the practice. Patient education about oral cancer risk factors should be ongoing.

## Caries Risk Assessment

Some clinical conditions (such as the presence of plaque) and behavioral patterns (such as frequent fermentable carbohydrate consumption) have strong associations with the occurrence of dental caries. Nevertheless, the presence of those factors alone has been shown to have limited predictability of current or future caries activity.

Recent caries experience and current disease activity continue to be the most important factors for predicting future caries activity.[55] Past caries experience represents the combination of many risk factors to which an individual has been exposed over a long period of time. Current dental caries activity represents recent exposure to risk factors and, if those factors remain unchanged, suggests a high likelihood of continuing caries activity in the future. It is unfortunate that dentists must rely on the appearance of clinical signs of the disease to have a high degree of certainty about future risk determination, but, on the positive side, detecting caries lesions is a relatively simple and inexpensive clinical activity, and early detection of lesions and the elevation of caries risk can lead to early and effective management of both risk factors and the disease process.

To diagnose, assess the risk level, and effectively manage active dental caries, an array of information must be obtained. Collecting information on risk factors such as presence and location of stagnant plaque, regularity of consumption of fermentable carbohydrates (particularly between meals), and salivary flow levels, along with information about protective factors, such as fluoride exposure and the presence of sealants, will provide the dental team and patient with an understanding of the causes and origins of the caries activity. This information will also be used to develop an individualized management plan for the patient[56] (see Chapter 9).

Several dental organizations have developed caries risk assessment modules, designed with the primary purpose of determining a patient's level of risk based on identified risk factors, as well as protective factors that are believed to be closely associated with limiting dental caries progression. Several of these instruments are available at dental organization websites or in recent publications (see *Suggested Readings and Resources* at the end of this chapter). Two notable examples include the Caries Management by Risk Assessment (CAMBRA) group[57] (Figure 3-1) and the Cariogram software program developed at the University of Malmö in Sweden (Figure 3-2). These risk assessment modules have been developed primarily based on expert opinion, and limited evidence is available on their validity.[58] In addition, the use of the modules in adults is based primarily on evidence from younger groups, because most of the reported studies have been conducted on younger age groups.[56]

To determine the risk level, the modules combine caries indicators (caries lesion presence in recent years), risk factors, and protective factors. In general, a patient is considered to be at low risk when no active caries lesions have been found in the last 3 to 5 years, combined with no recent changes in risk and protective factors. Patients considered at moderate or high caries risk are those presenting with recent caries lesions and/or detrimental changes in risk or protective factors. The following cases are examples of some of the types of patients who should be considered to be at elevated caries risk:

- A patient with apparently good oral hygiene but with new caries lesions, providing clear evidence that current risk factors result in development of lesions
- A patient with no new detectable caries lesions but a recent severe drop in salivary flow due to a new medication
- A patient who has been using fluoridated toothpaste all her/his life and with no caries activity in the last few years but who has recently decided to stop using fluoride. This patient will have a significant diminishing of the protective factors, potentially leading to dental caries activity.

All patients with these characteristics should have individualized management to reduce the risk of developing new lesions.

Although collecting caries risk information regularly is perceived as an extremely time-consuming process for the busy practitioner, most of the needed information is readily available via a well-conducted medical/dental history and examination. In most instances, no additional testing is necessary. In fact, the practitioner's subjective assessment based on clinical experience is a useful determinant of risk.[59] Nevertheless, systematic collection and recording of objective data are important for consistency across multiple members of the dental team, for monitoring progress of the caries management plan, and for legal protection.

Although many of the risk and protective factors associated with development of both root caries and recurrent caries are similar to those for coronal caries, there are a few unique aspects of root caries development and occurrence that the practitioner should be cognizant of. Root surface exposure to the oral environment is a prerequisite for the development of caries lesions on the root surface. The drop in biofilm mineral saturation necessary for demineralization of the dentin/cementum is less than that needed for enamel demineralization, suggesting that root caries lesions can be developing while enamel surfaces are unaffected.[60] Nevertheless, there is a clear association between root caries and active coronal caries.[61] In the United States, men exhibit a higher prevalence and greater severity of root caries. As for coronal caries, individuals with higher income and more education exhibit a lower prevalence of root caries. Importantly, however, most of these differences tend to disappear later in life.[62] It is of particular importance to continue monitoring patients when they enter their later years in life, as salivary, dietary, and oral hygiene behaviors frequently change.

For secondary caries, the quality of the tooth-restoration interface is of particular importance, especially in the interproximal areas where most of these lesions develop. Large gaps between the tooth and restorative material have been associated with increased caries development.[63] Gaps that can be penetrated with the tip of an explorer tend to be wider than 100 mm and should be considered a high-risk location for secondary caries development.

**Patient Name:** **Score:**

**Birth Date:** **Date:**

**Age:** **Initials:**

| | | Low Risk (0) | Moderate Risk (1) | High Risk (10) | Patient Risk |
|---|---|---|---|---|---|
| **Contributing Conditions** | | | | | |
| I. | **Fluoride Exposure** (through drinking water, supplements, professional applications, toothpaste) | **Yes** | **No** | | |
| II. | **Sugary Foods or Drinks** (including juice, carbonated or non-carbonated soft drinks, energy drinks, medicinal syrups) | **Primarily at mealtimes** | | **Frequent** or prolonged between meal **exposures/day** | |
| III. | **Caries Experience of Mother, Caregiver** and/or other **Siblings** (for patients ages 6-14) | **No carious lesions in last 24 months** | **Carious lesions in last 7-23 months** | **Carious lesions in last 6 months** | |
| IV. | **Dental Home**: established patient of record, receiving regular dental care in a dental office | **Yes** | **No** | | |
| **General Health Conditions** | | | | | |
| I. | **Special Healthcare Needs*** | **No** | **Yes (over age 14)** | **Yes (ages 6-14)** | |
| II. | **Chemo/Radiation Therapy** | **No** | | **Yes** | |
| III. | **Eating Disorders** | **No** | **Yes** | | |
| IV. | **Medications that Reduce Salivary Flow** | **No** | **Yes** | | |
| V. | **Drug/Alcohol Abuse** | **No** | **Yes** | | |
| **Clinical Conditions** | | | | | |
| I. | **Cavitated or Non-Cavitated** (incipient) **Carious Lesions or Restorations** (visually or radiographically evident) | **No new carious lesions or restorations in last 36 months** | **1 or 2 new carious lesions or restorations in last 36 months** | **3 or more carious lesions or restorations in last 36 months** | |
| II. | **Teeth Missing Due to Caries in past 36 months** | **No** | | **Yes** | |
| III. | **Visible Plaque** | **No** | **Yes** | | |
| IV. | **Unusual Tooth Morphology** that compromises oral hygiene | **No** | **Yes** | | |
| V. | **Interproximal Restorations - 1 or more** | **No** | **Yes** | | |
| VI. | **Exposed Root Surfaces** Present | **No** | **Yes** | | |
| VII. | **Restorations with Overhangs** and/or **Open Margins**; **Open Contacts** with Food Impaction | **No** | **Yes** | | |
| VIII. | **Dental/Orthodontic Appliances** (fixed or removable) | **No** | **Yes** | | |
| IX. | **Severe Dry Mouth (Xerostomia)** | **No** | | **Yes** | |
| | | | | **TOTAL:** | |

Patient Instructions:

*Patients with developmental, physical, medical or mental disabilities that prevent or limit performance of adequate oral healthcare by themselves or caregivers.

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**FIG 3-1** Caries Management by Risk Assessment (CAMBRA) caries risk assessment form. (Copyright the American Dental Association, 2009, 2011.)

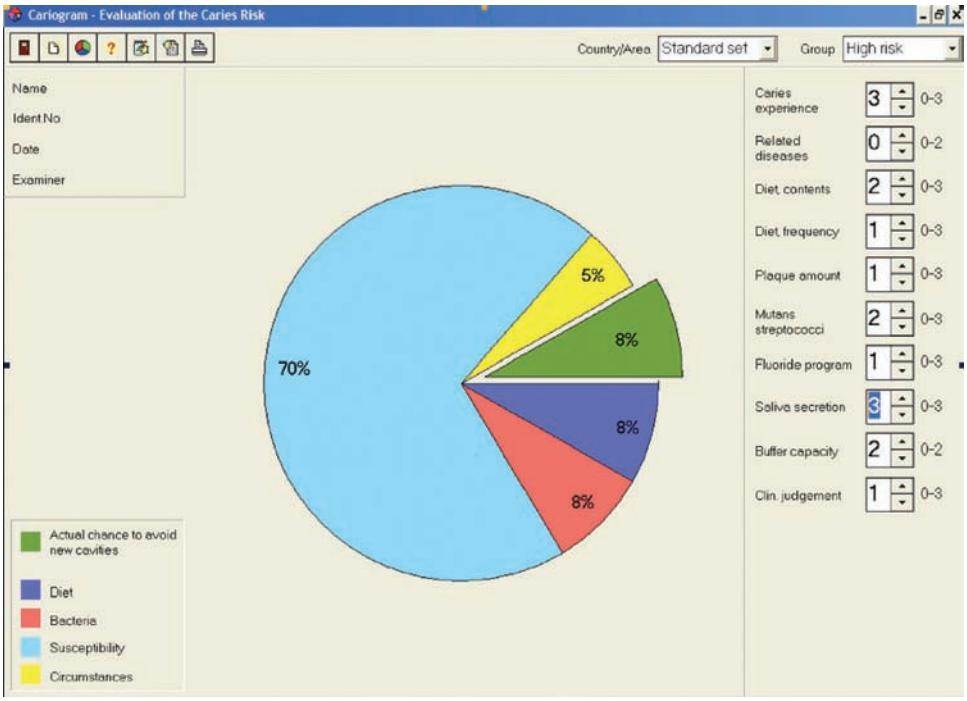


**FIG 3-2** Cariogram caries risk assessment form. (From Merdad K, Sonbul H, Gholman M, et al: Evaluation of the caries profile and caries risk in adults with endodontically treated teeth, *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 110(2):264-269, 2010.)

Once a patient has been determined to be at increased risk of caries, the patient needs to be informed, risk indicators discussed, and an appropriate intervention put in place. The basic caries control protocol and optional interventions to manage the patient with active caries are described in Chapter 9. It is also essential to continue to monitor the patient's caries activity and reassess caries risk at periodic intervals. Caries risk may diminish, increase, or remain static over time. The dental team must be vigilant to ensure that any increase in caries risk status is recognized and that aggressive intervention can be implemented.

## Periodontal Disease Risk Assessment

Periodontal risk assessment gained attention in the dental literature in the early 1990s.[64-66] Efforts have been made to characterize periodontal risk by quantifying clinical and radiographic findings and applying these values to validated algorithms.[67-69] These tools look at a number of parameters that, when input, will generate a summarized report categorizing the risk level and suggesting treatment strategies. Assessed parameters include the following:

- Probing depth
- Bleeding on probing
- Tooth loss
- Extent of radiographic bone loss
- Patient age relative to extent of disease
- Diabetes mellitus
- Genetic factors (interleukin [IL]-1 genotype status)
- Cigarette smoking
- Tooth-related factors (presence of furcation involvement, vertical bone loss, subgingival restorations, and/or calculus deposits)
- Treatment history (previous nonsurgical and/or surgical periodontal therapy)

Evidence of linkage between periodontal disease risk and patient outcomes has been reported (Box 3-1). Patients who have been determined to be at high risk for periodontal disease have been shown to have higher rates of tooth loss, even when compliant with treatment. Periodontal risk assessments have also been shown to be predictive of treatment outcomes.[70,71]

Periodontal disease risk assessment should be completed as part of any comprehensive or periodic dental examination. Given the slow and often occult progression of most

**BOX 3-1 Risk Factors That Exacerbate or Otherwise Affect Periodontal Disease Progression**

- Age
- Smoking/tobacco use
- Genetics
- Stress
- Medications
- Clenching/bruxism
- Systemic diseases (cardiovascular disease, diabetes, rheumatoid arthritis)
- Poor nutrition and obesity

From American Academy of Periodontology. http://www.perio.org/consumer/risk-factors/. Accessed June 3, 2014.

periodontal diseases, even younger adults will benefit from such an assessment. Assessing periodontal risk gives both the clinician and the patient a framework in which to discuss treatment and prevention strategies. Such an assessment helps to identify those factors that can or cannot be modified that will ultimately guide the long-term management of the patient. Consequently, a comprehensive assessment of a patient's periodontal risk factors is necessary throughout care. The American Academy of Periodontology website includes a "Gum Disease Risk Assessment Test" that can be utilized by the individual patient to assess his or her own periodontal risk (see *Suggested Readings and Resources*).

Effective early management strategies should address modifiable risk factors. Possible therapies for patients with risk factors for periodontitis include the following:

- Oral hygiene instructions to review plaque removal techniques
- Smoking cessation, including referrals to other healthcare professionals as needed
- Referral to a physician for diabetes management
- Replacement of restorations with defective margins to eliminate plaque-retentive factors

Detailed information on the management of periodontal diseases can be found in Chapters 9 and 10.

## Occlusal/Functional Risk Assessment

Both initial and subsequent periodic dental examinations of the patient should include an assessment of the dental occlusion and the patient's masticatory function. At the initial comprehensive examination (see Chapter 1), a detailed patient history and careful clinical examination will reveal current occlusal problems and enable the dentist to ascertain the risk for future problems. Similarly, at a maintenance visit, if the patient raises questions or c oncerns relating to the bite or function, or if the periodic examination reveals possible problems, risk issues should be explored with strategic questions to the patient and followed up with a clinical assessment of those conditions or concerns. As part of the examination and interview, the dentist should routinely look for signs and symptoms of parafunctional habits, clenching, bruxing, or limitation of jaw movements.

When occlusal or functional problems are recognized, or new problems anticipated, the dentist should consider implementing preventive or interventional strategies. An example, at the most basic level, is to identify patients involved in contact sports who will benefit from use of a protective mouth guard. At the more advanced level, this assessment would identify patients who are at higher risk for such problems as occlusal trauma, tooth fracture, worn or fractured restorations, bruxism, TMD, loss of vertical dimension of occlusion, or loss of function due to occlusal abnormalities or missing teeth.

Unlike caries risk and periodontal risk, there are no standardized instruments to establish a level of occlusal or functional risk. Risk assessment of three common occlusal/functional issues is addressed in the following sections.

### Bruxism

**Bruxism** is a relatively common parafunctional habit and is estimated to be present in up to 20% of dental patients.[72] It has been suggested that bruxism may lead to or exacerbate other conditions, such as headaches, temporomandibular joint (TMJ) pain, masticatory muscle tenderness, sleep apnea, tooth attrition, fractured teeth/restorations/implants, loss of tooth structure, and premature tooth loss.[73] The presence of bruxism is a complicating factor for any planned prosthodontic rehabilitation. Failure to address bruxism before extensive restorative dentistry may lead to various unfavorable outcomes, including tooth fracture and premature loss of teeth.[74]

Bruxers tend to be younger, with a lower prevalence found among the elderly.[73] It has been reported that severe bruxers in an adolescent population have a significantly higher presence of TMJ clicking.[75] Box 3-2 lists some suggested risk indicators or risk factors for bruxism.

Not all bruxers will become symptomatic or require treatment. Decisions as to whether treatment is to be implemented, and which treatment will be optimal, must be made with the full informed consent of the patient. The discussion needs to address not only the potential risks and hazards of bruxism for the patient, but also the probability of negative outcomes with and without treatment, given the patient's age, past dental experience, and specific oral condition. Common treatment options are presented in Box 3-3.

### Tooth Fracture

**Tooth fracture** may occur when heavy occlusal forces are applied to a vulnerable tooth. Such occurrences may be predicted

**BOX 3-2 Risk Indictors or Risk Factors for Bruxism**

- Age[73]
- Family history/genetics
- Emotional stress
- Psychological disorders (depression, psychoses, obsessive-compulsive disorder)[76]
- Occlusal interferences, such as balancing side interferences
- Nighttime alcohol consumption[77]
- Heavy caffeine consumption
- Smoking
- Dental class II occlusion[78]
- Obstructive sleep apnea syndrome (OSAS)[79]

**BOX 3-3 Possible Therapies for Patients Who Are Bruxers (or Patients Who Are at Elevated Risk to Become Bruxers)**

- Occlusal adjustment
- Occlusal splint
- Deprogramming
- Behavioral therapy (behavioral modification)
- Psychological therapy (medications and/or desensitization therapy or other forms of psychotherapy)

from the initial comprehensive examination of the patient. Study casts are a useful adjunct to the examination, as they usually show the existing wear of teeth more clearly than will direct observation of the teeth. It is generally recognized that heavily restored endodontically treated teeth that lack cuspal protection are more susceptible to fracture. Other risk indicators or risk factors for tooth fracture include the following:

- Clenching grinding habit[80]
- History of tooth/restoration fractures
- Generalized attrition, wear facets
- Existing large direct fill restorations (compromised cusp integrity)
- Occlusal trauma (primary or secondary)
- Excessive occlusal forces

Typical strategies to mitigate the risk for fracture include the following:

- Fabrication of an occlusal guard/splint
- Placement of cusp protective restorations
- Replacement of missing teeth to defray the occlusal load on the existing teeth
- Occlusal adjustment in the presence of acute occlusal trauma

As with bruxism, the "no treatment option" deserves serious consideration, especially if the patient is advanced in years, has not had significant problems with fractures in the recent past, has a conservative treatment philosophy, and is willing to accept the consequences and risks of not intervening at this time.

### Occlusion-Related Temporomandibular Disorders

TMDs are typically multifactorial in origin. They are identified most commonly in young adult women.[81] Common risk factors for patients with chronic TMDs include health status and other pain disorders, depression, history of trauma, stress (psychosocial), and parafunctional activity.[82]

The question of whether occlusal/functional problems such as bruxism cause or exacerbate TMDs continues to be controversial. A systematic review identified only two significant occlusal risk factors for TMDs: lack of lateral cuspid guidance and Class II malocclusions.[83] Others have reported evidence that "grinding one's teeth" is a significant risk factor for myofascial pain[84] and demonstrated that self-reported bruxism and variations in dental occlusion are linked to TMJ signs and symptoms.[85]

It is noteworthy that quantitative studies and those discussing specific methods for diagnosing bruxism have found a much lower association with TMD symptoms compared with self-reporting studies.[86] Most of the recent literature does not support the contention that malocclusion causes TMDs, and orthodontic treatment has not been found to be a risk indicator or cause of temporomandibular problems.

It is reasonable to assume, however, that the patient *may* have an elevated risk of developing a TMD when, at the initial or periodic examination, the patient's history is positive for any of the following:

- Joint clicking and pain
- Clenching or bruxing
- Jaw locking
- Head/jaw trauma

And/or when, on clinical examination, the dentist observes:

- Severe attrition caused by bruxism
- Symptomatic occlusal interferences
- Posterior crossbites
- Absence of cuspid guidance (especially in Angle Class II patients)
- Functional limitations in jaw movement
- TMJ noises associated with pain

The management and treatment of acute TMDs is discussed in Chapter 8 and other issues relating to TMDs in Chapter 9. When patients are identified as at risk for TMDs because of occlusal abnormalities, any recommended treatment should be as minimally invasive as will be effective. Common treatment strategies to prevent and treat occlusally related TMJ problems are listed in Box 3-4.

## PROGNOSIS[84,85,87-91]

Prognosis can be related to risk. For example, if a patient is at high risk for caries, the prognosis for the desired successful outcome, the control of the caries, may be poor unless the risk factors or indicators are modified or eliminated. It is critical to remember that risk and prognosis are distinctly different concepts. Several issues that may influence the prognosis may not themselves be risk indicators. Examples of such issues include severity of the disease at the onset of treatment, the ability and commitment of the dentist, and the patient's level of motivation to achieve a state of good oral health. Risk factors are used to estimate the probability of the patient acquiring the disease, whereas prognosis is a prediction of the outcome of the disease process or of our ability to manage it—our prediction of the success of associated treatments.

Because prognosis is a prediction of *future* outcomes, there is an inherent potential for inaccuracy. Most oral diseases are multifactorial in nature, and, for each patient, the

**BOX 3-4 Common Strategies to Prevent and Treat Occlusally Related Temporomandibular Joint Problems**

- Functional preventive recommendations (e.g., no gum chewing, change in sleep position)
- Nonsteroidal antiinflammatory drugs (NSAIDs) (in acute phase)
- Occlusal adjustment to eliminate pathologic interference (especially in lateral excursion)
- Fabrication of an occlusal guard/splint
- Replacement of missing teeth to establish harmonious (canine rise) occlusion
- Restoration of teeth to establish harmonious contours
- Jaw muscle deprogramming
- Behavioral modification therapy
- Referral to mental healthcare professionals
- Orthodontics

strength of the various causes and their relative effects, amid a dynamic oral condition with often changing social determinants of health, make it difficult to accurately predict the future oral health condition. Another uncertainty is the effect of future initiatives. Samet and Jotkowitz,[92] in their seminal work on classification and prognosis for individual teeth, described patient categories and treatment-related factors that play a role in determining the prognosis. These include the following:

- Biological risks (e.g., general health conditions that impair immune function or limit oral hygiene)
- Environmental risks
- Financial and behavioral/personal risks (e.g., finances, motivation, commitment, compromised oral hygiene)
- Quality of the dental treatment
- Quality of oral health maintenance

Embedded within these categories are both mutable and immutable patient-specific conditions that can be highly variable in their effects and that may change significantly during the course of treatment.

Generally speaking, prognosis is a professional judgment about the outcome of a health condition with or without treatment. In the dental setting, prognosis is established by the dentist. Determination of the prognosis can be used to frame the discussion with the patient about the relative merits of various treatment options and to provide the patient with invaluable information on which to base treatment planning decisions. In sharing the prognosis determination with the patient, the dentist must also be mindful of, and relate to the patient, some sense of the relative certainty (confidence level) held in assessing prognosis.

## Descriptors of Prognosis

There are clear benefits to both provider and patient in assigning a prognosis to a patient's condition and treatment plan. Although others have proposed classification systems[93-96] for prognoses in dentistry, there is no universally accepted system. In the context of this book, the descriptors used here pertain to the discussion that the practitioner can be expected to have with the patient regarding the prognosis of the proposed treatment plans or treatment plan alternatives.

- Excellent = highest level of certainty in achieving treatment goals; provider confidence level higher than 95%; safe to proceed without reservation; recommendations for treatment can be made freely to the patient by the provider; assurances that can be given to the patient after factoring in the dentist's expertise (experience, skill and training) and the dentist's perception of the patient's motivation, expectations, and anticipated level of cooperation.
- Good = high probability of success; provider confidence level higher than 80%; safe to proceed with selected or limited reservations; recommendations can be made by provider with some caution or limitation; limited assurances can be given to the patient in light of limiting factors and given the experience, skill and training of the dentist; and the dentist's perception of the patient's cooperation, motivation and expectations.
- Fair = reasonable but limited probability of success; usually one or more negative elements influence the prognosis determination; provider confidence level is in the 50% to 80% range; must have realistic discussion of the limiting factors with patient; provider can offer only the most restricted (if any) assurance.
- Poor or guarded = limited chance of success; provider confidence level less than 50%; patient must be fully informed about the risks, hazards, and possible negative outcomes of treatment; patient must provide documented commitment and informed consent before proceeding with treatment; provider can offer only limited assurance of success.
- Hopeless = no reasonable chance of success; confidence level less than 5%; elective treatment should not be undertaken.
- Uncertain/questionable = may mean that not enough information is available to make a determination of prognosis (e.g., prognosis cannot be determined until completion of disease control phase treatment), or, even in the presence of adequate diagnostic information, the prognosis cannot be determined (e.g., compelling positive *and* negative variables in force); provider and patient must proceed with caution and patient must provide documented commitment and informed consent before proceeding with treatment; provider can offer no assurance of success.

## Domains of Prognosis

A determination of prognosis can be useful in the various domains of dentistry and is commonly ascribed to a wide range of oral diseases and conditions. It can be applied to an individual tooth or to the dentition as a whole, particularly as pertains to the prospect for retaining the tooth or teeth in the mouth for an extended period of time. Prognosis is also commonly applied to the probability of success for a proposed dental treatment. Each of these applications is described here.

### Prognosis for Specific Diseases or Conditions

In this section, a few representative conditions are described—conditions in which the prognosis has unique and important implications for planning the dental treatment of the patient.

***Stomatitis.*** **Stomatitis** may have a singular cause or be multifactorial in origin; it may be acute and extremely debilitating or chronic, low grade, intermittent, and only "mildly annoying" to the patient. When the cause can be clearly determined and easily mitigated or eliminated, the prognosis is good or excellent. In this case the effect on the treatment plan is negligible. If, however, the symptoms are severe and persistent, and the cause elusive, then the prognosis will usually be uncertain or poor/guarded. In this situation, managing the stomatitis will typically override all other treatment priorities and may abrogate or delay other planned or needed treatment.

***Oral cancer.*** The patient with oral cancer may have a varied prognosis. At the time of the initial diagnosis, the prognosis is typically uncertain. During the course of cancer treatment, the prognosis may be guarded or fair. After successful treatment (surgical excision with clean margins and no lymph node involvement), the prognosis is usually good. A 10-year cancer survivor without recurrence is thought to have an excellent prognosis

Patients who are undergoing surgery, radiation, and/or chemotherapy for a squamous cell carcinoma with an uncertain prognosis will require extensive modification to the treatment plan. The cancer and the side effects of chemotherapy will require unique interventions. Treatment priorities will be altered. Patients will be subject to new oral health problems. Changes in the manner in which dental treatment is delivered may be necessary, and there may be significant limitations to the range and complexity of dental treatment in both the short term and for years to come. By contrast, the long-term oral cancer survivor with an excellent prognosis will require minimal adjustment to a treatment plan and is a candidate for a complete range of dental treatment.

***Periodontal disease.*** In their landmark article, Kwok and Caton[97] wrote, "Prognosis is an integral part of the periodontal practice because it directly influences treatment planning. However, there is limited direct evidence in the literature regarding the assignment of periodontal prognosis." In that commentary, they make the following key points:

> *In years past, most periodontal prognostication systems were primarily based on tooth loss—which has not proven to be a good predictor of future outcomes*
>
> *The stability of the periodontal supporting tissues is a more useful basis for determining periodontal prognosis as it is influenced by more evidence-based factors and may be more useful in patient management*

There is value in making both short- and long-term prognosis determinations while recognizing that the prognosis may change over time and be altered by patient behavioral changes and professional intervention and maintenance.

It is useful to determine prognosis both for individual teeth and for the entire dentition (Boxes 3-5 and 3-6).

**BOX 3-5 Factors That May Affect Periodontal Prognosis[97]**

**General Factors:**
Patient compliance in an effective maintenance program
Cigarette smoking
Diabetes mellitus
Other systemic factors

**Local Factors:**
Deep probing depths and attachment loss
Other anatomic plaque-retentive factors
Trauma from occlusion and parafunctional habits
Mobility

**BOX 3-6 Factors That "May Result in Deterioration of the Periodontal Apparatus"[92]**

- Poor oral hygiene
- Metabolic/ systemic disease
- Unfavorable microflora
- Family history
- Smoking
- Age
- Existing periodontal disease

Other factors that have been identified as predictors of periodontal prognosis include level of plaque control and IL-1 genotype 100. The *In Clinical Practice: Using Periodontal Prognosis in Treatment Planning* box illustrates how this information is useful in treatment planning and patient care.

## Prognosis for Individual Tooth or Teeth

It is important to assess prognosis for the whole dentition and also for individual teeth. This encourages a broader view of the patient while helping to develop detailed treatment plans to address localized needs. Samet et al have devised a comprehensive evidence-based prognosis classification system for

**IN CLINICAL PRACTICE**

**Using Periodontal Prognosis in Treatment Planning**

How can the practitioner use this information in a practical way? If, for example, a new patient presents to the practice with poorly controlled diabetes, multiple sites with 4 to 5 mm of attachment loss, isolated furcal involvement, subgingival calculus deposits, a 60% plaque score, and bleeding on probing at 35% of sites, and the individual seems poorly motivated to save his or her teeth; the initial prognosis would be ***uncertain*** and it would be prudent to engage the patient in a disease control phase plan of care (see Chapter 9). At the conclusion of the disease control phase, a reassessment of the patient's condition and prognosis would be implemented. If, at that time, the diabetes is well controlled, plaque control improved, calculus removed, and signs of inflammation dissipated, and the patient is now motivated and enthusiastic about retaining the teeth; the prognosis would elevate to ***good,*** tooth retention would be encouraged, and a full range of restorative (prosthetic) interventions could be favorably be considered. Conversely, if the diabetes remains poorly controlled, if the plaque score remains high (despite best efforts to educate the patient), inflammation persists, attachment loss progresses, and/or the patient's motivation languishes, and he/she has not been compliant with recommendations for therapy and maintenance, then the prognosis worsens to ***poor,*** and it may be wise to place the patient on a long-term maintenance schedule or recommend extraction of questionable teeth. Embarking on complex restorative procedures should be postponed until the patient's periodontal condition is stabilized and the prognosis improves.

individual teeth that can be a reliable guide for the novice or experienced practitioner.[92]

For many patients, there is one tooth, or a select few teeth, that is/are worthy of extensive consideration and for which treatment choices are debatable. There are other patients, those with complex problems and needs, for whom there may be one or a very few teeth whose fate is critical to the overall plan of care. The latter have been described in Chapter 4 as KEY teeth. In either scenario, determining the prognosis for the tooth or teeth in question is essential to making a treatment selection.

Important issues to evaluate in making the prognosis determination for the tooth or teeth include the following:

- Restorability
- Periodontal support
- Occlusal force on the tooth in maximum intercuspation (MI) and excursive movements
- Necessity and feasibility of root canal treatment
- Potential for future caries or fracture
- Patient commitment (time, finances, energy) to doing what will be required to retain the tooth
- Practitioner skill in restoring the tooth or teeth in question

### Prognosis Determinants for Specific Treatments

A prognosis can be assigned to a complete array of dental treatments. Box 3-7 includes the category of treatment, factors that may influence the prognosis, and selected related evidence. There are other notable determinants of prognosis that are not mentioned in Box 3-7 but that apply universally to any treatment. Two important considerations are patient cooperation during the procedure and the skill and expertise of the provider, the latter becoming more significant as the complexity of the procedure increases.

### Prognosis for Overall Treatment

Prognosis for overall treatment is the issue that is usually foremost in the patient's mind. Before embarking on a comprehensive plan of care, the patient will usually seek, and rightfully should expect to know, the prognosis for his or her condition and for the treatment plan. If multiple treatment plans are being offered, then it is appropriate to inform the patient as to the prognosis and relative merits of each.

## Application and Use of Prognosis in Treatment Planning

It is essential for the dentist to carefully and accurately assess the prognosis for the disease with and without treatment before treatment options are suggested to the patient. This step follows the initial oral examination of the patient and the generation of the diagnosis list, from which the prognosis is derived. Determining the prognosis for the patient's treatment typically has some degree of uncertainty. The more complicated the patient's disease state and the more complex the treatment plan, the greater will be the opportunity for error. To illustrate this point, consider a patient who has been diagnosed with severe periodontal

**BOX 3-7 Factors Influencing Prognosis for Selected Types of Treatment**

Orthodontic treatment: accurate assessment and case diagnosis, complexity of the deformity, type of tooth movement (rotation, tipping, bodily movement, extrusion, intrusion), periodontal support, caries risk, patient motivation, patient expectations, patient compliance with treatment and oral care regimens

Orthognathic surgery: accurate assessment and case diagnosis, medical limitations or contraindications to surgery, surgical complications, periodontal support, caries risk, patient motivation, patient expectations, patient compliance with treatment and oral care regimens

Endodontic treatment: tooth isolation, restorability of the tooth, marginal periodontal health, risk for caries, risk for fracture due to severe bruxism, risk-taking lifestyle (potential for future trauma to the tooth), complex anatomy (e.g., calcified canals, root dilaceration, accessory canals), quality of the canal obturation (proper length, diameter, density)

Periodontal treatment: uncontrolled medical problems; smoking, alcohol or other substance abuse; active caries; restorative condition (iatrogenic defects) of the teeth; patient ability to perform regular effective plaque control; highly pathogenic organisms; immune compromise; severity, extent, and progression of the periodontal disease

Individual restoration(s): magnitude of tooth destruction, material selection, tooth preparation, restoration quality (margins/contours/occlusion), disease control (secondary caries), potential for tooth fracture, occlusion, periodontal support, patient esthetic expectations

Implant: medical contraindications, immune compromise, bone height, bone contour, bone density, proximity to important anatomic structures, interocclusal space, occlusion, parafunctional habits, implant selection, implant position, function/load of attached prosthesis[98,99]

Complete denture: xerostomia, ridge form and extent, interarch space, flabby tissue, bony undercuts, bruxism or parafunctional habits, tongue size/position, gagging, opposing arch plane of occlusion, denture retention and stability, patient expectations, patient level of motivation, patient self-perceived level of function and esthetics, patient ability to comply with oral care regimen, patient willingness to return for continuing care visits[100-104]

Partial denture: same as for complete denture plus considerations for the abutment and remaining teeth: abutment tooth periodontal support, stability, restorability, potential for fracture or premature loss; ability of abutment teeth to withstand occlusal and functional load of prosthesis, risk for caries and/or periodontal disease on remaining teeth; patient ability to insert/remove/ clean/maintain the removable partial denture (RPD), patient willingness to return for recare visits[105]

disease and given a prognosis for an excellent outcome (elimination of the active disease and associated signs and symptoms) with a particular treatment plan. Despite the best efforts of both patient and dental team, the periodontal disease continues to advance. The discrepancy between what was predicted (the prognosis), and what actually occurs (the outcome) can arise because of many different factors, any one of which may not have been predicted accurately at the time of treatment planning. Despite such limitations, however, establishing a prognosis affords the dentist with an important, albeit imprecise, approach to evaluating treatment alternatives and ultimately treatment outcomes. Such a discussion provides the dentist with a basis on which to discuss with the patient which plan will have the greatest chance of success. Less promising treatment options with poorer prognoses can be ruled out, and alternatives with a better likelihood of success can be included in the choices presented to the patient.

When the patient has a thorough and accurate understanding of the prognosis, he or she can make an educated, rational choice regarding how to proceed. This is not to say that prognosis alone determines which alternative to choose, but, along with other issues (e.g., time, degree of discomfort, financial cost, esthetic benefits), the concept can be very important in helping the patient decide among the options. Determining a prognosis is indispensable to the dentist and patient in helping frame the treatment choices and making the best treatment selection, and as part of the overall effort to establish meaningful informed consent.

Multiple variables, individually or collectively, may have an effect on the prognosis for an oral condition or treatment to be provided. These variables may be beneficial, detrimental, or both. The information in Box 3-7 is representative of the kind of evaluation that the practitioner should make for a treatment option before recommending it to a patient.

After such an analysis, the prognosis for each of the appropriate options (as framed by the dentist) will need to be communicated in a way that is understandable to the patient. Usually this is accomplished seamlessly as a part of the larger informed consent discussion. Along with other issues, including financial cost, time and number of visits required for the treatment, and anticipated discomfort, inconvenience, or esthetic limitations during treatment, an understanding of the prognosis for each treatment option can be extremely helpful in assisting the patient to make a definitive treatment selection.

## OUTCOMES AND OUTCOMES MEASURES

### Role of Outcomes Measures

Outcomes measures are important in direct management of individual patient care, as well as for the opportunity they afford the dental profession to collectively compare types of care and evaluate the effectiveness of various treatments. Many treatment decisions are facilitated by knowledge of the likely outcome for each of the proposed alternatives. Such predictions can help the dentist select the best options, refine the list of realistic choices, and serve as an important adjunct to the presentation of the treatment plan to the patient. This information could be even more important to the patient who attempts to weigh the pros and cons of the various treatment options. The most valuable outcomes information for the patient would be the success rate for a specific procedure when performed by the practitioner who is proposing the treatment. Unfortunately, these data are usually not formally tracked in the community-based private dental practice and, therefore, are not readily available for dentists (or patients) to use. When outcomes measures are generated in institutional settings (e.g., hospitals, military/veterans affairs [VA] dentistry, dental schools/colleges), and when they are used to make quality improvements for those populations, they may have relevance to other practice settings as well. The ADA has endorsed the position that "in order to assure that the highest quality patient-centered care is being provided, dentistry should be able to measure what works and what does not and make changes needed to improve health outcomes."[106]

The ADA Guidebook: Quality Measurements in Dentistry[106] states that a good measure is one that

1. Covers an important clinical area
2. Is scientifically acceptable
3. Is useable
4. Is feasible

When selecting a measure of outcomes, the Agency for Healthcare Research and Quality (AHRQ) suggests that four questions should be considered[107]:

1. Are they to be used for research, quality improvement, or accountability?
2. At what point in an episode of care are they measured?
3. What other factors may influence the relationship between process of care and the outcome?
4. Can one clearly define who influence(s) the observed outcome?

The AHRQ system includes several dozen dental-specific outcome measures, with some of the following examples:

- *Restorative dentistry:* the percentage of permanent teeth retreated within 6 months of an episode of restorative treatment, during the time period under study.
- *Annual dental visit:* percentage of members 2 to 21 years of age who had at least one dental visit during the measurement year.
- *Pediatrics:* percentage of children with a dental health discussion by the 15-month well-child visit and/or a referral to a dentist.
- *Children's dental care:* percentage of teeth requiring retreatment (restoration, endodontic or extraction, but not including pit and fissure sealants) within 24 months of the initial fissure sealant treatment.
- *Oral health:* percentage of permanent teeth extracted within 12 months of commencement of a course of endodontic treatment, during the time period under study.

## WHAT'S THE EVIDENCE?

### How Long Do Restorations and Prostheses Last?

Although many research studies on the longevity of restorations and dental prostheses have been published, it is often difficult to make comparisons across studies because of differences in the way they were designed, conducted, or reported. Elements that often differ from study to study include number of patients, number of years of follow-up, number and types of clinicians, number of restorations per patient, type and size of restorations, materials used, parameters for placing a restoration or prosthesis, statistical methods, and, most important, the definition of failure and survival.[1] Except for the loss of a restoration, tooth, or prosthesis, there is no universal standard for dentists to use in determining the success or failure of a restoration or prosthesis. Short of complete failure, the point at which dentists make the definitive decision to replace a restoration or prosthesis is often subjective. If clinicians had guidelines on which to base the decision to replace a restoration, the subjectivity of the decision might be decreased. Information on the anticipated longevity of restorations and prostheses could assist clinicians in making clinical treatment decisions. Nevertheless, although the definitions of failure and survival are not standardized across all studies, it is useful to review available information about the longevity of various types of restorations and prostheses.

### Resin-Based Composite Restorations

Resin-based composite restorations have been shown to have less longevity than amalgam restorations.[2,3] Some studies have shown poor survival rates for composite resins, whereas others have shown better rates of survival, as shown in the tables that follow.

**SURVIVAL RATES FOR RESIN-BASED COMPOSITE RESTORATIONS**

| Resin-Based Composites Years in Place | Percent Restoration Survival |
|---|---|
| 3.3-5.0 | 50%[4,5] |
| 7.0 | 85.5%[6] |
| 10.0 | 56%[7] 82%[7] |
| 16.0 | 50%[9] |

**COMPARISONS OF SURVIVAL RATES FOR CLASS I AND CLASS II RESIN-BASED COMPOSITE RESTORATIONS**

| Class I | Restorations | Class II | Restorations |
|---|---|---|---|
| 5 yr | 80%[2] | 5 yr | 50%[2] |
| 10 yr | 60%[7] | 10 yr | 40%[7] |

A recent review has shown that 90% of the clinical trials investigating posterior composite restorations showed annual failure rates ranging from 1% to 3%.[10]

### Amalgam Restorations

Because of their wide use for more than a century in many parts of the world, many more studies have looked at the long-term outcomes for amalgam restorations. The studies cited in the table below were conducted in Western Europe, Australia, and the United States. As the table illustrates, reported results have varied widely, ranging, for example, from 50% to 90% at 5 years.

**SURVIVAL RATES FOR AMALGAM RESTORATIONS**

**Amalgam Restorations**

| Years in Place | Percent Restoration Survival |
|---|---|
| 5.0 | 50%,[11-15] 60%-75%,[16,17] 90%[8,20] |
| 6.8 | 50%[21] |
| 7.0 | 94%[6] |
| 8.0 | 50%[3,11,22] |
| 10.0 | 20%-80%,[7,8,11,16,18] 50%[18,19,24] |
| 12.0 | 50%[5] |
| 13.0 | 89%[25] |
| 15.0 | 10%[11] |
| 17.0 | 78%[24] |
| 20.0 | 10%,[11] 23%[18] |
| 22.5 | 50%[9] |

**SURVIVAL RATES FOR LARGE CUSPAL AMALGAM RESTORATIONS**

| Large Cuspal Amalgams Years in Place | Percent Restoration Survival |
|---|---|
| 5.0 | 65%,[26] 78%[27] |
| 10.0 | 36%-67%[1,23,27] |
| 12.0 | 76%[28] |
| 15.0 | 36%-73%[23,27,29] |
| 20.0 | 19%[23] |
| 22.5 | 50%[9] |

A recent review pointed out that the annual failure rate of amalgam restorations in posterior stress-bearing areas is 3%.[30]

### Cast Gold

Studies on cast-gold restorations have examined restoration survival for inlays, onlays, partial crowns, or full crowns. In general, cast-gold restorations have been found to survive longer than amalgam restorations.

**SURVIVAL RATES FOR CAST-GOLD RESTORATIONS**

| Cast-Gold Restorations Years in Place | Percent Restoration Survival |
|---|---|
| 3.0 | 83%[31] |
| 5.0 | 93.3%[32] |
| 7.0 | 50%[16] |
| 10.0 | 42%,[16] 59%,[16] 91%,[7] 96%[33] |
| 13.0 | 50%[9] |
| 14.0 | 50%[9] |
| 15.0 | 92%[33] |
| 18.5 | 50%[34] |
| 20.0 | 72%,[35] 87%[33] |
| 30.0 | 74%[33] |

### Crowns

Studies of this restoration may include not only full-metal crowns, but also porcelain-fused-to-metal crowns, partial crowns, and jacket crowns. Survival rates for crowns are generally higher than the rates for composite resin and amalgam restorations.

**SURVIVAL RATES FOR CROWNS**

| Crowns Years in Place | Percent Restoration Survival |
|---|---|
| 5 | 84% - 100%[26,27,36] |
| 10-15 | 68% - 97%[1,27,36,37] |
| 26 | 50%[8] |

New materials and techniques for crown making have been introduced and are widely used, but there are no long-term result studies to predict their longevity. A 2012 systematic review of all-ceramic crowns demonstrated an acceptable overall 5-year fracture rate of only 4.4%, irrespective of the materials used. Molar crowns (8.1%) showed a significantly higher 5-year fracture rate than premolar crowns (3.0%), and the difference between anterior (3.0%) and posterior crowns (5.4%) was also significant.[38]

Some short-term studies showed promising results.

**SURVIVAL RATES FOR NONTRADITIONAL CROWNS**

| Material | Years in Place | Survival Rate |
|---|---|---|
| Lithium disilicate | 5 | 97.8%[39] |
| | 8 | 94.8%[40] |
| Zirconia | 5 | 98.1%[41] |
| Cobalt-Chromium | 5 | 90.3%[42] |
| Cad-Cam Ceremic (Cerec 1) | 5 | 94.7% |
| | 10 | 85.7%[43] |

### Traditional Fixed Partial Dentures

Studies on the longevity of fixed partial dentures (FPDs), or bridges, are complicated by the differences in the number of teeth that are replaced. Many studies combine the results of all bridges, regardless of the number of units in each bridge.

**SURVIVAL RATES FOR TRADITIONAL FIXED PARTIAL DENTURES**

| Traditional Fixed Partial Dentures Years in Place | Percent Restoration Survival |
|---|---|
| 5 | 79%,[44] 80%[45] |
| 10 | 93%-98%[46-48] |
| 10-15 | 83%-95%[31,33,34,36,49] |
| 15 | 68%[50,51] |
| 20 | 65%[52] |
| 18 | 75%[53] |
| 23 | 97%[54] |

The best data on FPDs comes from systematic reviews and meta-analyses of studies that have followed such restorations and found 89%,[55] 90%,[56] and 92%[57] survival rates at 10 years.

As with crowns, new materials and techniques for FPDs have become popular in recent years. Similarly, although available short-term studies showed promising results, there are as yet no long-term result studies to predict their longevity.

**SURVIVAL RATES FOR NONTRADITIONAL FIXED PARTIAL DENTURES**

| Material | Years in Place | Survival Rate |
|---|---|---|
| Lithium disilicate monolithic structure | 5 | 100% |
| | 10 | 87.9%[58] |
| Zirconia | 5 | 92%[59] |
| | 7 | 83.4%[60] |

**SURVIVAL RATES FOR NONTRADITIONAL FIXED PARTIAL DENTURES**

| Material | Years in Place | Survival Rate |
|---|---|---|
| Cadcam fabricated superstructures | 6 | 88%[61] |

### Resin-Bonded Fixed Partial Dentures

Unlike traditional FPDs, most resin-bonded prostheses replace only a single tooth. Great variations in the reported percentages of prostheses dislodging have been reported, although a 2008 systematic review puts the 5-year survival rate at 87.7%.[62]

**SURVIVAL RATES FOR RESIN-BONDED FIXED PARTIAL DENTURES (CERAMIC AND METAL)**

| Resin-Bonded FPDs Years in Place | Percent Restoration Survival |
|---|---|
| 5 or less | 64.0%-98.7%[63-70] |
| 6-10 | 53%-87%[56,71-74] |
| 11 | 61%,[76] 90%[75] |
| 15 | 61%[77] |

A 2011 study reported a 10-year survival rate of 73.9% for an all-ceramic resin-bonded FPD with two retainers, and a 94.4% survival rate for a single retainer cantilever design.[78] Fiber-reinforced composite inlay fixed partial dentures' 8-year survival rate was 81.8%.[79]

### Removable Partial Dentures

A few studies have followed the outcomes of treatment involving removable partial dentures (RPDs).[80-82] Their results are presented here.

**SURVIVAL RATES FOR REMOVABLE PARTIAL DENTURES**

| | 5-yr survival rate | 10-yr survival rate |
|---|---|---|
| RPDs abutment teeth | Direct 86.6%[80] Indirect 93.1% | – |
| RPD | 90%-96.4% | 89.8%[81,82] |

### Implants

More studies[83-93] following the long-term outcome of single tooth implants are now being published, and, because of their use of strict criteria and standard parameters, the quality of these reports is far better than many of the studies reporting on other types of restoration. Studies have shown high single tooth implant survival rates.

**SINGLE TOOTH IMPLANT SURVIVAL RATES**

| Time Interval | Percent Survival |
|---|---|
| At 5 yr | 91%-98.9%[83-89] |
| At 5 and 6 yrs | 94%-100%[90-92] |
| At 10 yrs | 89.4%[93] |

A Cochrane review of 12 studies examining the longevity of dental implants concluded that there were no differences in implant longevity among the various types, shapes, sizes, and surface textures of implants.[94] A systematic review of the survival of implants supporting FPDs found a 95% survival rate of the implant after 5 years, and, after 10 years, the survival rate had declined only slightly, to 93%.[95]

### References

1. Kolker JL, Damiano PC, Caplan DJ and others: Teeth with large amalgam restorations and crowns: factors affecting the receipt of subsequent

treatment after 10 years, *J Am Dent Assoc* 136(6):738-748; quiz 805-806, 2005.
2. Moffa JP: Comparative performance of amalgam and composite resin restorations and criteria for their use. In Anusavice KJ, editor: *Quality evaluation of dental restorations,* Chicago, 1989, Quintessence.
3. Qvist V, Qvist J, Mjor IA: Placement and longevity of tooth-colored restorations in Denmark, *Acta Odontol Scand* 48(5):305-311, 1990.
4. Mjor IA, Toffenetti F: Placement and replacement of amalgam restorations in Italy, *Oper Dent* 17(2):70-73, 1992.
5. Forss H, Widstrom E: From amalgam to composite: selection of restorative materials and restoration longevity in Finland, *Acta Odontol Scand* 59(2):57-62, 2001.
6. Bernardo M, Luis H, Martin MD and others: Survival and reasons for failure of amalgam versus composite posterior restorations placed in a randomized clinical trial, *J Am Dent Assoc* 138(6):775-783, 2007.
7. Bentley C, Drake CW: Longevity of restorations in a dental school clinic, *J Dent Educ* 50(10):594-600, 1986.
8. Opdam NJ, Bronkhorst EM and others. A retrospective clinical study on longevity of posterior composite and amalgam restorations, *Dent Mater* 23(1):2-8, 2007.
9. Hawthorne WS, Smales RJ: Factors influencing long-term restoration survival in three private dental practices in Adelaide, *Austr Dent J* 42(1):59-63, 1997.
10. Demarco FF, Corrêa MB, Cenci MS, and others: Longevity of posterior composite restorations: not only a matter of materials, *Dent Mater* 28(1):87-101, 2012.
11. Allan DN: A longitudinal study of dental restorations, *Br Dent J* 143(3):87-89, 1977.
12. Elderton RJ: Longitudinal study of dental treatment in the general dental service in Scotland, *Br Dent J* 155(3):91-96, 1983.
13. Friedl KH, Hiller KA, Schmalz G: Placement and replacement of amalgam restorations in Germany, *Oper Dent* 19(6):228-232, 1994.
14. Jokstad A, Mjor IA: Analyses of long-term clinical behavior of class-II amalgam restorations, *Acta Odontol Scandi* 49(1):47-63, 1991.
15. Mjor IA, Toffenetti F: Placement and replacement of resin-based composite restorations in Italy, *Oper Dent* 17(3):82-85, 1992.
16. Crabb HS: The survival of dental restorations in a teaching hospital, *Br Dent J* 150(11):315-318, 1981.
17. Mjor IA, Jokstad A, Qvist V: Longevity of posterior restorations, *Intl Dent* J 40(1):11-17, 1990.
18. Robinson AD: The life of a filling, *Br Dent J* 130(5):206-208, 1971.
19. Worskett P: A comparative study of bonded and non-bonded amalgam restorations in general dental practice, *Br Dent J* 214(7):E19, 2013.
20. Letzel H, van't Hof M, Vrijhoef MA and others: Failure, survival, and reason for replacement of amalgam restorations. In Anusavice KJ, editor, *Quality evaluation of dental restorations,* Chicago, 1989, Quintessence.
21. Burke FJ, Cheung SW, Mjor IA and others: Restoration longevity and analysis of reasons for the placement and replacement of restorations provided by vocational dental practitioners and their trainers in the United Kingdom, *Quintessence Intl* 30(4):234-242, 1999.
22. Mjor IA: The reasons for replacement and the age of failed restorations in general dental practice, *Acta Odontol Scand* 55(1):58-63, 1997.
23. Robbins JW, Summitt JB: Longevity of complex amalgam restorations, *Oper Dent* 13(2):54-57, 1988.
24. Osborne JW, Norman RD: 13-year clinical assessment of 10 amalgam alloys, *Dent Mater* 6(3):189-194, 1990.
25. Bjertness E, Sonju T: Survival analysis of amalgam restorations in long-term recall patients, *Acta Odontol Scand* 48(2):93-97, 1990.
26. Martin JA, Bader JD: Five-year treatment outcomes for teeth with large amalgams and crowns, *Oper Dent* 22(2):72-78, 1997.
27. Smales RJ, Hawthorne WS: Long-term survival of extensive amalgams and posterior crowns, J Dent 25(3-4):225-227, 1997.
28. Opdam NJ, Bronkhorst EM, Loomans BA, Huysmans MC: 12-year survival of composite vs. amalgam restorations, *J Dent Res* 89(10):1063-1067, 2010.
29. Smales RJ: Longevity of cusp-covered amalgams: survivals after 15 years, *Oper Dent* 16(1):17-20, 1991.
30. Manhart J, Chen H, Hamm G, Hickel R: Buonocore Memorial Lecture. Review of the clinical survival of direct and indirect restorations in posterior teeth of the permanent dentition, *Oper Dent* 29(5): 481-508, 2004.
31. Allan DN: The durability of conservative restorations, *Br Dent J* 126(4):172-177, 1969.
32. Federlin M, Hiller KA, Schmalz G: Controlled, prospective clinical split-mouth study of cast gold vs. ceramic partial crowns: 5.5 year results, *Am J Dent* 23(3):161-167, 2010.
33. Studer SP, Wettstein F, Lehner C and others: Long-term survival estimates of cast gold inlays and onlays with their analysis of failures, *J Oral Rehab* 27(6):461-472, 2000.
34. Mjor IA, Medina JE: Reasons for placement, replacement, and age of gold restorations in selected practices, *Oper Dent* 18(3):82-87, 1993.
35. Donovan T, Simonsen RJ, Guertin G and others: Retrospective clinical evaluation of 1,314 cast gold restorations in service from 1 to 52 years, *J Esthet Restor Dent* 16(3):194-204, 2004.
36. Leempoel PJ, Eschen S, De Haan AF and others: An evaluation of crowns and bridges in a general dental practice, *J Oral Rehab* 12(6):515-528, 1985.
37. Behr M, Zeman F, Baitinger T and others: The clinical performance of porcelain-fused-to-metal precious alloy single crowns: chipping, recurrent caries, periodontitis, and loss of retention, *Int J Prosthodont* 27(2):153-160, 2014.
38. Wang X, Fan D, Swain MV, Zhao K: A systematic review of all-ceramic crowns: clinical fracture rates in relation to restored tooth type, *Int J Prosthodont* 25(5):441-450, 2011.
39. Pieger S, Salman A, Bidra AS: Clinical outcomes of lithium disilicate single crowns and partial fixed dental prostheses: a systematic review, *J Prosthet Dent* pii: S0022-3913(14)00074-2.
40. Gehrt M, Wolfart S, Rafai N and others: Clinical results of lithium-disilicate crowns after up to 9 years of service, *Clin Oral Investig* 17(1):275-284, 2013.
41. Monaco C, Caldari M, Scotti R: AIOP Clinical Research Group. Clinical evaluation of 1,132 zirconia-based single crowns: a retrospective cohort study from the AIOP clinical research group, *Int J Prosthodont* 26(5):435-442, 2013.
42. Ortorp A, Ascher A, Svanborg P: A 5-year retrospective study of cobalt-chromium-based single crowns inserted in a private practice, *Int J Prosthodont* 25(5):480-483, 2012.
43. Zimmer S, Göhlich O, Rüttermann S and others: Long-term survival of Cerec restorations: a 10-year study, *Oper Dent* 33(5):484-487, 2008.
44. Cheung GS, Dimmer A, Mellor R and others: A clinical evaluation of conventional bridgework, *J Oral Rehab* 17(2):131-136, 1990.
45. Schwartz NL, Whitsett LD, Berry TG and others: Unserviceable crowns and fixed partial dentures: life-span and causes for loss of serviceability, *J Am Dent Assoc* 81(6):1395-1401, 1970.
46. Coornaert J, Adriaens P, De Boever J: Long-term clinical study of porcelain-fused-to-gold restorations, *J Prosthetic Dent* 51(3): 338-342, 1984.
47. Glantz PO, Ryge G, Jendresen MD and others: Quality of extensive fixed prosthodontics after five years, *J Prosthet Dent* 52(4):475-479, 1984.
48. Karlsson S: A clinical evaluation of fixed bridges, 10 years following insertion, *J Oral Rehab* 13(5):423-432, 1986.
49. Reitemeier B, Hänsel K, Kastner C and others: A prospective 10-year study of metal ceramic single crowns and fixed dental prosthesis retainers in private practice settings, *J Prosthet Dent* 109(3):149-155, 2013.
50. Glantz PO, Nilner K, Jendresen MD and others: Quality of fixed prosthodontics after 15 years, *Acta Odontol Scand* 51(4):247-252, 1993.

51. Valderhaug J: A 15-year clinical evaluation of fixed prosthodontics, *Acta Odontol Scand* 49(1):35-40, 1991.
52. Lindquist E, Karlsson S: Success rate and failures for fixed partial dentures after 20 years of service: Part I, *Intl J Prosthodontics* 11(2):133-138, 1998.
53. Sundh B, Odman P: A study of fixed prosthodontics performed at a university clinic 18 years after insertion, *Intl J Prosthodont* 10(6):513-519, 1997.
54. Palmqvist S, Swartz B: Artificial crowns and fixed partial dentures 18 to 23 years after placement, *Intl J Prosthodont* 6(3):279-285, 1993.
55. Tan K, Pjetursson BE, Lang NP and others: A systematic review of the survival and complication rates of fixed partial dentures (FPDs) after an observation period of at least 5 years, *Clin Oral Implants Res* 15(6):654-666, 2004.
56. Creugers NH, Kayser AF, van't Hof MA: A seven-and-a-half-year survival study of resin-bonded bridges, *J Dent Res* 71(11):1822-1825, 1992.
57. Scurria MS, Bader JD, Shugars DA: Meta-analysis of fixed partial denture survival: prostheses and abutments, *J Prosthet Dent* 79(4):459-464, 1998.
58. Kern M, Sasse M, Wolfart S: Ten-year outcome of three-unit fixed dental prostheses made from monolithic lithium disilicate ceramic, *J Am Dent Assoc* 143(3):234-240, 2012.
59. Schmitt J, Goellner M, Lohbauer U and others: Zirconia posterior fixed partial dentures: 5-year clinical results of a prospective clinical trial, *Int J Prosthodont* 25(6):585-589, 2012.
60. Rinke S, Gersdorff N, Lange K, Roediger M: Prospective evaluation of zirconia posterior fixed partial dentures: 7-year clinical results, *Int J Prosthodont* 26(2):164-171, 2013.
61. Hey J, Beuer F, Bensel T, Boeckler AF: Metal-ceramic-fixed dental prosthesis with CAD/CAM-fabricated substructures: 6-year clinical results, *Clin Oral Investig* 17(5):1447-1451, 2013.
62. Pjetursson BE, Tan WC, Tan K and others: A systematic review of the survival and complication rates of resin bonded bridges after an observation period of at least 5 years, *Clin Oral Implants Res* 19(2):131-141, 2008.
63. Besimo C: Resin-bonded fixed partial denture technique: results of a medium-term clinical follow-up investigation, *J Prosthet Dent* 69(2):144-148, 1993.
64. Chang HK, Zidan O, Lee IK and others: Resin-bonded fixed partial dentures: a recall study, *J Prosthet Dent* 65(6):778-781, 1991.
65. Ferrari M, Mason PN, Cagidiaco D and others: Clinical evaluation of resin bonded retainers, *Intl J Periodont Resto Dent* 9(3):207-219, 1989.
66. Gilmour AS, Ali A: Clinical performance of resin-retained fixed partial dentures bonded with a chemically active luting cement, *J Prosthet Dent* 73(6):569-573, 1995.
67. Hussey DL, Pagni C, Linden GJ: Performance of 400 adhesive bridges fitted in a restorative dentistry department, *J Dent* 19(4): 221-225, 1991.
68. Marinello CP, Kerschbaum T, Pfeiffer P and others: Success rate experience after rebonding and renewal of resin-bonded fixed partial dentures, *J Prosthet Dent* 63(1):8-11, 1990.
69. Verzijden CW, Creugers NH, Mulder J: A multi-practice clinical study on posterior resin-bonded bridges: a 2.5-year interim report, *J Dent Res* 73(2):529-535, 1994.
70. Howard-Bowles E, McKenna G, Allen F: An evidence based approach for the provision of resin-bonded bridgework, *Eur J Prosthodont Restor Dent* 19(3):99-104, 2011.
71. Rammelsberg P, Pospiech P, Gernet W: Clinical factors affecting adhesive fixed partial dentures: a 6-year study, *J Prosthet Dent* 70(4):300-307, 1993.
72. Smales RJ, Berekally TL, Webster DA: Predictions of resin-bonded bridge survivals, comparing two statistical models, *J Dent* 21(3): 147-149, 1993.
73. Audenino G, Giannella G, Morello GM and others: Resin-bonded fixed partial dentures: ten-year follow-up, *Int J Prosthodont* 19(1):22-23, 2006.
74. Boening KW, Ullmann K: Retrospective study of the clinical performance of porcelain-fused-to-metal resin-bonded fixed partial dentures, *Int J Prosthodont* 25(3):265-269, 2012.
75. Barrack G, Bretz WA: A long-term prospective study of the etched-cast restoration, *Intl J Prosthodont* 6(5):428-434, 1993.
76. Priest G: An 11-year reevaluation of resin-bonded fixed partial dentures, *Intl J Periodontics Restorative Dent* 15(3):238-247, 1995.
77. Thayer KE, Williams VD, Diaz-Arnold AM and others: Acid-etched, resin bonded cast metal prostheses: a retrospective study of 5- to 15-year-old restorations, *Intl J Prosthodont* 6(3):264-269, 1993.
78. Kern M, Sasse M: Ten-year survival of anterior all-ceramic resin-bonded fixed dental prostheses, *J Adhes Dent* 13(5):407-410, 2011.
79. Cenci MS, Rodolpho PA, Pereira-Cenci T and others: Fixed partial dentures in an up to 8-year follow-up, *J Appl Oral Sci* 18(4):364-371, 2010.
80. Tada S, Ikebe K, Matsuda K, Maeda Y: Multifactorial risk assessment for survival of abutments of removable partial dentures based on practice-based longitudinal study, *J Dent* 41(12):1175-1180, 2013.
81. Rehmann P, Orbach K, Ferger P, Wöstmann B: Treatment outcomes with removable partial dentures: a retrospective analysis, *Int J Prosthodont* 26(2):147-150, 2013.
82. Behr M, Zeman F, Passauer T and others: Clinical performance of cast clasp-retained removable partial dentures: a retrospective study, *Int J Prosthodont* 25(2):138-144, 2012.
83. Becker W, Becker BE: Replacement of maxillary and mandibular molars with single endosseous implant restorations: a retrospective study, *J Prosthet Dent* 74(1):51-55, 1995.
84. Ekfeldt A, Carlsson GE, Borjesson G: Clinical evaluation of single-tooth restorations supported by osseointegrated implants: a retrospective study, *Intl J Oral Maxillofac Implants* 9(2):179-183, 1994.
85. Jemt T, Lekholm U, Grondahl K: 3-year followup study of early single implant restorations ad modum Branemark, *Intl J Periodont Restor Dent* 10(5):340-349, 1990.
86. Laney WR, Jemt T, Harris D and others: Osseointegrated implants for single-tooth replacement: progress report from a multicenter prospective study after 3 years, *Intl J Oral Maxillofac Implants* 9(1):49-54, 1994.
87. Misch CE, Misch-Dietsh F, Silc J and others: Posterior implant single-tooth replacement and status of adjacent teeth during a 10-year period: a retrospective report, *Periodontol* 79(12):2378-2382, 2008.
88. Abt E: Growing body of evidence on survival rates of implant-supported fixed prostheses, *Evid Based Dent* 9(2):51-52, 2008.
89. Salinas TJ, Eckert SE: In patients requiring single-tooth replacement, what are the outcomes of implant - as compared to tooth-supported restorations? *Int J Oral Maxillofac Implants* 22(Suppl):71-95, 2007.
90. Cordioli G, Castagna S, Consolati E: Single-tooth implant rehabilitation: a retrospective study of 67 implants, *Intl J Prosthodont* 7(6): 525-531, 1994.
91. Haas R, Mensdorff-Pouilly N, Mailath G and others: Branemark single tooth implants: a preliminary report of 76 implants, *J Prosthet Dent* 73(3):274-279, 1995.
92. Schmitt A, Zarb GA: The longitudinal clinical effectiveness of osseointegrated dental implants for single-tooth replacement, *Intl J Prosthodont* 6(2):197-202, 1993.
93. Jung RE, Zembic A, Pjetursson BE and others: Systematic review of the survival rate and the incidence of biological, technical, and aesthetic complications of single crowns on implants reported in longitudinal studies with a mean follow-up of 5 years, *Clin Oral Implants Res* Oct;23 Suppl 6:2-21, 2012.
94. Esposito M, Coulthard P, Thomsen P and others: Interventions for replacing missing teeth: different types of dental implants, *The Cochrane Database of Systematic Reviews* 2005, Issue 1. Art. No.: CD003815.pb2.DOI:10.1002/14651858.CD003815.pub2.
95. Pjetursson BE, Tan K, Lang NP and others: A systematic review of the survival and complication rates of fixed partial dentures (FPDs) after an observation period of at least 5 years, *Clin Oral Implants Res* 15(6):667-676, 2004.

## Using Outcomes Information in the Treatment Planning Process

There are some common clinical situations for which there is available information to help guide the dentist in the formulation of the treatment options, and guide the patient in making a treatment decision. The following scenarios and attendant questions illustrate how outcomes information can be useful.

### Can Caries Be Left Under a Permanent Restoration?

A long-held truism in dentistry has been that the closer a carious lesion is to the pulp of a tooth, the more likely that there is or will be pulpal or periapical pathology. There is mounting evidence, however, that what most dentists learned in school, that it is mandatory to remove all carious tooth structure as part of restorative dentistry procedures, is not necessarily the best course of action. In fact, outcomes studies suggest that partial caries removal in symptomless teeth is often advantageous compared with complete excavation, especially when close to the pulp, as doing so reduces the risk of an exposure.[108-111] Studies show that leaving some caries at the deepest extent of a defect is not detrimental with regard to posttreatment symptoms, tooth vitality, or restoration longevity and results in lower long-term costs.[109,112,113] Given this evidence, partial caries removal would seem to be the default treatment. There are circumstances under which partial caries excavation is not indicated, however, and that raises the questions: When is it advisable to do partial caries removal, and what is the best technique for doing so?

Factors when considering partial caries removal are

- Preoperative pulpal symptoms
- Radiographic and/or clinical signs of pulpal or periapical disease
- Restorability of the tooth
- Planned use of the tooth as an abutment for a prosthesis
- Patient availability for follow-up
- Whether the treatment is done in the disease control phase or the definitive phase

There are two methods for partial caries removal, a one-step method, in which the tooth receives its definitive restoration at one appointment, and a two-step method, in which the tooth is temporarily restored and then reentered and restored definitively at a subsequent appointment. Both approaches have been shown to be effective.[114] Proponents of the two-step procedure suggest that it is necessary to remove the temporary base/cement and reexamine the remaining dentin to ensure the presence of healthy tissue (as would be demonstrated by the presence of a dentin bridge). The drawback to this step is that it increases the chance of a pulpal exposure.[114] The one-step approach has the obvious advantage of lower cost[112] and less time, but is it preferable? Outcomes studies suggest that the one-step technique is associated with longer tooth retention and vitality and should, therefore, be the default procedure.[111,112,115] Other variables (such as fewer involved tooth surfaces) also contribute to higher success rates.[113]

### When Should a Defective Restoration Be Replaced?[116-117]

Re-restoration is not an innocuous procedure. Research demonstrates that when old restorations are replaced with new ones, the new restorations tend to be larger and more expensive than their predecessors.[118] As intracoronal restorations become successively larger, it is increasingly likely that a protective cusp restoration (usually a crown) will be recommended and that, in a predictable percentage of the cases, undesirable sequelae will occur, such as an irreversible pulpitis and the need for root canal therapy. Outcomes studies provide some guidance[119]:

- Teeth with obvious recurrent caries should be restored.
- Restorations with small marginal discrepancies (ditching) and no overt caries need not be replaced.
- Teeth with isolated recurrent caries may be successfully repaired or patched.[120-122]

When faced with the decision as to whether a restoration should be replaced, a review of the relevant outcomes literature provides the practitioner with additional guidance for the decision, an understanding of the consequences of the available options, and some broad treatment parameters. Such a review will not, however, provide answers to such diagnostic questions as whether active caries exists under an old restoration with open or stained margins. If all of the information revealed by careful evaluation and inspection of the tooth fails to resolve that question, then an exploratory repair preparation may be in order. The decision as to whether to re-restore the tooth must ultimately be an informed decision made by the patient. The expected outcome of each of the treatment options, including no treatment, is an important piece of information that the patient must have to make a wise choice.

### When Should a Heavily Restored Tooth Be Crowned?

This is a common clinical scenario, and it has particular importance in the present context, because it also is one of the most common opportunities for overtreatment in dentistry. To be sure, there are compelling reasons for fabricating a crown on an otherwise heavily restored tooth. A tooth that exhibits pain on biting and has a crack line is one such example. But in the absence of symptoms, new or recurrent caries, restoration defect, or fracture line in the tooth, the question must be asked: *Is the mere presence of a large direct fill restoration sufficient indication to recommend a crown to a patient?*

To answer this question, the dentist will need to evaluate several parameters:

- What is the stability and viability of the current restoration? Past history of the tooth and restoration in question is most often a good predictor of future longevity and success. In other words, if the current restoration has been in the mouth for many years and there have been no negative outcomes, then it is more likely that there will be a continuing track record of success if the restoration is retained.
- Are there excessive occlusal forces on the tooth? Severe attrition, loss of vertical dimension, and heavy lateral or incline forces on the tooth all increase the probability of tooth fracture and, therefore, increase the probable benefit of crowning the tooth.

- What has been the patient's past experience with tooth fracture? Has it happened frequently, seldom, or not at all? Certainly a patient with a recent history of multiple tooth fractures is at greater risk for future fractures.
- If there is a high risk for fracture on the tooth in question, can the risk be mitigated by other means, such as eliminating all incline contacts on the tooth or fabricating an occlusal guard? Is placement of a crown the only or the best way to prevent future fracture?
- What is the probability that the process of fabricating the crown will necessitate additional procedures, such as prophylactic or prosthetically required root canal therapy, forced eruption, a crown-lengthening procedure, or placement of a new foundation or a post and core?
- With either treatment option, what is the probability of future negative sequelae, such as pulpal necrosis, recurrent caries, coronal amputation, or crown debonding? What would be the consequences of these sequelae?
- What is the prognosis for the tooth with or without the crown?

Ultimately, the treat versus no treat decision must be made by the patient after an informative consent discussion. In most situations, when the patient presents with a disease-free and asymptomatic tooth that has a large direct fill restoration, there will not be a compelling argument for placing a crown, but the patient should nevertheless be made aware of the treatment options and the benefits and deficits of those options—including any negative sequelae that may arise with either choice—and the *probability* of those negative sequelae. Here is an instance in which good outcomes data can be helpful to the patient who is trying to weigh the options and deciding whether or not to proceed with a crown at this time.

## When Should a Missing Posterior Tooth Be Replaced?

Conventional wisdom has encouraged the replacement of missing teeth when posterior tooth loss has created a *bounded edentulous space* (BES). The time-honored assumption has been that unless the space is filled, tipping or extrusion of remaining teeth, leading to arch collapse, will likely occur, and there will be a significantly increased potential for localized marginal bone loss and periodontal disease, pathologic temporomandibular condition, and occlusal trauma. It has been held that delaying reconstruction may necessitate more complex procedures, such as crown lengthening, root canal therapy, and/or crown placement on an opposing hyper-erupted tooth.[123] Studies suggest that these concerns may be inflated[124] and that replacement with a fixed partial denture has significant limitations.[125] Replacement with an implant-retained crown has a predictably favorable outcome but will typically incur greater cost to the patient. It has been shown that, although some teeth bounding an edentulous space may drift or tip, many do not. Of those that do move, most do so immediately after the extraction.[126]

Given this information (and in the absence of a compelling esthetic or psychological concern), it is reasonable to suggest the option of closely monitoring the space with intervention only if notable change (e.g., >2 mm) begins to occur. Even if intervention becomes necessary, limited treatment, such as a fixed or removable orthodontic device or an occlusal guard, may be all that is necessary to prevent tipping and extrusion of the opposing tooth.

For this situation, outcomes studies have been instrumental in challenging the profession to reconsider conventional wisdom. Outcomes information allows patient and practitioner to define a wider and more practical range of treatment options and provides research-based information on which to evaluate treatment options. It may still be prudent for the patient to proceed with tooth replacement, but the choice can be made with more knowledge and a clearer understanding of the risks and benefits of the various options.

## Should a Tooth With a Failed Root Canal Treatment Be Retreated?[127]

Cumulative statistics from several studies suggest that the overall success rate (lesion healing and tooth retention) for initial root canal therapy is 80% to 85% for nonvital teeth and 90% to 92% for vital teeth under controlled conditions.[128-132] The presence of a periapical lesion before treatment, obturation beyond the radiographic apex, or obturation with silver points all tend to diminish success. When failure does occur, it is usually the result of bacterial invasion or persistence of bacteria in the root canal system through root fracture, inadequate coronal seal, incomplete obturation, or the presence of lateral canals or other anatomic anomalies. If the initial conventional root canal treatment is not successful, many patients are reluctant to invest additional time, effort and/or financial resources in the tooth and may prefer to extract.

Nevertheless, many studies support the benefits of retreatment. As long as the root is not overtly fractured, the success rate averages 80%.[133] Subsequent retreatments show diminished success, however. If retreatment by conventional means is not feasible or has a poor prognosis, or if time constraints weigh in favor of a surgical approach, apicoectomy with retrograde fill may be another alternative. A surgical approach is often recommended when the tooth has an adequate coronal restoration (i.e., good coronal seal with no leakage or recurrent decay) and a previous root canal treatment that has met the standard of care. Traditional surgical techniques with severe bevels and the use of amalgam retrofills have had a success rate of approximately 60%. With modern microsurgical techniques, apical microsurgery has been shown to be successful in 90% of the cases.[134-136]

In this situation, information obtained from outcomes research provides patient and provider with the resources required to make a rational and informed treatment decision. Based on this information, the patient can make a reasoned choice about whether the benefit (likelihood of retaining the tooth) is worth the cost of conventional or surgical endodontic retreatment. Knowledge about the expected outcome of the common alternative treatment—extraction and placement of a single implant-retained crown—has further aided this process (see *In Clinical Practice: A Common Dilemma* box). Now the patient is in the ideal position of being able to weigh options: the endodontic surgical or retreatment at a lesser fee, but with a poorer success rate, versus the extraction, implant, and crown at a higher fee, but with a higher success rate.

## IN CLINICAL PRACTICE

**A Common Dilemma—Deciding between Extraction and Placement of an Implant-Retained Crown Versus Restoration with a Root Canal Treatment, Foundation, and Crown**

Before the development of the osseointegrated implant-retained crown, it was not unusual for the dentist to go to extraordinary lengths to save a badly broken-down tooth. If the tooth was lost, the common replacement alternative had been a fixed or removable partial denture (see Chapter 8 for details). Dentists and patients alike generally sought to avoid those alternatives if reasonably possible. In recent years, replacement of a badly compromised tooth with an implant-retained crown has become a predictable and financially viable alternative, but there are still many situations in which it is preferable to retain a compromised tooth rather than to extract it. The treatment dilemma of when to restore and when to extract a severely decayed or fractured tooth continues to be a common and relevant treatment planning question in the contemporary practice of general dentistry. It is also a good example of how the evolving body of evidence in dentistry can help both dentist and patient make sound rational treatment decisions.

For the dentist, the starting point in this analysis is to determine the prognosis if the tooth were to be restored. What treatment will be required? What is the expected survival rate? If failure occurs, what are the other possible negative outcomes? How can each of those negative outcomes be addressed? What additional treatments could be required at that time? Typically, the patient will be interested in the same questions. He or she may also seek information on the prognosis, expected outcomes, and possible discomfort and inconvenience attendant on the alternative treatment of implant placement and restoration. The patient will need to be informed about the financial costs, time required, and expected number of visits necessary to accomplish either alternative.

The following information summarizes many of the tooth- and patient-specific factors that may have a bearing on this decision-making process:

***Factors that Favor Retention and Restoration:***

- General health condition that contraindicates implant surgery
- Patient aversion to oral surgical procedures
- Root canal treatment has favorable long-term prognosis
- Tooth and restoration have favorable long-term prognosis
- Sufficient biologic width is present (crown-lengthening procedure or forced eruption will be unnecessary)
- Low caries risk/low risk for tooth fracture

***Factors that Favor Extraction and Implant and Crown Placement:***

- No general health contraindications to extraction and implant placement
- Patient willing to undergo oral surgical procedures
- Adequate bone for implant fixture retention
- Inadequate biologic width (crown-lengthening procedure or forced eruption needed if the tooth is to be retained)
- High caries risk
- High risk for tooth fracture

Ultimately, the treatment decision must be made as part of a conversation with the patient in which these issues are covered in depth. Typically, the immediate situation will have some factors that may weigh in favor of tooth retention and others that will weigh in favor of extraction and implant placement. Many other intangibles, such as a patient's previous personal experience with root canal therapy, often weigh heavily in the patient's mind and will influence the decision. Whenever possible, the dentist should share relevant information from the dental literature and augment that information with specific outcomes measures from his or her own practice. When the decision remains in the balance, even after an extended options and consent discussion, the scale is usually tipped in the patient's mind as to whether additional surgical intervention is anticipated—in other words, a crown-lengthening procedure in the case of saving the tooth, or augmentation or sinus lift in the case of implant placement. If the prognosis is deemed favorable in both cases, the ultimate cost of the two alternatives may be the determining factor in the decision. At present, in most cases, it is still less expensive to restore the tooth with a root canal treatment, foundation (or post and core), and crown than to extract, place, and restore an implant. If a crown-lengthening procedure or orthodontic forced eruption is necessary to save the tooth, the total costs for the two options become more equitable.

These examples suggest the ways in which outcomes research can support clinical treatment decisions. As further research reveals quantified outcomes for additional treatments under various conditions, the practitioner has the responsibility to remain current with the scientific literature and to relate that information to the individual patient's situation. Where reliable longitudinal studies about the specific type of treatment are lacking, the dentist will need to keep updated and critically appraise other, even if less reliable, available literature when making clinical decisions. The dentist may rely in part on his or her own experience to make a treatment recommendation, but that must be supplemented by guidance from the published literature whenever such evidence is available. See eBox 3-2 for discussion of Decisions Pathways and Decision Trees.

Additional bases for decision making will be available when the dentist has developed individual or practice-based treatment outcomes data for a full range of procedures in his or her own setting. This information will be helpful to patients as they make treatment choices, and the process should help the individual dentist to better assess his or her own practice techniques. An additional potential benefit of this process is providing the impetus for constant quality improvement in the procedures, materials, and techniques in the practice.

## CHANGING THE TREATMENT PLANNING PARADIGM

Globally, nationally, and in local communities, the dental patient population has become larger, more mobile, and more culturally and ethnically diverse. Increasingly, most general dentistry practices are also managing patients who are older and have more serious health problems. Concurrently, the needs and expectations of the general patient population, and of individual patients, have grown

significantly. Patients are asking more questions and have higher standards for their oral appearance, and their ability to chew and function. They also have higher expectations for the outcomes of their treatment. As they seek more information, they will commonly search the electronic media and may rely on the advice of friends and relatives—and will no longer rely solely on their dentist to provide that information.

Today's patient is more likely to seek and expect some degree of autonomy in making treatment planning decisions. As patients become increasingly interested in becoming full participants in their oral healthcare decisions, the patient's plan of care is more likely to be arrived at via an open and informed conversation rather than a singular plan devised by the dentist to be accepted or refused by the patient. As discussed earlier in this chapter, the further development of an evidence-based body of knowledge about risk assessment, prognosis, and outcomes supports both patient and dentist as they work through the process and ultimately reach consensus regarding the optimal plan of care.

There is, and will continue to be, the need for reliable and comprehensive research to substantiate which treatment methods are most effective in varying clinical circumstances. From the individual dentist's perspective, there will be the need to question everything—most especially conventional wisdom that lacks any evidence-based support. Only through a constant, thorough, and dedicated reassessment of procedures, techniques, and materials—with a foundation in the emerging body of evidence—can the dentist hope to guide the patient through the range of treatment options with clarity, candor, and accuracy.

## Clinical Recommendations and Guidelines

Dentists have traditionally resisted any intrusion into the one-on-one doctor–patient discussion of the treatment plan. Even though managed care plans, and to a lesser extent insurance carriers, have had an effect on the decision-making process, dentists can be expected to maintain autonomy in relation to these third-party agencies in assessing, diagnosing, and treatment planning for the needs of individual patients. As more research provides a knowledge base in this area, however, it will become possible to determine a controlled range of therapies that can be expected to succeed for a given clinical situation. This should be viewed as a positive development. Treatment planning will be more evidence based, and the patient will ultimately be able to more reliably, appropriately, and convincingly select the treatment that is in his or her personal best interests.

As the science of decision making evolves, and as treatment outcomes data become ubiquitous and universally accessible, it will be easier for those inside and outside the profession to determine what, under some circumstances, may constitute inappropriate or unprofessional treatment. It is possible that state boards of dentistry or other oversight or governing agencies may at some point use the tools and information at their disposal to identify marked deviations from the standard of care.

Even in a climate in which treatment plans may be scrutinized and held to a more formal standard, the dentist can and should maintain the central and leading role, continuing to plan treatment with the goal of bettering the individual patient's oral and general health—as the dentist and the patient deem appropriate. As long as the rationale for such plans is well documented, and evidence provided for thorough informed consent by the patient, both patient and dentist can proceed with confidence.

Dental treatment planning is already moving from a tradition in which the norm was a limited discussion with the patient of a few treatment possibilities to today's more open format, characterized by discussion of an array of increasingly sophisticated options. What, then, are the goals for the future? In the best-case situation, the patient will have a full and rich understanding of all the issues and be prepared by the dentist to make an optimal treatment choice that will be in his or her short and long-term best interest. In the future, fully informed consent will include more than an understanding by the patient of the diagnosis, relative advantages of the various treatment options, and costs (monetary and otherwise) of the treatment to be rendered. Consent will also include a more complete patient understanding of the prognosis for the treatment and the disease, the expected outcomes for the therapy, and the current and future risk for disease. The ultimate goal and anticipated result of these changes will be improved treatment planning and increased quality of care.

Evidence-based clinical practice guidelines have been developed by the ADA and other professional organizations to assist dentists in clinical decision making. They are generated through comprehensive and critical evaluation of the dental literature with a particular focus on what is clinically viable and relevant. The best available scientific evidence is objectively assessed and used to formulate clinical recommendations. Clinical Practice Guidelines are intended to provide guidance and do not represent a standard of care, requirements, or regulations. The basic elements of an acceptable guideline include one or more systematic reviews, an expert panel that develops the treatment recommendation based on the evidence in the systematic reviews, and a broader review body that reviews and comments on the expert panel's work, culminating in the guideline.

See *Suggested Readings and Resources* at the end of this chapter for links to a variety of general practice and discipline based practice guidelines and practice parameters.

The ADA website includes more than 30 dental practice parameters, adopted between 1994 and 1997 and describing the clinical considerations in various dental conditions and evaluations intended to aid dentists in clinical decision making. Although these parameters were not universally accepted or routinely used by practicing dentists, the ADA will maintain the parameters on its website "until such time that new evidence-based clinical recommendations are published on the same topic." In its EBD section, there are now several Clinical Recommendations, some with accompanying Chairside Guides. They are intended to be useful tools that can be applied in making evidence-based treatment decisions. In 2013, the ADA published a 58-page document titled *ADA Clinical Practice Guidelines Handbook*, and it can be expected that more recommendations and chairside guides will be forthcoming.

## eBox 3-2 Decision Pathways and Decision Trees

Several developments have already had an impact on treatment planning patterns and can help guide the treatment planning process for the individual patient. One approach has been the development of **decision pathways** specific to dentistry. These provide direction in identifying the range of treatment options, indicating some of the key decision nodes leading to appropriate treatment decisions. Decision pathways have been developed to cover a wide array of dental situations and procedures. In 1994, Hall and coauthors wrote a comprehensive treatment planning text using this format.[1] Since then, several authors have contributed to this field.[2-13] By providing a template for decision making and patient presentation, decision pathways can be particularly helpful to the novice. They can be useful to the experienced practitioner as well by providing a restatement of the range of options that should be considered. Their most significant limitation is that they tend to be somewhat cumbersome for routine daily use, especially for the experienced practitioner who has learned to intuitively sort out which issues are important for a specific patient, dismissing decision nodes that are not applicable.

**Decision trees** represent a more sophisticated expansion on this theme. Decision trees not only specify key decision nodes and treatment options but also include research-based success rates for each of these options. The rates can be based on outcomes of clinical conditions (e.g., effect of tooth loss) or on outcomes of treatment (e.g., success of various therapies for tooth replacement). Decision trees may also be influenced by patient-related variables, such as the patient's preferences, expectations, and financial resources.

In theory, comprehensive decision trees would be useful for the patient treatment planning discussion, but unfortunately, to date, they do not exist for most clinical situations. Decision analysis has already been applied to several areas, including radiographic selection,[14,15] endodontic treatment,[13] management of exposed dentin and dentin hypersensitivity,[9] guided tissue regeneration,[3] treatment planning of compromised teeth,[10] management of the endodontically abscessed tooth,[2] management of apical lesions after endodontic treatment, restorative dentistry,[16,17] and TMDs.[18,19] See Suggested Reading and Resources at the end of the chapter for representative Decision Pathways and Decision Trees.

**References**


1. Hall WB, Roberts WE, LaBarre EE: *Decision making in dental treatment planning,* St Louis, 1994, Mosby.
2. Balevi B, Shepperd S: The management of an endodontically abscessed tooth: patient health state utility, decision-tree and economic analysis, *BMC Oral Health* 7:17, 2007.
3. Bashutski J, Oh TJ, Chan HL, Wang HL: Guided tissue regeneration: a decision-making model, *J Int Acad Periodontol* 13(2):48-57, 2011.
4. Bauer J, Spackman S, Chiapelli F, Prolo P: Evidence-based decision making in dental practice, *J Evid Base Dent Pract* 5:125-130, 2005.
5. Bauer J, Spackman S, Chiappelli F, Prolo P: Model of evidence-based dental decision making, *J Evid Based Dent Pract* 5(4): 189-197, 2005.
6. Chiapelli F, Cajulis OS: The logic model for evidence-based clinical decision making in dental practice, *J Evid Base Dent Pract* 9: 206-210, 2009.
7. Harris R, Bridgman C: Introducing care pathway commissioning to primary dental care: the concept, *Br Dent J* 209(5):233-239, 2010.
8. Khatami S, MacEntee MI, Pratt DD, Collins JB: Clinical reasoning in dentistry: a conceptual framework for dental education, *J Dent Educ* 76(9):1116-1128, 2012.
9. Martens LC: A decision tree for the management of exposed cervical dentin (ECD) and dentin hypersensitivity (DHS), *Clin Oral Investig Suppl* 1:S77-S83, 2013.
10. Ovaydi-Mandel A, Petrov SD, Drew HJ: Novel decision tree algorithms for the treatment planning of compromised teeth, *Quintessence Int* 44(1):75-84, 2013.
11. Reynolds PA, Harper J, Dunne S: Better informed in clinical practice - a brief overview of dental informatics, *Br Dent J* 204(6):313-317, 2008.
12. Scott SE, Walter FM, Webster A and others: The model of pathways to treatment: conceptualization and integration with existing theory, *Br J Health Psychol* 18(1):45-65, 2013.
13. Suebnukarn S, Rungcharoenporn N, Sangsuratham S: A Bayesian decision support model for assessment of endodontic treatment outcome, *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 106(3):e48-58, 2008.
14. Hollender L: Decision making in radiographic imaging, *J Dent Educ* 56(12):834-843, 1992.
15. Friedland B: Risk-benefit analysis of the radiographic standards of care, *Int J Periodont Restor Dent* 25(1):6-7, 2005.
16. Anusavice KJ: Decision analysis in restorative dentistry, *J Dent Educ* 56(12):812-822, 1992.
17. Anusavice KJ: Present and future approaches for the control of caries, *J Dent Educ* 69(5):538-554, 2005.
18. Mohl ND, Ohrbach R: Clinical decision making for temporomandibular disorders, *J Dent Educ* 56(12):823-833, 1992.
19. John MT, Dworkin SF, Mancl LA: Reliability of clinical temporomandibular disorder diagnoses, *Pain* 118(1-2):61-69, 2005.

## CONCLUSION

Using risk analysis, prognosis determination, and outcomes assessment in the treatment plan presentation and discussion, members of the profession have begun to move from empirically based to evidenced-based treatment planning. As both diagnosis and treatment planning become more evidence based, the profession can be expected to move closer to consensus, with recommendations to patients that are more thoughtful, logical, predictable, and consistent. Similarly, patients can expect to have more appropriate and accurate information, be better able to compare and weigh treatment alternatives, and be prepared to make more informed judgments about what is in their individual best interests. They will also be better prepared for the possibility of adverse outcomes, should they occur.

As this paradigm shift takes place, the dentist's role is changing. On one hand, some control in the decision-making process is being passed from practitioner to patient. At the same time, the dental team's role is expanding as the need to collect, filter, focus, and transmit information to the patient increases. In short, the role of the dentist in presenting the treatment plan is changing from that of final authority in all decisions to that of a content expert, educator, and advisor to the patient. This altered role will ultimately be to the betterment of patients, dentists, and the profession.

## REVIEW QUESTIONS

- Describe how treatment plans have traditionally been formulated and presented to patients. What are some problems with that traditional model? How might patient care suffer in that paradigm?
- How can risk assessment be a useful adjunct to the dental treatment planning process?
- How does the prognosis for a disease differ from the prognosis for treatment?
- Give examples of how the prognosis for a treatment can alter the treatment plan presentation to a patient.
- How does outcomes research support clinical treatment decision making? Give examples.
- Why do dentists disagree in their treatment planning? How can these sources of disagreement be reduced?

## SUGGESTED READINGS AND RESOURCES


### Evidence-Based Dentistry

Abt E, Bader JD, Bonetti D: A practitioner's guide to developing critical appraisal skills: translating research into clinical practice, *J Am Dent Assoc* 143(4):386–390, 2012.

ADA Center for Evidence-Based Dentistry: http://ebd.ada.org/en/.

Kwok V, Caton JG, Polson AM, Hunter PG: Application of evidence-based dentistry: from research to clinical periodontal practice, *Periodontol* 59(1):61–74, 2012.

Pitts N: Understanding the jigsaw of evidence-based dentistry: 1. Introduction, research and synthesis, *Evidence-Based Dent* 5:2–4, 2004.

Pitts N: Understanding the jigsaw of evidence-based dentistry: 3. Implementation of research findings in clinical practice, *Evidence-Based Dent* 5:60–64, 2004.

Video tutorials on EBD: http://ebd.ada.org/en/education/tutorials.

### Risk Assessment

ADA Caries Risk Assessment Form Completion Instructions: http://www.ada.org/~/media/ADA/Member%20Center/FIles/topics_caries_instructions.ashx.

ADA Caries Risk Assessment Form >6 years old: http://www.ada.org/~/media/ADA/Science%20and%20Research/Files/topic_caries_over6.ashx.

American Academy of Pediatric Dentistry: http://www.aapd.org/media/Policies_Guidelines/G_CariesRiskAssessment.pdf.

American Academy of Periodontology Gum Disease Risk Factors. https://www.perio.org/consumer/risk-factors.

Caries Management by Risk Assessment (CAMBRA) group (Doméjean S, White JM, Featherstone JD): Validation of the CDA CAMBRA caries risk assessment—a six-year retrospective study, *J Calif Dent Assoc* 39(10):709–715, 2011.

Cariogram at the University of Malmö: http://www.mah.se/fakulteter-och-omraden/Odontologiska-fakulteten/Avdelning-och-kansli/Cariologi/Cariogram/.

Matuliene G et al: Significance of periodontal risk assessment in the recurrence of periodontitis and tooth loss, *J Clin Periodontol* 37(2):191–199, 2010.

Periodontology Online: Periodontal Risk Assessment. http://www.perio-tools.com/pra/en/index.asp.

### Outcomes and Outcomes Measures

Bader JD, Shugars DA: Cost implications of differences in dentists' restorative treatment decisions, *J Public Health Dent* 56:219–222, 1996.

Matthews DC: Decision making in periodontics: a review of outcome measures, *J Dent Educ* 58(8):641–647, 1994.

Quality Measurement in Dentistry: A Guidebook: http://www.ada.org/~/media/ADA/Science%20and%20Research/Files/DQA_Guidebook_52913.ashx.

Vernazza C, Heasman P, Gaunt F, Pennington M: How to measure the cost-effectiveness of periodontal treatments, *Periodontol* 60(1):138–146, 2012.

### Decision Making in Dentistry

Azarpazhooh A, Dao T, Ungar WJ, et al: Clinical decision making for a tooth with apical periodontitis: the patients' preferred level of participation, *Jendod* 40(6):784–789, 2014.

Benn DK: Applying evidence-based dentistry to caries management in dental practice, a computerized approach, *J Am Dent Assoc* 133(11):1543–1548, 2002.

Eli I: Reducing confirmation bias on clinical decision making, *J Dent Educ* 60(10):831–835, 1996.

Hickel R, Brüshaver K, Ilie N: Repair of restorations—criteria for decision making and clinical recommendations, *Dent Mater* 29(1):28–50, 2013.

Holtzman S, Kornman KS: Decision analysis for periodontal therapy, *J Dent Educ* 56(12):844–862, 1992.
Kennedy JM: Impediments to change and their resolution in clinical practice, *J Dent Pract* 62(10):882–888, 1998.
Khatami S, Macentee MI: Evolution of clinical reasoning in dental education, *J Dent Educ* 75(3):321–328, 2011.
Straub-Morarend CL, Marshall TA, Holmes DC, Finkelstein MW: Informational resources utilized in clinical decision making: common practices in dentistry, *J Dent Educ* 75(4):441–452, 2011.

### Decision Pathways ad Decision Trees

A Decision Tree for the Treatment of Caries in Posterior Teeth (Article): http://www.quintpub.com/userhome/qi/qi_21_3_surmont_11.pdf.
Decision Tree in Case of a Suspected Breach of Patient Information: http://www.ada.org/8762.aspx.
Decision Tree for Oral Mucosa Lesions: http://www.dentalcare.com/media/en-US/education/ce110/decisiontree.pdf.
Decision Trees for Management of an Avulsed Permanent Tooth: http://www.aapd.org/media/Policies_Guidelines/RS_Trauma-FlowSheet.pdf.
Extraction Versus Conservation Decision Chart: http://www.dentistry-today.com/periodontics/7100-the-evidencebased-decision-path.
Model of Evidence-Based Dental Decision Making (Article): http://www.academyofprosthodontics.org/_Library/ap_articles_download/Baur-EBD_In_Decision_Making.pdf.
The Management of an Endodontically Abscessed Tooth: Patient Health State Utility, Decision-Tree and Economic Analysis (Open Access Article): http://link.springer.com/article/10.1186%2F1472-6831-7-17.
Thesis on Clinical Reasoning in Dentistry: https://circle.ubc.ca/bitstream/id/90407/ubc_.

### Practice Guidelines and Parameters

ADA Additional support for evidence-based practice: http://ebd.ada.org/Resources.aspx.
ADA Clinical Recommendations: http://ebd.ada.org/ClinicalRecommendations.aspx.
ADA Systematic Reviews and Summaries: http://ebd.ada.org/en/evidence/evidence-by-topic.
American Academy of Pediatric Dentistry 2013-14 Definitions, Oral Health Policies, and Clinical Guidelines: http://www.aapd.org/policies/.
American Academy of Periodontology Clinical and Scientific Papers: http://www.perio.org/resources-products/clinical-scientificpapers.html.
Guide to Clinical Endodontics (AAE): http://www.nxtbook.com/nxtbooks/aae/guidetoclinicalendodontics5/.
Joint Position Statement of the AAE and the American Academy of Oral and Maxillofacial Radiology: http://c.ymcdn.com/sites/www.aaomr.org/resource/resmgr/Docs/AAOMR-AAE_postition_paper_CB.pdf.
National Guideline Clearinghouse (a public resource for evidence-based clinical practice guidelines, which provides search by topic): http://www.guideline.gov.
Parameters of Care for Oral and Maxillofacial Surgery: http://www.aaoms.org/images/uploads/pdfs/parcare_assessment.pdf.
Recommended Guidelines of the AAE for the Treatment of Traumatic Dental Injuries: http://www.nxtbook.com/nxtbooks/aae/traumaguidelines/.
Treatment Options for the Compromised Tooth: a Decision Guide (American Association of Endodontists [AAE]): http://www.aae.org/uploadedfiles/dental_professionals/treatment_planning_options/condensedtreatmentoptionsweb.pdf.

## REFERENCES

1. Centre for Evidence-Based Medicine Toronto: *What is EBM?* http://www.cebm.utoronto.ca/intro/whatis.htm. Accessed February 12, 2015.
2. Ismail AI, Bader JD: Evidence-based dentistry in clinical practice, *J Am Dent Assoc* 135:78–83, 2004.
3. Hook CR: Treatment planning in dental schools, *J Dent Educ* 66(1):68–74, 2002.
4. Bader JD, Shugars DA: Understanding dentists' restorative treatment decisions, *J Public Health Dent* 52(2):102–110, 1992.
5. Bader JD, Shugars DA: Variation in dentists' clinical decisions, *J Public Health Dent* 55(3):181–187, 1995.
6. Brennan JD, Spencer AJ: Factors influencing choice of dental treatment by private general practitioners, *Int J Behav Med* 9(2):94–110, 2002.
7. Gordan VV, et al: Restorative treatment thresholds for interproximal primary caries based on radiographic images findings of the dental PBRN, *Gen Dent* 57(6):654–673, 2009.
8. Gordon VV, et al: How dentists diagnose and treat defective restorations findings from the dental PBRN, *Oper Dent* 34(6):664–673, 2009.
9. Lanning SK: Variation in periodontal diagnosis and treatment planning among clinical instructors, *J Dent Educ* 69(3):325–337, 2005.
10. Bader JD, Shugars DA: Systematic reviews of selected dental caries diagnostic and management methods, *J Dent Educ* 65(10):960–968, 2005.
11. Ouellet A, Hondrum SO, Pietz DM: Detection of occlusal carious lesions, *Gen Dent* 50(4):346–350, 2002.
12. Nokhbatolfoghahaie H, Ali Khasi M, Chiniforush N, et al: Evaluation of accuracy of DIAGNOdent in diagnosis of primary and secondary caries in comparison to conventional methods, *J Lasers Med Sci* 4(4):159–167, 2013.
13. Teo TK, Ashley PF, Louca C: An in vivo and in vitro investigation of the use of ICDAS, DIAGNOdent pen and CarieScan PRO for the detection and assessment of occlusal caries in primary molar teeth, *Clin Oral Investig* 18(3):737–744, 2014.
14. Seremidi K, Lagouvardos P, Kavvadia K: Comparative in vitro validation of VistaProof and DIAGNOdent pen for occlusal caries detection in permanent teeth, *Oper Dent* 37(3):234–245, 2012.
15. Bader JD, Shugars DA: Descriptive models of restorative treatment decisions, *J Public Health Dent* 58(3):210–219, 1998.
16. Hallett KB: The application of caries risk assessment in minimum intervention dentistry, *Australian Dent J* 58(Suppl 1):26–34, 2013.
17. Redford M, Gift HC: Dentist/patient interactions in treatment decision making: a qualitative study, *J Dent Educ* 61(1):16–21, 1997.
18. Marachlioglou CR, Dos Santos JF, Cunha VP, Marchini L: Expectations and final evaluation of complete dentures by patients, dentist and dental technician, *J Oral Rehabil* 37(7):518–524, 2010.
19. Flexner A: *Medical education in the United States and Canada: a report to the Carnegie Foundation for the Advancement of Teaching*, New York, 1910, Carnegie Foundation for the Advancement of Teaching.
20. Geis William J: *Dental education in the United States and Canada: a report to the Carnegie Foundation for the Advancement of Teaching*, New York, 1926, Carnegie Foundation for the Advancement of Teaching.

21. Sackett DL, Rosenberg WM, Gray JA, et al: Evidence based medicine: what it is and what it isn't, *BMJ* 312(7023): 71, 1996.
22. Chambers D W: Evidence-based dentistry, *J Am Coll Dent* 77(4):68–80, 2009.
23. American Dental Association: *ADA Principles of Ethics and Code of Professional Conduct*. http://www.ada.org/en/about-the-ada/principles-of-ethics-code-of-professional-conduct. Accessed February 20, 2015.
24. American Dental Association Commission on Dental Accreditation: *Accreditation Standards for Dental Education Programs*. http://www.ada.org/~/media/CODA/Files/predoc.ashx.
25. Beck JD: Commentary: risk revisited, *Comm Dent Oral Epidemiol* 26(4):220–225, 1998.
26. Vieira AR, Marazita ML, Goldstein-McHenry T: Genome-wide scan finds suggestive caries loci, *J Dent Res* 87(5):435–439, 2008.
27. Wright JT: Defining the contribution of genetics in the etiology of dental caries, *J Dent Res* 89(11):1173–1174, 2010.
28. Alavi G, et al: Dental erosion in patients with gastro esophageal reflux disease (GERD), *J Dent* 5(7):62–67, 2013.
29. Tantbirojn D, Pintado MR, Versluis A: Quantitative analysis of tooth surface loss associated with gastroesophageal reflux disease. A longitudinal clinical study, *J Am Dent Assoc* 143(3):278–285, 2012.
30. Ganss C, Lussi A, Schlueter N: Dental erosion as oral disease. Insights in etiological factors and pathomechanisms, and current strategies for prevention and therapy, *Am J Dent* 25(6):351–364, 2012.
31. Borgnakke WS, Ylöstalo PV, Taylor GW, Genco RJ: Effect of periodontal disease on diabetes: systematic review of epidemiologic observational evidence, *J Periodontol* 84(Suppl 4): S135–S152, 2013.
32. Lockhart PB, Bolger AF, Papapanou PN, et al: Periodontal disease and atherosclerotic vascular disease: does the evidence support an independent association? A scientific statement from the American Heart Association, *Circulation* 125(20):2520–2544, 2012.
33. Teeuw WJ, Slot DE, Susanto H: Treatment of periodontitis improves the atherosclerotic profile: a systematic review and meta analysis, *J Clin Periodontol* 41(1):70–79, 2014.
34. Pontefract H, et al: The erosive effects of some mouthrinses on enamel, *J Clin Periodontol* 28(4):319–324, 2001.
35. Hellwig E, Lussi A: Oral hygiene products and acidic medicines, *Monogr Oral Sci* 20:112–118, 2006.
36. Buczkowska-Radlinska J, Łagocka R, Kaczmarek W, et al: Prevalence of dental erosion in adolescent competitive swimmers exposed to gas-chlorinated swimming pool water, *Clin Oral Investig* 17(2):579–583, 2013.
37. Tanaka K, Miyake Y, Sasaki S, Hirota Y: Socioeconomic status and risk of dental caries in Japanese preschool children: the Osaka Maternal and Child Health Study, *J Public Health Dent* 73(3):217–223, 2013.
38. Watt RG, Sheiham A: Integrating the common risk factor approach into a social determinants framework, *Community Dent Oral Epidemiol* 40(4):289–296, 2012.
39. Jiang Y, Okoro CA, Oh J, Fuller DL: Sociodemographic and health-related risk factors associated with tooth loss among adults in Rhode Island, *Prev Chronic Dis* 10:E45, 2013.
40. Costa SM, et al: A systematic review of socioeconomic indicators and dental caries in adults, *Int J Env Res Public Health* 9(10):3540–3574, 2012.
41. Ferro R, et al: Caries experience in 14-year-olds from Northeast Italy. Is socioeconomic-status (SES) still a risk factor? *Eur J Paed Dent* 13(1):46, 2012.
42. Bratthall D, Hansel Peterson G: Cariogram—a multifactorial risk assessment model for a multifactorial disease, *Comm Dent Oral Epidemiol* 33(4):256–264, 2005.
43. Graves R, Disney J, Stamm J, et al: Physical and environmental risk factors in dental caries, In Bader J, ed: *Risk assessment in dentistry*, Chapel Hill, 1989, University of North Carolina Dental Ecology.
44. Mejàre I, Axelsson S, Dahlén G, et al: Caries risk assessment. A systematic review, *Acta Odontologica Scandinavica* 72(2):81–91, 2013.
45. Neville BW, Damm DD, Allen CM, et al: *Oral and Maxillofacial Pathology,* ed 3, St. Louis, 2009, Saunders.
46. Gan SJ, Dahlstrom KR, Peck BW, et al: Incidence and pattern of second primary malignancies in patients with index oropharyngeal cancers versus index nonoropharyngeal head and neck cancers, *Cancer* 119(14):2593–2601, 2013.
47. Znaor A, Brennan P, Gajalakshmi V, et al: Independent and combined effects of tobacco smoking, chewing and alcohol drinking on the risk of oral, pharyngeal and esophageal cancers in Indian men, *Int J Cancer* 105(5):681–686, 2003.
48. Madani AH, Dikshit M, Bhaduri D, et al: Interaction of alcohol use and specific types of smoking on the development of oral cancer, *Int J High Risk Behav Addict* 3(1):e12120, 2014.
49. Maasland DH, van den Brandt PA, Kremer B, et al: Alcohol consumption, cigarette smoking and the risk of subtypes of head-neck cancer: results from the Netherlands Cohort Study, *BMC Cancer* 14:187, 2014.
50. Sathish N, Wang X, Yuan Y: Human Papillomavirus (HPV)-associated oral cancers and treatment strategies, *J Dent Res* 93(Suppl 7): S29–S36, 2014.
51. Lingen MW, Xiao W, Schmitt A, et al: Low etiologic fraction for high-risk human papillomavirus in oral cavity squamous cell carcinomas, *Oral Oncol* 49(1):1–8, 2013.
52. de Araújo RL, Lyko Kde F, Funke VA, Torres-Pereira CC: Oral cancer after prolonged immunosuppression for multiorgan chronic graft-versus-host disease, *Rev Bras Hematol Hemoter* 36(1):65–68, 2014.
53. Ganesan S, Iype EM, Kapali AS: Radiation induced sarcoma of oral cavity-a rare case report and a short review, *J Clin Diagn Res* 7(11):2598–2599, 2013.
54. Turati F, Edefonti V, Bosetti C, et al: Family history of cancer and the risk of cancer: a network of case-control studies, *Ann Oncol* 24(10):2651, 2013.
55. Zero D, Fontana M, Lennon AM: Clinical applications and outcomes of using indicators of risk in caries management, *J Dent Educ* 65(10):1126–1132, 2001.
56. Fontana M, Gonzalez-Cabezas C: Minimal intervention dentistry part 2. Caries risk assessment in adults, *Br Dent J* 213:447–451, 2012.
57. Doméjean S, White JM, Featherstone JD: Validation of the CDA CAMBRA caries risk assessment—a six-year retrospective study, *J Calif Dent Assoc* 39(10):709–715, Oct 2011.
58. Tellez M, Gomez J, Pretty I, et al: Evidence on existing caries risk assessment systems: are they predictive of future caries? *Community Dent Oral Epidemiol* 41:67–78, 2013.
59. Disney JA, Graves RC, Stamm JW, et al: The University of North Carolina caries risk assessment study: further developments in caries risk prediction, *Community Dent Oral Epidemiol* 20:64–75, 1992.

60. González-Cabezas C: The chemistry of caries: remineralization and demineralization events with direct clinical relevance, *Dent Clin North Am* 54(3):469–478, 2010.
61. Pappas A, Koski A, Guinta J: Prevalence and intraoral distribution of coronal and root caries in middle-aged and older adults, *Caries Res* 26:459–465, 1992.
62. Dye BA, Tan S, Smith V, et al: National Center for Health Statistics. Trends in oral health status: United States, 1988–1994 and 1999–2004, *Vital Health Stat* 11(248):1–92, 2007.
63. Totiam P, González-Cabezas C, Fontana MR, Zero DT: A new in vitro model to study the relationship of gap size and secondary caries, *Caries Res* 41:467–473, 2007.
64. Grossi SG, Zambon JJ, Ho AW, et al: Assessment of risk for periodontal disease. I. Risk indicators for attachment loss, *J Periodontol* 65(3):260–267, 1994.
65. Grossi SG, Genco RJ, Machtei EE, et al: Assessment of risk for periodontal disease. II. Risk indicators for alveolar bone loss, *J Periodontol* 66(1):23–29, 1995.
66. Locker D, Leake JL: Risk indicators and risk markers for periodontal disease experience in older adults living independently in Ontario, Canada, *J Dent Res* 72(1):9–17, 1993.
67. Lang NP, Tonetti MS: Periodontal risk assessment (PRA) for patients in supportive periodontal therapy (SPT), *Oral Health Prev Dent* 1(1):7–16, 2003.
68. Page RC, Martin JA, Loeb CF: The oral health information suite (OHIS): its use in the management of periodontal disease, *J Dent Educ* 69(5):509–520, 2005.
69. Page RC, Martin J, Krall EA, et al: Longitudinal validation of a risk calculator for periodontal disease, *J Clin Periodontol* 30(9):819–827, 2003.
70. Matuliene G, et al: Significance of periodontal risk assessment in the recurrence of periodontitis and tooth loss, *J Clin Periodont* 2:191-199, and *J Clin Periodontol* 37(5):427–435, 2010.
71. Leininger, M, Tenenbaum H, Davideau J-L: Modified periodontal risk assessment score: long-term predictive value of treatment outcomes. A retrospective study, *J Clin Periodont* 37(5):427–435, 2010.
72. Glaros AG: Incidence of diurnal and nocturnal bruxism, *J Prosthet Dent* 45(5):545–549, 1981.
73. Ohayon MM, Li KK, Guilleminault C: Risk factors for sleep bruxism in the general population, *Chest J* 119(1):53–61, 2001.
74. Johansson A, Ridwaan O, Carlsson GE: Bruxism and prosthetic treatment: a critical review, *J Prosthodont Res* 55(3):127–136, 2011.
75. Nagamatsu-Sakaguchi C, Minakuchi H, Clark GT, Kuboki T: Relationship between the frequency of sleep bruxism and the prevalence of signs and symptoms of temporomandibular disorders in an adolescent population, *Int J Prosthodont* 21(4):292–298, 2008.
76. Alajbeg IZ, Zuvela A, Tarle Z: Risk factors for bruxism among Croatian navy employees, *J Oral Rehab* 39(9):668–676, 2012.
77. Rintakoski K, Kaprio J: Legal psychoactive substances as risk factors for sleep-related bruxism: a nationwide Finnish Twin Cohort study, *Alcohol Alcohol* 48(4):487–494, 2013.
78. Carra MC, et al: Prevalence and risk factors of sleep bruxism and wake-time tooth clenching in a 7-to 17-yr-old population, *Eur J Oral Sci* 119(5):386–394, 2011.
79. Hosoya H, Kitaura H, Hashimoto T, et al: Between sleep bruxism and sleep respiratory events in patients with obstructive sleep apnea syndrome, *Sleep Breath* 18(4):837–844, 2014.
80. van de Sande FH, et al: Patient risk factors' influence on survival of posterior composites, *J Dent Res* 92(Suppl 7):S78–S83, 2013.
81. Johansson A, et al: Gender difference in symptoms related to temporomandibular disorders in a population of 50-year-old subjects, *J Orofac Pain* 17(1), 2003.
82. Ohrbach R, et al: Clinical findings and pain symptoms as potential risk factors for chronic TMD: descriptive data and empirically identified domains from the OPPERA case-control study, *J Pain* 12(11):T27–T45.0, 2011.
83. Selaimen C, et al: Occlusal risk factors for temporomandibular disorders, *Angle Orthodont* 77(3):471–477, 2007.
84. Kiriakou J, Pandis N, Fleming P, et al: Reporting quality of systematic review abstracts in leading oral implantology journals, *J Dent* 41(12):1181–1187, 2013.
85. Lang LA, Teich ST: A critical appraisal of evidence-based dentistry: the best available evidence, *J Prosthet Dent Jun* 111(6):485–492, 2014.
86. Manfredini D, Lobbezoo F: Relationship between bruxism and temporomandibular disorders: a systematic review of literature from 1998 to 2008, *Oral Surg Oral Med Oral Pathol Oral Radiol and Endodontol* 109(6):e26–e50, 2010.
87. Tada S, Ikebe K, Matsuda K, Maeda Y: Multifactorial risk assessment for survival of abutments of removable partial dentures based on practice-based longitudinal study, *J Dent* 41(12):1175–1180, 2013.
88. Kalsi J, Hemmings K: The influence of patients' decisions on treatment planning in restorative dentistry, *Dent Update* 40(9):698–710, 2013.
89. Faggion C, Giannakopoulos N: Critical appraisal of systematic reviews on the effect of a history of periodontitis on dental implant loss, *J Clin Periodontol* 40(5):542–552, 2013.
90. Ballini A, Capodiferro S, Toia M, et al: Evidence-based dentistry: what's new? *Int J Med Sci* 4(3):174–178, 2007.
91. Thomason JM, Heydecke G, Feine JS, Ellis JS: How do patients perceive the benefit of reconstructive dentistry with regard to oral health-related quality of life and patient satisfaction? A systematic review, *Clin Oral Implants Res* 18(Suppl 3):168–188, 2007.
92. Samet N, Jotkowitz A: Classification and prognosis evaluation of individual teeth—a comprehensive approach, *Quint Int* 40(5):377–387, 2009.
93. Becker W, Berg BE: The long-term evaluation of periodontal treatment and maintenance in 95 patients, *Int J Periodontics Restorative Dent* 4:54–71, 1984.
94. Becker W, Berg BE: Periodontal treatment without maintenance. A retrospective study in 44 patients, *J Periodontol* 55:505–509, 1984.
95. McGuire MK: Prognosis versus actual outcome: a long-term survey of 100 treated periodontal patients under maintenance care, *J Periodontol* 62(1):51–58, 1991.
96. McGuire MK, Nunn ME: Prognosis versus actual outcome. II. The effectiveness of clinical parameters in developing an accurate prognosis, *JPeriodontol* 67(7):658–665, 1996.
97. Kwok V, Caton JG: Commentary: prognosis revisited: a system for assigning periodontal prognosis, *J Periodontol* 78:2063–2071, 2007.
98. Sbaraini A, Carter SM, Evans RW, Blinkhorn A: Experiences of dental care: what do patients value? *BMC Health Serv Res* 12:177, 2012.
99. de Lima EA, Fernandes dos Santos MB, Marchini L: Patients' expectations of and satisfaction with implant-supported fixed partial dentures and single crowns, *Int J Prosthodont* 25(5):484–490, 2012.

100. Carlsson GE: Critical review of some dogmas in prosthodontics, *J Prosthodont Res* 53(1):3–10, 2009.
101. Critchlow SB, Ellis JS: Prognostic indicators for conventional complete denture therapy: a review of the literature, *J Dent* 38(1):2–9, 2010.
102. Fenlon MR, Sherriff M, Newton JT: The influence of personality on patients' satisfaction with existing and new complete dentures, *J Dent* 35(9):744–748, 2007.
103. Huumonen S, Haikola B, Oikarinen K, et al: Residual ridge resorption, lower denture stability and subjective complaints among edentulous individuals, *J Oral Rehabil* 39(5):384–390, 2012.
104. John MT, Micheelis W, Steele JG: Depression as a risk factor for denture dissatisfaction, *J Dent Res* 86(9):852–856, 2007.
105. de Siqueira GP, dos Santos MB, dos Santos JF, Marchini L: Patients' expectation and satisfaction with removable dental prosthesis therapy and correlation with patients' evaluation of the dentists, *Acta Odontol Scand* 71(1):210–214, 2013.
106. American Dental Association. Dental Quality Alliance Quality Measurement in Dentistry: *A Guidebook*. http://www.ada.org/en/science-research/dental-quality-alliance/. Accessed February 20, 2015.
107. Agency for Healthcare Research and Quality: *Selecting Health Outcome Measures for Clinical Quality Measurement*. http://www.qualitymeasures.ahrq.gov/tutorial/selecting.aspx. Accessed February 20, 2015.
108. Schwendicke F, Dörfer CE, Paris S: Incomplete caries removal: a systematic review and meta-analysis, *J Dent Res* 92(4):306–314, 2013. doi: 10.1177/0022034513477425. Epub Feb 8, 2013.
109. Ricketts DN, Kidd EA, Innes N, Clarkson J: Complete or ultraconservative removal of decayed tissue in unfilled teeth, *Cochrane Database Syst Rev Jul* 19(3):CD003808, 2006.
110. Maltz M, Henz SL, de Oliveira EF, Jardim JJ: Conventional caries removal and sealed caries in permanent teeth: a microbiological evaluation, *J Dent* 40(9):776–782, Sep 2012. doi: 10.1016/j.jdent.2012.05.011. Epub Jun 2, 2012.
111. Maltz M, Jardim JJ, Mestrinho HD, et al: Partial removal of carious dentine: a multicenter randomized controlled trial and 18-month follow-up results, *Caries Res* 47(2):103–109, 2013. doi: 10.1159/000344013. Epub Nov 28, 2012.
112. Schwendicke F, Stolpe M, Meyer-Lueckel H, et al: Cost-effectiveness of one- and two-step incomplete and complete excavations, *J Dent Res* 92(10):880–887, 2013. doi: 10.1177/0022034513500792. Epub Aug 14, 2013.
113. Maltz M, Alves LS, Jardim JJ, et al: Incomplete caries removal in deep lesions: a 10-year prospective study, *Am J Dent* 24(4):211–214, 2011.
114. Orhan AI, Oz FT, Orhan K: Pulp exposure occurrence and outcomes after 1- or 2-visit indirect pulp therapy vs complete caries removal in primary and permanent molars, *Pediatr Dent* 32(4):347–355, 2010.
115. Schwendickea F, Meyer-Lueckelb H, Dörfera C, Parisa S: Failure of incompletely excavated teeth—a systematic review, *J Dent* 41(7):569–580, 2013.
116. Arvanitis G: Criteria for the replacement of defective restorations, *Dent Today* 23(4):78–81, 2004.
117. Reasons for replacement of restorations, *Oper Dent* 30(4):409–416, 2005.
118. Brantley CF, et al: Does the cycle of rerestoration lead to larger restorations? *J Am Dent Assoc* 126(10):1407–1412, 1995.
119. Anusavice KJ, editor: *Quality evaluation of dental restorations: criteria for placement and replacement*, Chicago, 1989, Quintessence Publishing.
120. Frencken, JE, et al: Minimal intervention dentistry for managing dental caries–a review, *Int Dent J* 62(5):223–243, 2012.
121. Martin J, et al: Management of class I and class II amalgam restorations with localized defects: five-year results, *Int J Dent* 450260, 2013. http://www.hindawi.com/journals/ijd/2013/450260/. Accessed February 20, 2015.
122. Hempel MC, Mjör IA, Gordan VV: Sealing, refurbishment and repair of Class I and Class II defective restorations: a three-year clinical trial, *J Am Dent Assoc* 140(4):425–432, Apr 2009.
123. Rosenstiel SF, Land MF, Fujimoto J: *Contemporary fixed prosthodontics*, ed 4, St Louis, 2007, Mosby.
124. Shugars DA, et al: Survival rates of teeth adjacent to treated and untreated posterior bounded edentulous spaces, *J Am Dent Assoc* 129:1084–1094, Aug 1998.
125. Scurria MS, Bader JD, Shugars DA: Meta-analysis of fixed partial denture survival: prostheses and abutments, *J Prosthet Dent* 79:459–464, 1998.
126. Lindskog-Stokland B, et al: Changes in molar position associated with missing opposed and/or adjacent tooth: a 12-year study in women. *J Oral Rehabil* 39(2):136-143, 2012.
127. Torabinejad M, White SN: Evaluation of endodontic outcomes. In Torabinejad M, Walton RE, and Fouad AF, editors: *Principles and practice of endodontics*, ed 5, St. Louis, 2015, Saunders.
128. Kerekes K, Tronstad L: Long-term results of endodontic treatment performed with a standardized technique, *J Endodontics* 5(3):83–90, 1979.
129. Seltzer S, et al: Factors effecting successful repair after root canal therapy, *J Am Dent Assoc* 67:651–662, 1963.
130. Sjogren U, et al: Influence of infection at the time of root filling in the outcome of endodontic treatment of teeth with apical periodontitis, *Int Endodontic J* 30(5): 297–306, 1997.
131. Friedman S: Success and failure of initial endodontic therapy, *Ontario Dentist* 74(1):35–38, 1997.
132. Friedman S, Mor C: The success of endodontic therapy—healing and functionality, *J Calif Dent Assoc* 32(6):493–503, 2004.
133. Torabinejad M, Corr R, Handysides R, Shabahang S: Outcomes of nonsurgical retreatment and endodontic surgery: a systematic review, *J Endod* 35(7):930–937, Jul 2009.
134. Rubinstein RA, Kim S: Long-term follow-up of cases considered healed one year after apical microsurgery, *J Endod* 28(5):378–383, May 2002.
135. Tsesis I, Faivishevsky V, Kfir A, Rosen E: Outcome of surgical endodontic treatment performed by a modern technique: a meta-analysis of literature, *J Endod* 35(11):1505–1511, Nov 2009.
136. Setzer FC, Shah SB, Kohli MR, et al: Outcome of endodontic surgery: a meta-analysis of the literature—part 1: Comparison of traditional root-end surgery and endodontic microsurgery, *J Endod* 36(11):1757–1765, 2010.

# 4

# Developing the Treatment Plan

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## OUTLINE

**Developing Treatment Objectives**
- Patient Goals and Desires
- Patient Modifiers
- Dentist Goals and Desires
- Dentist Modifiers

**Establishing the Nature and Scope of the Treatment Plan**
- Visioning
- Key Teeth
- Phasing

**Presenting Treatment Plans and Reaching Consensus with the Patient**

**Guidelines for Sequencing Dental Treatment**
- Resolution of Chief Complaint
- Periodontal Therapy
- Caries Control
- Endodontic Therapy
- Extraction
- Occlusion
- Replacements for Teeth
- Third Parties
- Private Fee-for-Service Dental Insurance Policies

**Obtaining Informed Consent and Documenting the Treatment Plan**
- Informed Consent
- Treatment Plan Documentation

**Conclusion**

Having established the patient's comprehensive diagnosis list, the dentist is prepared to begin developing a treatment plan. This process can be rather simple for patients with few problems and relatively good oral health. Treatment can commence quickly, especially when the patient is knowledgeable about dentistry, harbors little anxiety toward dental treatment, and has the necessary financial resources available. More commonly, though, the patient has many diagnoses and problems, often interrelated and complex, which will require analysis before treatment can begin. The dentist may wonder whether an individual problem can or should be addressed, and what treatment options are available. Would a crown, for instance, be better than a large direct restoration to restore a carious lesion? Would an implant be a more satisfactory option than a fixed partial denture to replace a missing tooth? Which treatment should be provided first, and which procedures can be postponed until later? What role should the patient have in any of these decisions? Is he or she even fully aware of the specific dental problems? Finally, how successful, overall, will the planned treatment be?

Although all dentists struggle with these questions, experienced practitioners know when to address each issue individually and when to step back and look at all elements of the case as a whole. The experienced dentist is also aware that treatment planning cannot occur in a vacuum and must involve the patient. This means educating patients about their problems and making them partners in determining both the general direction and the specific elements of a proposed treatment plan.

The purpose of this chapter is to provide the reader with the fundamental skills necessary to begin creating treatment plans for patients. This includes developing treatment objectives, separating treatment into phases, presenting the treatment plan to the patient, sequencing procedures, consulting with other practitioners, obtaining informed consent, and documenting the treatment plan. Much of the material is presented as guidelines, which must be modified by the circumstances of each patient. Few, if any, rules are ironclad when treatment planning, and like many other aspects of dentistry, clinical decisions will improve with experience.

## DEVELOPING TREATMENT OBJECTIVES

As we discussed in Chapters 1 and 2, the practitioner examines the patient, determines which patient findings are significant, and then creates a comprehensive diagnosis list that will formally document why treatment is necessary. After assessing the patient's risk for ongoing and future disease (discussed in Chapter 3), the next step in preparing to devise a treatment plan is to articulate, with the patient's assistance, several **treatment objectives** (Figure 4-1). These objectives represent the intent, or rationale, for the final treatment plan. Treatment objectives are usually expressed as short statements and can incorporate several activities aimed at solving particular problems. Effectively expressed treatment objectives articulate clear goals from both the dentist's and patient's perspectives. Objectives will evolve from an understanding of the current diagnoses and problems integrated with the knowledge of what dental procedures are possible. Treatment objectives link to and strongly influence actual treatment (Table 4-1).

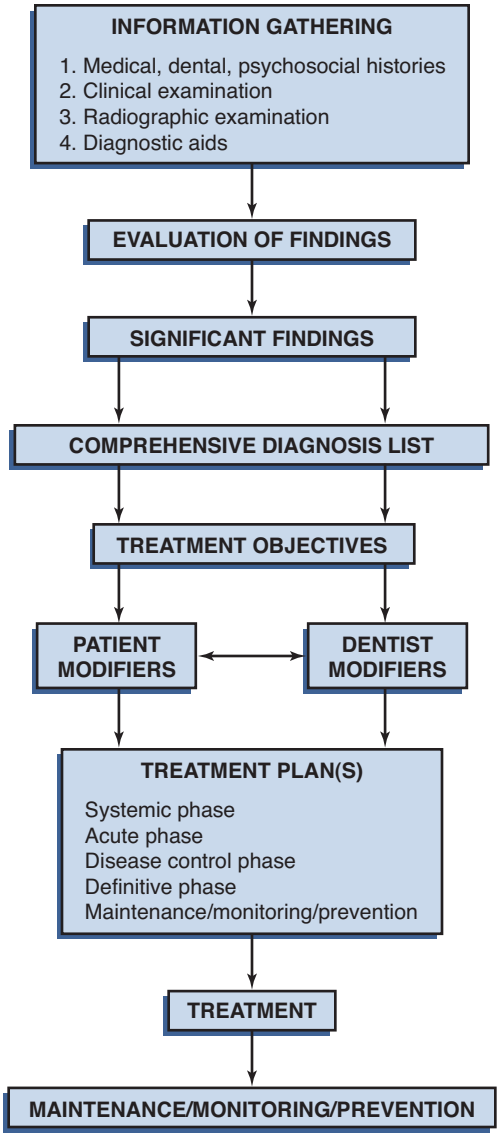


**FIG 4-1** The treatment planning process in dentistry.

## Patient Goals and Desires

Before creating any treatment plan, the dentist must first determine the patient's own treatment desires and motivation to receive care. Patients usually have several expectations, or **goals,** that can be both immediate and long term in nature. The most common short-term goal will be resolution of the chief complaint or concern—for instance, relieving pain or repairing broken teeth. Long-term goals are usually more global and can be more difficult to identify and articulate, especially if the dentist only focuses on his or her own preconceived ideas of what the patient desires. For example, an understandable long-term goal would be maintaining oral health and keeping the teeth for a lifetime. Most dentists would extol this expectation, as would many patients, especially those who come to the dentist with good oral health. But for patients with a history of sporadic dental care, poor systemic health, or extensive (and potentially *expensive*) dental needs, individual goals may be quite different. The patient with less than a year to live may only wish to stay free of pain or to replace missing teeth to enable eating more comfortably. On the other hand, a physically healthy patient with recurrent caries around many large restorations may be frustrated with past dental treatment and want any remaining teeth extracted and full dentures constructed. Some patients may have goals that are completely unrealistic. For example, the patient may want to preserve nonrestorable or periodontally hopeless teeth.

Determination of the patient's goals begins during the initial interview and may continue throughout the examination process. Careful probing of the patient's dental history may provide an indication of both past and future treatment goals. The prudent practitioner will avoid asking leading questions about treatment expectations. Such questions may instead convey the dentist's own personal goals, opinions, and biases and inhibit the patient from expressing his or her own goals and views. Some examples of such biased questions are

"Do you want to keep your teeth for a lifetime?"

"Isn't it worth the time and money to chew better?"

"Wouldn't you like whiter teeth and a prettier smile?"

It will be more effective to use open questions that may elicit the patient's thoughts and feelings and encourage the sharing of genuine concerns, especially regarding the chief complaint:

"Can you describe any problems you're having in your mouth?"

"How well are you able to eat with the teeth you have?"

"How do you feel about the appearance of your teeth?"

The dentist can participate in shaping the patient's treatment goals. This may need to occur when the patient has expectations that are difficult or even impossible to achieve, considering the condition of the mouth. For instance, the patient may wish to retain his or her natural teeth but be unaware of severe periodontal attachment loss. Ultimately, the dentist needs to educate the patient about the dental problems and, at the same time, begin to suggest possible treatment outcomes.

## Patient Modifiers

Treatment goals are frequently influenced by patient attributes, often referred to as **patient modifiers.** Positive modifiers include an interest in oral health, the ability to afford treatment, and a history of regular dental care. Commonly encountered negative modifiers include time or financial constraints, a fear of dental treatment, lack of motivation, poor oral or general health, and destructive oral habits. Many patients are understandably concerned about the potential cost of care, especially when they recognize that they have many dental problems. Whether the fees for services will function as a barrier to treatment depends on several variables, including the patient's financial resources, the level of immediate care necessary, the types of procedures proposed (i.e., large restorations versus crowns or partial dentures), the feasibility of postponing care, and the availability of third-party assistance with the cost.

**TABLE 4-1 The Relationship Between Diagnoses, Problems, Treatment Objectives, and Treatment**

**Signs and symptoms:** Ms. Smith, a 45-year-old patient, requests an examination. She has been diagnosed with Sjögren's syndrome. Her last visit to a dentist was 2 years ago for teeth cleaning. She reports symptoms of sore hands and wrist joints and a dry mouth. Her gingiva is red, and extensive plaque covers the necks of the teeth. Several teeth have small, dark areas on the facial enamel near the gingival margin, which are soft when evaluated with an explorer. The patient works in a convenience store and consumes an average of 1 liter of naturally sweetened carbonated beverage per day. Her chief concern is a painful maxillary right molar.

| Diagnosis | Problems | At Risk for | Treatment Objectives | Treatment |
|---|---|---|---|---|
| Sjögren's syndrome | Reduced salivary flow, symptoms of xerostomia (dry mouth) | Caries, poor prosthesis retention, discomfort | Investigate ways to increase salivary flow and/or reduce symptoms | Consider prescribing medications to promote saliva production; saliva substitute products |
| Rheumatoid arthritis affecting the hands | Unable to use a manual toothbrush | Poor oral hygiene, gingival and periodontal disease | Look for aids to improve oral hygiene | Suggest an electric toothbrush |
| Gingivitis | Poor plaque control and oral hygiene | Periodontal disease | Restore gingival health | Prophylaxis and oral hygiene instruction |
| Caries on seven teeth | Increased caries susceptibility resulting from a high-sucrose diet | Pain, tooth loss | Reduced refined carbohydrates in the patient's diet | Diet analysis and counseling; begin a caries control program; topical fluoride |
| Acute apical abscess | Constant pain in upper right first molar | Infection, swelling | Relieve pain | Emergency endodontic therapy |

Poor motivation, poor oral hygiene, or a diet high in refined carbohydrates can significantly affect the prognosis for any treatment plan. Nevertheless, occasionally, such patients may still want treatment involving complex restorations, implants, and fixed or removable partial dentures. Before treatment is provided, the dentist must inform the patient of the high risk for failure and record this discussion in the patient record.

## Dentist Goals and Desires

The dentist's goals also influence treatment plan development. Several goals are obvious, such as removing or arresting dental disease and eliminating pain. Others may be less apparent, especially to the patient, but are just as important nonetheless. Examples include determining the correct treatment for each problem, ensuring that the most severe problems are treated first, selecting the best material for a particular restoration, and making efficient use of the patient's and the provider's time.

In gathering these altruistic goals, the dentist will likely wish to create an **ideal treatment plan.** Simply put, such a plan would provide the best, or most preferred, type of treatment for each of the patient's problems. Thus, if a tooth has a large composite restoration that requires replacement, placing a crown might be considered the ideal treatment. If the patient has missing teeth, then the dentist might recommend replacing them. The goal of ideal treatment planning provides a useful starting point for planning care. Unfortunately, such a plan may not take into account important patient modifiers or may fail to meet the patient's *own* treatment objectives. In addition, one dentist's ideal treatment plan may differ significantly from another's, depending on personal preference, experience, and knowledge (see *In Clinical Practice: Evaluating Treatment Plans From Other Dentists* box).

Creating a **modified treatment plan** balances the patient's treatment objectives with those of the dentist's. For example, a patient with financial limitations may not be able to afford replacement of missing posterior teeth. The dentist needs to explain (and document) the possible outcomes of failing to implement ideal treatment (i.e., in some instances, tipping and extrusion of the remaining teeth). Or, the dentist may need to justify to the patient removal of several periodontally involved teeth, even though the teeth are not excessively mobile or symptomatic at the present time. In this situation, an appropriate treatment objective might be for the dentist to suggest observing the teeth for the present, with the plan to extract them if mobility increases or the patient reports other symptoms.

At times, incorporating the patient's wishes into a treatment plan can be difficult to implement. A classic example is the patient with rampant dental caries involving both anterior and posterior teeth. For esthetic reasons, the patient may be interested in restoring the anterior teeth first, but the dentist, after interpreting the radiographs, may detect more serious problems with the posterior teeth, such as caries nearing the pulp, and wish to treat these teeth first. Another example is the patient with poor oral hygiene and severe periodontal disease who wishes to have extensive fixed prosthodontics treatment begun immediately.

## Dentist Modifiers

Every dentist brings factors to the treatment planning task that can influence the goals for patient care and ultimately

## IN CLINICAL PRACTICE

### Evaluating Treatment Plans From Other Dentists

Occasionally, a dentist may be asked to evaluate a treatment plan created by another dentist. This can result from litigation or peer review, but more commonly, such an evaluation is initiated by a patient who wishes a second opinion. The patient may have reservations about some or all of a proposed treatment plan or simply want a second opinion to confirm the adequacy of what the first dentist has recommended. In some instances, the fees for service quoted by the first dentist are the primary reason the patient seeks the advice of a second dentist. No matter the reason, the second dentist must consider several factors before rendering an opinion.

**Diagnostic information and documentation:** Sometimes, such a patient will present without a written treatment plan and able only to generally recall what the other provider has proposed. "The dentist told me I need three crowns and six fillings. I am not sure I want all that treatment." Without documentation, it is difficult to corroborate or refute this information, and it is possible that the patient may be incorrectly stating the first dentist's recommendations. Without diagnostic materials, such as radiographs and models, rendering a second opinion is further complicated, particularly for a comprehensive treatment plan involving multiple procedures. Some patients may consent to additional radiographs by the second dentist or may request that copies of radiographs be sent from the original dentist.

**Patient examination:** The second dentist will need to examine the patient to validate findings, diagnoses, and treatment recommendations from the first dentist. This may be a problem-focused examination, in which a single tooth or area has been treatment planned. If the original treatment plan contains more procedures, however, the dentist will need to perform a comprehensive examination. The clinician should avoid rendering opinions based on hasty analysis. The patient must be informed in advance of the time required and fee for examination before a second opinion can be offered.

**Reasons for differences in treatment plans:** There are several reasons that treatment plans will differ from one dentist to another. Errors when making a diagnosis or in assessing the severity of a diagnosis can lead to inappropriate treatment selection. The first dentist may have relied on empirical versus evidence-based decision making or have failed to offer the patient a range of treatment options. The first dentist may not have adequately evaluated the effect of the patient's treatment objectives and modifiers when developing the treatment plan. The patient who is particularly concerned about cost and desires a conservative, incremental treatment approach may conclude that an all-encompassing treatment plan with many definitive phase procedures represents overtreatment. Finally, the patient may not fully understand or be willing to accept the extent of his or her dental problems and the rationale for the treatment procedures that have been recommended. The second dentist must clearly and objectively communicate to the patient any differences of opinion with the first practitioner and allow the patient to decide how to proceed.

All dentists should be mindful that other professionals may review the treatment plans they develop for their patients. When this occurs, the reviewed dentist should avoid feeling defensive and should facilitate sharing diagnostic information. Often, the patient who receives a second opinion returns and is more confident in pursuing treatment.

the sort of treatment plans that he or she develops. The astute dentist is aware of these modifiers, especially when they limit his or her ability to devise the most appropriate treatment plan to satisfy the patient's dental needs and personal desires.

### Knowledge

The dentist's level of knowledge and experience can influence the selection of goals and objectives for patient care. At one extreme is the beginning dental student, with a limited knowledge base and little experience in treating patients. Such early practitioners may not recognize the patient's treatment desires and modifying factors. As a result, they may create only "ideal" treatment plans, overlooking more appropriate solutions. At the other extreme is the complacent dentist who has been in practice for many years and has substantial clinical experience, but a knowledge base that has changed little since graduation. Such dentists may lack information about new treatment modalities that could be offered to patients, preferring instead to limit what they do. For these clinicians, the adage, "If all you have is a hammer, then everything is a nail," unfortunately may be true. The conscientious practitioner will be a lifelong student who is never complacent and learns not only from his or her own experiences, but from those of others as well. This dentist keeps up with current developments in the profession by attending continuing education courses, interacting with peers, and critically reading the professional literature, searching for evidence-based care.

### Technical Skills

In addition to a sound knowledge base, the dentist must also have the technical ability to provide treatment. Many dentists choose not to provide certain procedures, such as implant placement, extraction of impacted third molars, or endodontic treatment for multirooted teeth. This is not necessarily a limiting factor *per se* when treatment planning, but it can be if the dentist does not refer the patient to another dentist who has the expertise to provide the treatment.

### Treatment Planning Philosophy

Finally, each dentist develops an individual treatment planning philosophy that will continue to evolve over years of treating patients. Philosophies relating to treatment planning may vary considerably among individual dentists as a result of differences in their knowledge bases, technical skills, clinical experience, and judgment. Treatment planning in a dental school environment is often different from treatment planning in a private practice. Students are often frustrated when

instructors differ among themselves in treatment philosophies because of differing educational backgrounds. Dental schools and dental practices may also control or recommend which treatment options practitioners can provide to patients. The recent graduate, starting out in practice, is often motivated to incorporate new techniques and materials different from those used in dental school. Dentists who have been in practice several years strive to keep up with new developments in the profession, which in theory can influence the ways in which they develop treatment plans for patients. Patients often benefit from the practitioner's use of new materials and techniques. Patient care suffers, however, when experienced or inexperienced practitioners adopt treatment philosophies for which there is little supporting evidence. For example, the unwarranted removal of sound amalgam restorations and their replacement with gold or composite resin under the premise that amalgam affects the patient's systemic health is such a procedure. Such treatment can be unethical and may represent a disservice to the patient by exposing teeth to the risk of pulpal damage, fracture, or unnecessary removal of additional tooth structure.

## ESTABLISHING THE NATURE AND SCOPE OF THE TREATMENT PLAN

With the examination finished and the dentist confident that he or she has gained an awareness of the patient's treatment desires, it is time to develop the treatment plan. The dentist has the responsibility to determine what treatment is possible, realistic, and practical for the patient. In many instances, this is a relatively straightforward process, especially for those patients with few problems and the resources for and interest in preserving oral health. At the other end of the spectrum, the process is more complex. Patients with many interrelated oral problems and a high degree of unpredictability regarding the final treatment outcome present planning challenges. For such cases, the dentist has at his or her disposal several useful techniques for developing a treatment plan: These include visioning, identification of key teeth, and phasing procedures.

### Visioning

Dentists naturally contemplate treatment options while examining patients. The experienced practitioner will also develop a **vision** of what the patient's final condition will be when the course of treatment is completed. The concept of having a vision of the final result could be described as analogous to deciding on the destination before starting a journey. Imagining one or more end points for the completed case is beneficial when evaluating different treatment approaches. For the patient with many severely decayed teeth in both arches, the dentist might see the individual ultimately wearing complete dentures or, alternatively, might consider retaining some teeth and placing a removable partial denture, or even restoring more teeth and using implants to support fixed or removable prostheses (Figure 4-2).

Further exploration of each option requires the dentist to identify the steps that will be necessary to reach the treatment goals. Experienced dentists commonly use this technique of "deconstructive" thinking to explore each option. In the first example, the dentures can only be fabricated after the remaining teeth have been extracted. Will all the teeth be extracted at the same time? The patient will need time to heal and might be without teeth for several weeks. On the other hand, possibly only the posterior teeth should be removed at first and the anterior teeth retained to maintain a good appearance. After healing, dentures could be constructed for immediate placement after extraction of the remaining anterior teeth. Thinking ahead again, the dentist takes into account the fact that immediate dentures often require relining 6 to 12 months after placement. Is the patient prepared to accept this additional cost?

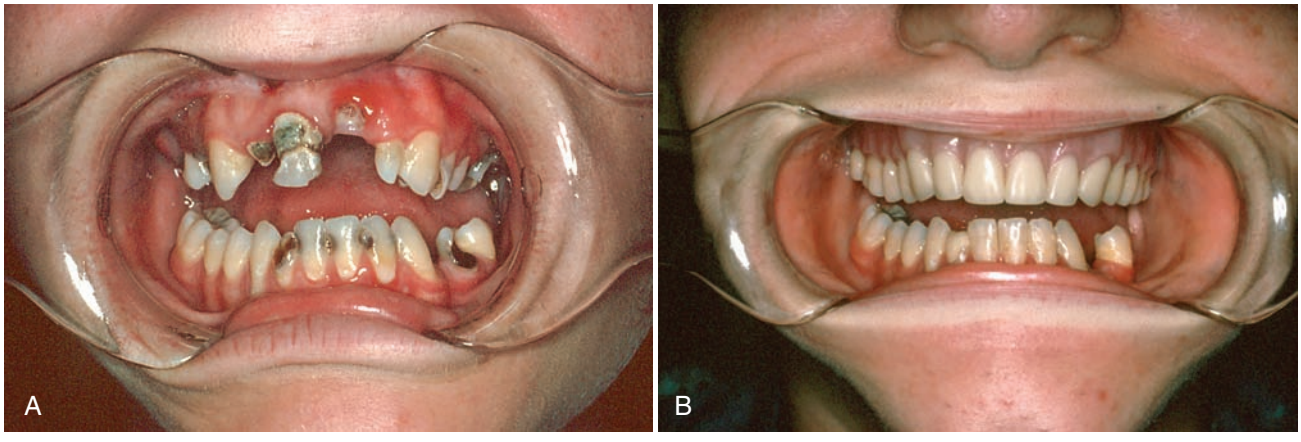


**FIG 4-2** Visioning skills are useful when trying to arrive at treatment options for the patient with many problems. **A,** This 20-year-old woman had extensive dental caries, nonrestorable teeth, and limited financial resources. **B,** Of the several options presented, the patient chose to have the maxillary teeth removed and mandibular teeth restored.

Considering the second option, the dentist might envision the patient with removable partial dentures and again begin the process of deconstructing the final result. Which teeth will serve as abutments for the removable partial denture? A surveyed crown may be necessary on some or all of the teeth to achieve adequate retention of the prosthesis. For the teeth needing such crowns, insufficient tooth structure may remain, and a foundation restoration or post and core will need to be provided. Endodontic therapy must first be performed before a post and core can be placed. The dentist may determine that the periodontal condition of several abutment teeth is poor, calling for a new treatment plan designed around different abutment teeth. Can a suitable partial denture be made using these alternative abutment teeth?

Experienced dentists perform this mental dance of forward and backward thinking almost automatically, constructing and deconstructing various treatment plans. Such practitioners can simultaneously envision proposed changes in the treatment plan at three levels: the individual tooth, the arch, and the overall patient. Dental students and recent graduates who lack experience and visioning skills need to work harder at coming up with various options and testing their clinical validity. Even for straightforward cases, it may be advantageous to construct mounted study casts and make diagnostic waxings to aid in the evaluation of possible options. Being part of a network of experienced dentists with whom casts and radiographs can be shared and cases discussed can be helpful. The dentist who practices alone may need to join a study club or develop relationships with experienced general and specialist dentists.

## Key Teeth

A first step in developing a treatment plan for the patient with a variety of tooth-related problems, such as periodontal disease, caries, and failing large restorations, may be to identify the important or **key teeth** that can be salvaged. Such teeth may often serve as abutments for fixed and removable partial dentures, and their position in an arch will add stability to a dental prosthesis. Retaining key teeth also often improves the prognosis for other teeth or the case as a whole. Conversely, the loss of a key tooth can limit the number of treatment options available to the patient.

Key teeth can be characterized as having several qualities. If enough of these qualities are present, the tooth or teeth may be important enough to make an extra effort to retain them.

- Key teeth should be periodontally stable. Although some loss of bone or periodontal attachment may be evident from radiographs and during periodontal probing, the tooth usually should exhibit little mobility. Of the anterior teeth, the canines have the most favorable crown-to-root ratios and are particularly valuable as abutments. Similarly, posterior key teeth, such as multirooted first molars, have a better prognosis as abutments—especially if the roots are divergent—than do single-rooted teeth or those with tapered or fused roots.
- Key teeth are usually favorably positioned in the arch. For example, imagine the patient who has many missing or nonrestorable maxillary teeth. The dentist would like to identify several key teeth, ideally spread throughout the arch, to secure a fixed or removable prosthesis, or to be used as overdenture abutments. Hopefully, the maxillary canines and at least one posterior molar can be retained for stability of the prosthesis. In addition to being favorably located in the arch, key teeth should not be excessively extruded from the occlusal plane (supraerupted), tipped into edentulous spaces, rotated, or located in an extreme buccal or lingual position. Third molars and often some second molars are not suitable to serve as key teeth because of their position in the arch and the difficulties involved in restoring them. The dentist can evaluate the positions of individual teeth directly during the examination, with mounted casts and by surveying study casts.
- Key teeth that are decayed or broken must be restorable. Teeth that have caries extending below the level of the alveolar crest may be poor candidates for restorative treatment and subsequent use as an abutment (see Figure 4-2). In situations with less tooth destruction but with the margin of the final restoration approaching the alveolar crest, the periodontal health of the tooth may be compromised. Orthodontic extrusion of the tooth or clinical crown-lengthening surgery can improve the situation, although the loss of periodontal attachment may lead to increased mobility and decreased suitability as a key tooth.

## Phasing

When preparing to treat a patient with complex needs, the dentist may find it advantageous to break the treatment plan into segments, or **phases.** Sorting treatment into phases helps the clinician organize the plan and improves the overall prognosis of the case. In addition, patients often comprehend a complicated treatment plan more easily when it is separated into segments. The five general categories of phasing are systemic phase, acute phase, disease control phase, definitive treatment phase, and maintenance care phase.

### Systemic Phase

The systemic phase of treatment involves a thorough evaluation of the patient's health history and any procedures necessary to manage the patient's general and psychological health before or during dental treatment. This may include consultation with other health providers, antibiotic prophylaxis, stress and fear management, avoidance of certain medications and products (e.g., latex), and any other precautions necessary to deliver treatment safely to patients with serious general health problems.

### Acute Phase

The purpose of an acute phase of treatment is to resolve any symptomatic problems with which a patient may present. Any number of patient problems may require attention during this phase. Common complaints include pain, swelling, infection, broken teeth, and missing restorations. Possible acute phase treatments include extractions, endodontic therapy, initial periodontal therapy, placement of

**provisional** (temporary) or permanent restorations, and repair of prostheses. The dentist may also choose to prescribe medications to control pain and infection. Acute phase procedures are often provided before a comprehensive treatment plan is created.

### Disease Control Phase

The goal of the disease control phase is to control active oral disease and infection, stop occlusal and esthetic deterioration, and manage any risk factors that cause oral problems. For many patients, this means controlling dental caries and arresting periodontal disease before deciding how to rebuild or replace teeth. Common procedures during the disease control phase include oral hygiene instruction, scaling and root planing, caries risk assessment and prevention, endodontic therapy, extraction of hopeless teeth, and operative treatment to eradicate dental caries.

A disease control only phase can be valuable when the dentist is uncertain about disease severity, available treatment options, or patient commitment to treatment (Figure 4-3). The outcomes of the disease control phase are evaluated with a **posttreatment assessment examination** before proceeding with definitive treatment procedures. If the patient's dental disease is not controlled, or if the patient wishes to limit treatment, he or she may enter a holding period and not proceed to definitive treatment.

### Definitive Treatment Phase

Definitive treatment aims to rehabilitate the patient's oral condition and includes procedures that improve appearance and function. Depending on the patient, several procedures in the various disciplines of dentistry, such as prosthodontics, periodontics, and endodontics, may be required. Examples of definitive treatment procedures include the following:

- Additional periodontal treatment, including periodontal surgery
- Orthodontic treatment and occlusal therapy
- Oral surgery (elective extractions, preprosthetic surgery, and orthognathic surgery)
- Elective (nonacute) endodontic procedures
- Single tooth restorations
- Replacement of missing teeth with fixed or removable prosthodontics, including implants
- Cosmetic or esthetic procedures (composite bonding, veneers, bleaching)

The accompanying *In Clinical Practice* box examines how comprehensive a treatment plan should be.

**FIG 4-3** This patient had ignored his teeth for many years and has rampant caries and periodontal disease. A disease control only phase of care is indicated before any definitive care, such as crowns, can be planned.

## IN CLINICAL PRACTICE

### How Comprehensive Should a Patient's Treatment Plan Be?

When a patient has extensive dental problems, it may be difficult, if not impossible, to develop a comprehensive treatment plan incorporating both disease control and definitive phases. This is especially true when the patient has significant periodontal disease or many carious, missing, or broken-down teeth.

Patients often want to know as soon as possible all that will be involved in rehabilitating their oral condition, and the dentist may feel pressured at an early stage to create a comprehensive treatment plan. Unfortunately, with the level of unpredictability that extensive problems involve, this may be impossible. In this situation, the clinician has two treatment planning options available, depending the complexity of the case.

**Designing a disease control–only plan.** Such a plan improves predictability by controlling variables, such as rampant dental caries or active periodontal disease, and simplifies the situation by removing hopeless teeth. During this time, it may be necessary to fabricate provisional replacements for missing teeth to satisfy the patient's esthetic and functional needs.

At the conclusion of the disease control phase, the dentist performs a posttreatment assessment. Depending on the level of disease resolution, patient compliance, and desire for further care, the dentist may decide to simply maintain the patient or alternatively may begin designing a definitive phase treatment plan.

**Designing a disease control and tentative definitive treatment plan.** For patients with greater predictability, it may be possible to control disease while developing a vision for the definitive treatment to follow. For example, by identifying key teeth and planning for a removable partial denture, the dentist might opt to perform endodontic therapy when a carious exposure occurs, instead of simply temporizing the tooth. It may be necessary to prepare mounted study casts and perform some preliminary surveying or diagnostic wax-ups to arrive at a tentative plan. The dentist may also need to consult with specialists, such as orthodontists or prosthodontists, on treatment options.

Having a tentative treatment plan in mind enables the dentist to discuss a possible end point with the patient while retaining the flexibility to change directions if necessary. As with the disease control–only plan alternative, however, it is imperative to have a posttreatment assessment examination before actually beginning further definitive care.

### Maintenance Care Phase

Unfortunately, many dentists fail to specify a maintenance phase of care to follow after completion of other treatment. Without a plan to periodically reevaluate the patient and provide supportive care, the patient's oral condition may relapse and disease may recur. The maintenance phase is more than simply a "check-up every 6 months"; rather, it constitutes a highly personalized plan that strives to maintain the patient in optimum oral health. Unlike the acute care, disease control, and definitive phases of care that end after completing a "work order" of procedures, a systemic and maintenance phase treatment plan is ongoing and continuous. Maintenance phase procedures may include periodic hard and soft tissue examinations, periodontal maintenance treatment, application of fluoride, and oral hygiene instruction.

## PRESENTING TREATMENT PLANS AND REACHING CONSENSUS WITH THE PATIENT

During the examination process, the dentist has had a chance to listen to the patient's concerns, evaluate his or her oral and systemic condition, assess the risk for progressive or future disease, and begin mentally envisioning ways to achieve sustainable oral health, function, and appearance. As discussed earlier, effective treatment plans attempt to address all patient problems and still accommodate the treatment goals of both dentist and patient. Once the dentist has begun to build a relationship of trust and rapport with the patient, he or she must now use communication skills to reach consensus on the final treatment plan. If handled properly, the practitioner will be viewed in a respected, professional manner. If handled poorly, the patient may perceive the dentist as uncertain, lacking confidence, self-serving, arrogant, or even incompetent. The dentist must be prepared to discuss all aspects of the case and remain open to any questions or concerns the patient may have. (See Video 4-1 Presenting a Treatment Plan on Evolve.)

The presentation begins by educating the patient about his or her problems and diagnoses. Careful attention should be paid to the chief complaint and other symptoms so that the patient understands *why* treatment is necessary. The clinician should also emphasize the importance of eliminating disease and achieving and maintaining oral health. It is important to use terminology that the patient can understand and to present information in a simple and organized manner. For example, the patient may better understand the intricacies of a three-wall infrabony pocket if described as "a loss of bone around the teeth." Rather than pointing out each carious lesion in the mouth, the condition might be summarized as "decay on six teeth." Extraoral and intraoral images, mounted casts (Figure 4-4), radiographs, diagnostic wax-ups, drawings, and informational pamphlets may be used to educate patients and help them visualize their own problems. Throughout this discussion, the dentist should encourage questions and periodically verify that the patient understands what is being said.

Next, the dentist can begin discussing treatment options. Before presenting this information, the dentist should have evaluated all possible treatment alternatives available to meet the patient's needs. Thinking in general terms facilitates this approach (i.e., large fillings versus crowns, fixed versus removable prosthetics, replacing or not replacing teeth). Once the patient has decided on a general direction for care, the advantages and disadvantages of the individual options should be discussed. The dentist should clearly describe the short- and long-term prognosis for each type of treatment and for the plan as a whole, as well as describing

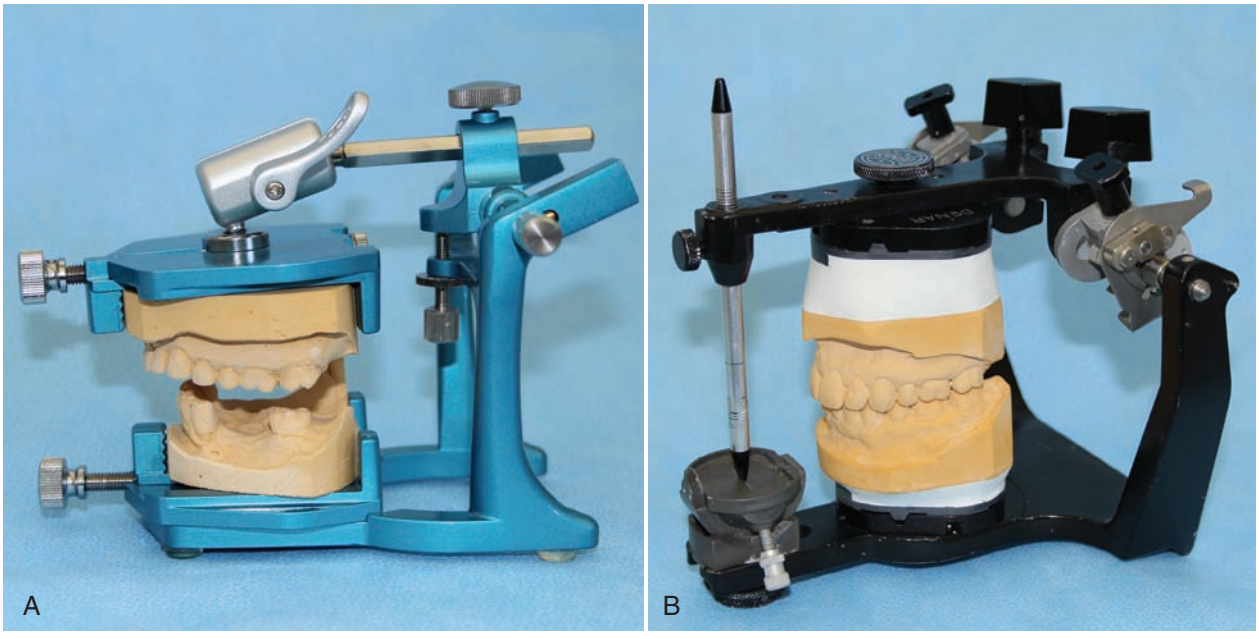


**FIG 4-4** Depending on the complexity of the case, it can be helpful use patient models with either a plasterless **(A)** or conventional **(B)** articulator.

what can be expected if no treatment is provided at all. The importance of the patient's cooperation in plaque control, smoking cessation, reducing parafunctional habits, and returning for maintenance therapy should be emphasized, including the effect of that cooperation (or lack of it) on the overall prognosis for treatment. Again, the patient should be prompted for questions.

About this time, many patients are beginning to think about the cost for services, the number of appointments, and the length of time involved for treatment. The *What's the Evidence? Improving Patient Acceptance of Treatment Plans* and *In Clinical Practice: Suggestions for Presenting Treatment Plans to Patients* boxes offer additional information about presenting treatment plans. The dentist should be prepared to discuss some general time and fee ranges, letting the patient know that a more precise estimate will be available before beginning treatment. Many practitioners have chosen to delegate much of this discussion to a business manager or other office staff. If so, the dentist should be available to answer questions if the plan changes.

## WHAT'S THE EVIDENCE?

### Improving Patient Acceptance of Treatment Plans

Confronting the patient's health beliefs is a useful technique for gaining acceptance of your treatment plans or understanding why a patient is reluctant to proceed with treatment. Developed to investigate the widespread failure of patients to accept preventive treatment for diseases, the **health belief model** argues that patients must hold four beliefs before they will accept treatment for a particular disease. According to the model, patients must believe

1. That they are susceptible to the specific disease to be treated.
2. That contracting the disease has serious consequences for them.
3. That the disease can be prevented or limited if the patient engages in certain activities or receives treatment.
4. That engaging in these preventive or disease-limiting activities is preferable to suffering from the disease.

Medical and dental researchers have used the health belief model to better understand why patients accept or reject treatment. Although its ability to predict health behaviors has not been proven, the model does provide a useful framework for explaining why people do or do not engage in health-related activities. Practitioners can improve case acceptance by addressing each aspect of the model during the treatment plan presentation.

- **Perceived susceptibility.** This comes from a thorough discussion of the list of the patient's problems. The patient must understand and accept the dentist's diagnoses before treatment will be agreed to. This is usually not an obstacle if the patient believes the dentist is competent and a complete and thorough examination has been performed. The practitioner may wish to use educational aids, models, photos, and radiographs to help instruct the patient about his or her problems.
- **Perceived severity.** The patient must recognize that there is some level of severity in his or her oral condition before treatment will be considered. This is especially important if the patient does not have symptoms and has been unaware of a particular dental problem. For instance, the dentist may interpret a large, asymptomatic, periapical radiolucency as very serious, but the patient may not share that perception until the dentist characterizes its significance. Again, patient education is the key, especially discussion of what the consequences may be if the patient chooses *not* to have the problem treated.
- **Perceived benefits.** A patient must believe that the proposed treatment plan will help solve his or her problems. This usually is achieved by spending time discussing the prognosis with the patient. Photographs of completed cases can be a helpful adjunct to this discussion.
- **Perceived barriers.** Surprisingly, it may be necessary to convince the patient that accepting the treatment plan is better than living with his or her dental problems. Patients often have—or perceive that they have—barriers to receiving treatment. The most common barriers are cost, time, and fear of pain. The dentist should make it a point to always address these three issues when presenting a treatment plan.

In addition to the individual's health beliefs and lack of oral health education, the patient may choose not to follow professional recommendations because of poor dentist-patient communication. Communication is an interaction that involves the patient and the dentist. Good patient-provider communication in dentistry includes creating a pleasant interpersonal relationship, exchanging information, and making cooperative treatment-related decisions. A pleasant interpersonal relationship is created when the dentist carefully explains procedures with a calm demeanor and encourages the patient to ask questions. Most patients prefer to receive information in an interaction in which they do not feel that the dentist is attempting to dominate them and in which they can comfortably provide information about themselves. When the patient is calm, trustful, and free of anxiety, he or she is more likely to comply with the dentist's recommendations.

Exchanging information allows the dentist to make the diagnosis and create the treatment plan with an understanding of the patient's preferences and expectations. During this time, the dentist not only educates the patient about what good oral health practices involve, but also motivates the patient to incorporate good oral health practices into his or her daily life. When treatment-related decision making is shared with the patient, the patient is more likely to perceive that he or she has a vested interest in the process and will be motivated to comply with the proposed treatment. Although the dentist is the professional in the relationship and may perform services of the highest quality, if the patient has a negative perception of the relationship, the treatment outcome may be compromised. Because patient-provider communication requires mutual participation, the interpersonal skills of the dentist are as important as the personality and motivation of the patient.

### Suggested Readings

Becker M: The health belief model and personal health behavior, *Health Educ Monogr* 2:324–508, 1974.

Harrison J, Mullen P, Green L: A meta-analysis of studies of the health belief model with adults, *Health Educ Res* 7(1):107–116, 1992.

Hollistger MC, Anema MG: Health behavior models and oral health: a review, *J Dent Hyg* 78(3):6, Summer 2004.

Janz NK, Becker MH: The health belief model: a decade later, *Health Educ Q* 11(1):1–47, 1984.

Sondell K, Sönderfeldt B: Dentist-patient communication: a review of relevant models, *Acta Odontol Scand* 55(2):116–126, 1997.

## IN CLINICAL PRACTICE

**Suggestions for Presenting Treatment Plans to Patients**

- Sit facing the patient at eye level while presenting the plan.
- Have the patient sitting upright; never present a treatment plan with the patient in a reclining position.
- Use language that the patient can understand.
- Avoid using threatening or anxiety-producing terms.
- Talk to the patient; don't preach. Be aware of your body language.
- Do not overwhelm the patient with the minute details.
- Ask the patient to repeat information back to you to confirm understanding of the treatment plan.
- Use casts, wax-ups, images, and radiographs to emphasize key points.

## GUIDELINES FOR SEQUENCING DENTAL TREATMENT

Once the patient's problems have been identified and a general course of therapy proposed, the dentist's next major responsibility is sequencing the individual treatment procedures. This process can be particularly challenging when the patient has many interrelated problems and treatment needs. Modifiers, such as patient finances, insurance coverage, time availability, and the need to resolve the chief complaint, may also influence the sequence of treatment.

Although the order in which treatment should proceed may vary, some general guidelines can be followed initially to sequence procedures (Box 4-1). In general, these guidelines parallel the recommendations for phasing treatment. The practitioner begins by assigning procedures to each phase and then sequences the procedures within each phase according to the level of problem severity. The resulting list of procedures addresses the patient's most severe problems first and concludes with those of less consequence.

Because it may be difficult to create a linear, step-by-step prescription for addressing all of the patient's problems, the dentist must remain flexible throughout this process. In some situations, it may be helpful to group treatments together, or to create a cluster within a phase and not specify a specific order. For instance, a patient may need a number of teeth restored to control caries. By clustering the planned restorations into groups labeled as "treat early" and "treat later," sequencing is achieved, yet the practitioner retains some flexibility to decide later which restoration to do first, second, et cetera. As discussed earlier, although the dentist can follow certain guidelines when sequencing treatment, exceptions can and will arise. Many of the challenges in sequencing are associated with the issues described in the following sections.

### Resolution of Chief Complaint

New patients usually have specific concerns or complaints. To help build rapport, the dentist should sequence the treatment

### BOX 4-1 Guidelines for Sequencing Dental Treatment

I. Systemic treatment
  A. Consultation with patient's physician
  B. Premedication
  C. Stress/fear management
  D. Special positioning of the patient
  E. Any necessary treatment considerations for systemic disease
II. Acute treatment
  A. Emergency treatment for pain or infection
  B. Treatment of the urgent chief complaint when possible
III. Disease control
  A. Caries removal to determine restorability of questionable teeth
  B. Extraction of hopeless or problematic teeth
    1. Possible provisional replacement of teeth
  C. Periodontal disease control
    1. Oral hygiene instruction
    2. Initial therapy
      a. Scaling and root planing, prophylaxis
      b. Controlling other contributing factors
        (1) Replace defective restorations, remove caries
        (2) Reduce or eliminate parafunctional habits, smoking
  D. Caries control
    1. Caries risk assessment
    2. Provisional (temporary) restorations
    3. Definitive restorations (i.e., amalgam, composite, glass ionomers)
  E. Replace defective restorations
  F. Endodontic therapy for pathologic pulpal or periapical conditions
  G. Stabilization of teeth with provisional or foundation restorations
  H. Posttreatment assessment
IV. Definitive treatment
  A. Advanced periodontal therapy
  B. Stabilize occlusion (vertical dimension of occlusion, anterior guidance, and plane of occlusion)
  C. Orthodontic and/or orthognathic surgical treatment
  D. Occlusal adjustment
  E. Definitive restoration of individual teeth
    1. For endodontically treated teeth
    2. For key teeth
    3. Other teeth
  F. Esthetic dentistry (i.e., tooth whitening, esthetic restorations)
  G. Elective extraction of asymptomatic teeth
  H. Replacement of missing teeth
    1. Fixed partial dentures, implants
    2. Removable partial dentures
    3. Complete dentures
  I. Posttreatment assessment
V. Maintenance therapy
  A. Periodic visits

## IN CLINICAL PRACTICE

**Referring Patients to Dental Specialists**

General dentists refer patients to specialists for several reasons. Most commonly, the practitioner wants the specialist's assistance in diagnosing or treating a patient's problem. Many general dentists choose not to provide certain types of treatment procedures or do not possess the skills necessary to perform them. Treatment complexity may also be a concern. Occasionally, the generalist's treatment of the patient's problem is not progressing well or has resulted in an unfavorable outcome. Examples of the second situation might include the inability to extract an impacted third molar or complaints of pain by a patient 6 months after completion of root canal therapy.

The patient's well-being should be first and foremost when deciding whether to refer for treatment. Most patients look favorably on the dentist who seeks assistance for their problems. The referral process flows more smoothly if the dentist observes the following guidelines:

- Inform the patient of the reason for the referral, including any pertinent diagnoses or problems from prior treatment rendered. Make sure the patient understands the consequences of *not* seeking specialty treatment.
- Familiarize the patient with the specialist's area of expertise and, in general, what types of treatment will be provided.
- Assist the patient in making contact with appropriate specialists by providing names and telephone numbers. Some practices choose to make the first appointment for the patient.
- Provide the specialist with copies of any radiographs, photographic images, casts, or other diagnostic aids before the patient's first appointment.
- Communicate the particulars of the case to the specialist, especially the reason for referral, a summary of the overall treatment plan, and any special concerns regarding patient management. Many specialists provide dentists with referral pads for conveying this information, but often a short letter is better. In the event of an emergency referral, the dentist should speak first with the specialist on the telephone before arranging the patient's visit.
- Maintain a referral log to assist with follow-up of referred patients. Specialists often send an acknowledgment after their examination or completion of treatment. If the general dentist recommends and makes a referral, but the patient does not follow up by contacting the recommended clinician, this should be documented in the patient record.

The general dentist is responsible for coordinating overall patient care between specialists and the general dental practice. On occasion, the dentist may need to consult with the patient when specialty opinions or changes to the treatment plan conflict. The general dentist must also confirm with the specialist any need for future treatment or reevaluation. A classic example is the orchestration of periodontal maintenance treatment between the periodontist and the general dentist. Other examples include periodic evaluation of implant therapy and treatment for pathologic oral conditions.

for these complaints early in the treatment plan when feasible. Obviously, it makes sense to provide treatment immediately when the patient has pain or swelling, but occasionally the solution to the patient's problems is complicated and, from the dentist's point of view, should be addressed later in the plan. For example, although a patient may request that missing teeth be replaced so that he or she can function better, it may be inappropriate to fabricate a fixed partial denture if the patient has active periodontal disease or more immediate restorative needs. When this situation occurs, the dentist must carefully explain the significance of the disease control phase and its relationship to the success of future treatment. One solution may be to provide a provisional removable partial denture. Another example is the patient with rampant caries who, for esthetic reasons, wants the anterior teeth restored before treating the often more severely decayed posterior teeth. Again, the dentist will need to discuss the situation with the patient and reach some consensus. Perhaps treating the most severe posterior tooth and one or two anterior teeth at the next appointment will be an acceptable compromise. Occasionally, as discussed in *In Clinical Practice: Referring Patients to Dental Specialists* box, the dentist will refer a patient to a specialist to resolve certain problems.

## Periodontal Therapy

In a dental school environment, initial periodontal therapy often is sequenced first in a treatment plan. Although this may be appropriate for the individual with few additional treatment needs, it may not be appropriate for others, especially those who are experiencing some discomfort. To ensure appropriate care, periodontal therapy should occur as early as possible in the plan, but it can be delayed for several reasons. One frequently encountered justification is the decision to first resolve a simple complaint, such as replacing a lost restoration or extracting symptomatic impacted third molars. Another example is the patient with large carious lesions, especially those located subgingivally. Restoring such teeth with a permanent or provisional filling should make periodontal treatment more comfortable for the patient and begin to resolve the gingivitis that accompanies subgingival lesions. Lastly, teeth that are nonrestorable or are periodontally hopeless are often extracted before beginning scaling and root planing procedures.

Occasionally, it may be appropriate to begin periodontal treatment *before* completing the patient's dental examination. This typically occurs when the patient has not seen a dentist for many years, and the dentition is covered with plaque and calculus. The dentist may decide to begin gross scaling or plaque debridement of the teeth to permit visualization and exploration of tooth surfaces during the examination.

## Caries Control

For the patient with many carious lesions, treatment consists of restoring lost or decayed tooth structure and implementing preventive strategies designed to prevent caries from occurring in the future. Such strategies as reducing refined carbohydrate consumption, improving the patient's plaque

removal technique, and applying fluorides, should commence immediately and be regularly reinforced, ideally at every appointment.

The following guidelines should be followed when sequencing treatment for caries:

- Address any symptomatic teeth first. Extract those that should not be retained for obvious periodontal or restorative reasons. For other symptomatic teeth, remove all caries, begin endodontic therapy if necessary, and place a permanent or provisional restoration.
- Treat any asymptomatic carious lesions that may be nearing the pulp as determined clinically or interpreted on radiographs. The goal is to prevent symptoms for the patient and avoid irreversible injury to the pulp.
- Remove caries to determine restorability. For teeth with caries at or below the alveolar crest radiographically, remove the caries and decide whether the tooth can be restored (Figure 4-5). Endodontic therapy should not be provided until the tooth is deemed periodontally sound and restorable.
- Finally, remove caries from asymptomatic teeth and, when possible, restore with a definitive restoration, such as composite resin or amalgam. For efficiency, sequence first by severity and then by quadrant.

## Endodontic Therapy

Endodontic therapy consists of a series of treatments, including removing pulpal tissue, filing and shaping root canals, obturating the root canal space, and placing a permanent restoration for the tooth. For some patients, it may be appropriate to do each step in succession, especially when no other problems have been identified. For patients with many deep carious lesions or pulpal pain, simply removing the caries and pulpal tissue, followed by rudimentary filing and shaping and placement of a provisional, **sedative restoration**, is preferred. After establishing some level of disease control, endodontic therapy can then be completed. To prevent fracture, permanent restorations for endodontically treated teeth should be sequenced before those for vital teeth if at all possible.

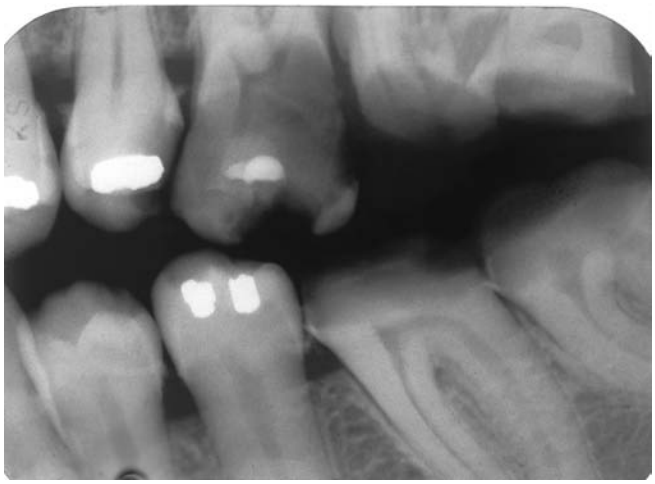

**FIG 4-5** Bite-wing radiographs are especially useful for evaluating the extent of caries in relation to the alveolar crest. In this patient, the maxillary and mandibular molars are probably not restorable.

## Extraction

When possible, tooth extractions should be sequenced early in the treatment plan to permit healing to take place, especially before tooth replacements are fabricated. The dentist should attempt to limit the number of surgical appointments and extract all hopeless or nonrestorable teeth at the same time. It may be necessary to delay the extraction of asymptomatic teeth so that provisional replacements can be fabricated to preserve appearance or to maintain the position of opposing and adjacent teeth for short periods of time. The classic example of this concept involves planning to place immediate dentures. The process begins by removing the posterior teeth, leaving the anterior teeth for esthetic reasons. Impressions for the dentures are taken 6 to 8 weeks later, after some healing of the posterior segments has occurred. Dentures can be fabricated using altered casts and delivered when the anterior teeth are extracted.

Sequencing removal of third molars may vary in a treatment plan. When symptomatic, they should be removed immediately. Asymptomatic or impacted teeth may be removed at the end of the disease control phase or during the definitive treatment. If the treatment plan includes extracting a third molar and fabricating a crown for the second molar anterior to it, the third molar should be removed first because of the potential to damage adjacent teeth during the oral surgery.

## Occlusion

Achieving a stable occlusal relationship represents an important goal when developing a comprehensive treatment plan. During the examination, the dentist will have identified any occlusal problems, such as malocclusion, tooth mobility, loss of vertical dimension, malposed teeth, or signs of parafunctional habits, such as bruxism. Mounted study casts are essential for evaluating and planning occlusal relationships, especially if multiple crown and bridge restorations are planned.

The practitioner should have a clear vision of the final occlusion before beginning definitive care, especially when the plan involves prosthodontics treatment. Treatment for occlusal problems normally begins after the disease control phase and may involve orthodontic treatment, occlusal adjustment, or altering the vertical dimension. In some instances, occlusal therapy, such as a limited occlusal adjustment, may be part of the initial therapy. When restoring or replacing teeth with crowns or fixed or removable prosthodontic appliances, procedures should be sequenced to develop the anterior occlusion first, followed by development of the posterior occlusion.

## Replacements For Teeth

Patients who eventually will need to have teeth replaced with implants, fixed and removable partial dentures typically have several dental problems. Controlling caries and periodontal disease should begin immediately. It may also be necessary to fabricate provisional partial dentures to satisfy the patient's esthetic and functional needs during this interval. The practitioner should

also begin identifying key teeth during the disease control phase, particularly those that will serve as abutments for fixed and removable partial dentures. It may be necessary to do a preliminary removable partial denture design on study casts with the help of a dental surveyor. At the same time, the dentist should be evaluating the potential need for preprosthetic surgery, especially torus removal and maxillary tuberosity reduction.

Key teeth should receive special attention during the posttreatment assessment, especially in terms of their response to disease control procedures and their suitability as abutments. The partial denture design should be finalized before beginning definitive care. This is particularly important in enabling the dentist to incorporate occlusal rests, guide planes, and retentive areas into the restoration design as needed. Preprosthetic surgery, endodontic therapy, post and cores, survey crowns, and fixed partial dentures will precede fabrication of the removable partial denture.

## Third Parties

The most fundamental dental relationship involves just two parties, the dentist and the patient. Ideally, in such a relationship, outside interference with treatment planning decisions is minimal, because all aspects of the plan will be decided on by the dentist and patient. Frequently, however, **third parties** participate in treatment planning decisions and affect how dentistry is practiced. Although dental insurance companies are generally seen as the major third-party influence on dental care, it is important to remember that other individuals—for example, a patient's parent or guardian, may modify the dentist-patient relationship and function as a third party (Figure 4-6).

### Public Assistance Plans

This type of insurance plan, commonly associated with such programs as Medicaid in the United States, is often restrictive. Here, the third party exerts limits on both the *type* of treatment covered and the *level of payment* for particular dental procedures. If the dentist's regular fee is higher than what the program pays, the dentist cannot charge the patient the difference. Medicaid programs are controlled at the state level, with coverage varying from state to state. Although the programs provide many individuals with some access to dental care, they often do not pay for the ideal or most appropriate type of treatment. For example, if the patient has an ill-fitting maxillary partial denture, the program may only pay for extractions in preparation for a complete denture, regardless of the condition of the abutment teeth.

When the program dictates an extremely limited treatment plan that, in the dentist's judgment, constitutes irrational or poor dental care, the dentist is faced with an ethical dilemma. To render the optimal treatment at no charge may not be economically feasible, yet to perform the "approved" treatment may constitute substandard care. The dentist and patient must

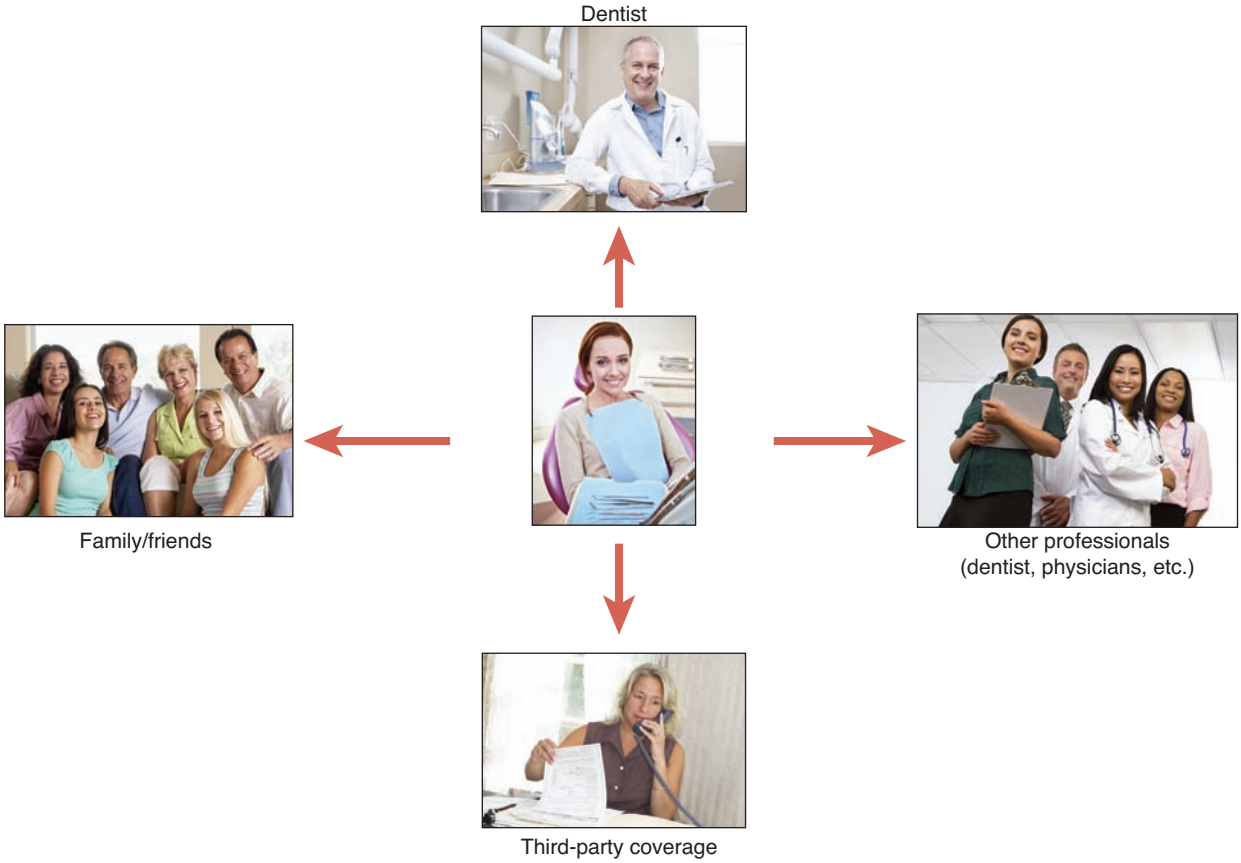


**FIG 4-6** A number of relationships may need to be considered when treating a patient. (Photos courtesy iStock.)

decide on a course of treatment that represents the best available option under the circumstances. In some cases, the dentist may decide not to accept the patient for treatment under the third-party restrictions. More often, however, at least minimal disease control can be carried out within the limitations of the program. Patients may later choose to pay for further treatment on their own. Providing informed consent concerning what public assistance will and will not cover is critical before beginning treatment. The dentist also needs to inform the patient of the existence of treatment procedures that could be performed—for example, implants versus a removable appliance—but are not paid for by the public assistance program. See Chapter 18 for more information about managing patients with financial limitations.

### Private Fee-for-Service Dental Insurance Policies

With private fee-for-service insurance, the third party is usually more generous with treatment covered and levels of payment, compared with public assistance programs. The insurance companies control reimbursement for services by

1. Limiting the types of treatment covered
2. Paying only a fixed amount or a percentage of the dentist's fee for each service, with patients often expected to pay the difference
3. Setting yearly or lifetime maximum benefit limits

For the patient with limited treatment needs, this type of third party may cover all of the proposed treatment at a high level of payment. When there are extensive oral health needs, the patient may ask the dentist to provide treatment in stages to coincide with annual benefit limitations. Sometimes, treatment can be begun at the end of one policy year and concluded into the next, thus taking advantage of two benefit years. The dentist will often wish, and may be required, to request authorization from the third party before beginning treatment so as to determine the patient's benefit levels, particularly for treatments involving prosthodontics.

Occasionally, an extensive treatment plan may be extended over 3, 4, or even 5 years to take maximum advantage of the insurance benefits. Such long-term treatment planning is challenging and assumes a stable dentist–patient–third party relationship. For such a plan to work, the current insurance coverage must remain in effect during the entire treatment period and the patient must remain eligible for benefits and must not move or change dentists during the course of treatment. If any of these conditions is likely to change, this type of extended treatment planning is inadvisable.

The dentist must also consider whether delivery of treatment can be safely extended over several years without jeopardizing the final result. Typically, with an extended treatment plan, the dentist performs disease control therapy first, placing interim restorations and building up teeth while postponing more costly rehabilitation of the dentition. This may be impossible in some cases—for example, when restoring several endodontically treated teeth that should have full crowns placed for protection. Although repairing large, defective amalgams or composites instead of providing full-coverage restorations, such as crowns or onlays, may save the patient money, such a strategy may only postpone the inevitable. When teeth need to be replaced, transitional removable appliances may be attempted to preserve appearance in lieu of definitive removable or fixed partial dentures. Unfortunately, many patients cannot or will not tolerate these interim prostheses for an extended period, and the prostheses may damage remaining teeth.

## OBTAINING INFORMED CONSENT AND DOCUMENTING THE TREATMENT PLAN

### Informed Consent

The treatment plan presentation appointment is the appropriate time to discuss the risks of the planned procedures, a discussion that can serve as the basis for obtaining informed consent from the patient to begin treatment. This type of discussion not only helps reduce the risk of malpractice claims, but also serves to better educate patients and prepare them for treatment. The topic of informed consent is discussed in greater detail in Chapter 6, but a brief review is presented here.

In general, for the patient to make an informed decision regarding treatment, the dentist must have described and discussed all diagnoses and problems, treatment alternatives, and the advantages and disadvantages of each alternative. The consenting individual must be mentally competent and of majority age (usually 18 years of age or older). The consent must not have been obtained by fraudulent means or under a situation of duress. It may be necessary to have translation services available if the patient has a limited ability to speak and understand English or other languages spoken by the clinician.

Specifically, the dentist must disclose

1. The nature of the condition being treated (i.e., the diagnosis and problem list)
2. The proposed treatment
3. Any risks involved in undergoing the proposed treatment
4. Any potential complications or side effects
5. Any consequences or risks of *not* undergoing the proposed treatment
6. Any alternative procedures that might be used
7. The prognosis for the treatment

When obtaining informed consent, the dentist should use lay terms to the extent possible. In addition, the patient must be given the opportunity to ask, and have answered to his or her satisfaction, any questions regarding the intended treatment. It may be helpful to draw sketches or use casts and radiographs to assist in the explanation and to add these to the patient record. Patients should also be provided with information about the cost for treatment. (See Video 4-2 Obtaining Informed Consent for a Treatment Plan on Evolve.)

### Treatment Plan Documentation

In addition to examination findings (see Chapter 1), and patient diagnoses (see Chapter 2), the dentist must also document the proposed treatment plan. Besides the obvious risk management benefits, a clearly written treatment plan is a useful practice management tool. With such a plan, the dentist, staff, and patient will all be aware of the procedures to be

performed, the sequence of care, and the fees that will be charged. It is a good idea to include treatment *objectives* in the documented plan, especially for disease control and limited treatment patients. Supplying the patient with information about his or her diagnoses and problems, as well as treatment objectives, can be useful in educating the individual in preparation for obtaining informed consent for the overall treatment plan. A disease control–only treatment plan should include a clearly written statement articulating the need for reevaluation and further definitive care.

Depending on the patient's needs, treatment plans may be simple or extremely complex documents. For patients requiring only one or two procedures, a short entry in the record, often in the progress notes, will provide sufficient information. For more complex treatment plans, particularly those with multiple options, the dentist may choose to give the patient hard copies of several alternative treatment plans to review later, independently or with others.

Once a plan is agreed on and informed consent established, the patient affirms acceptance with his or her signature.

Usually, two treatment plans must be documented. Much of the discussion in this chapter has focused on the **active treatment plan** (Figure 4-7). The active treatment plan is typically a list of disease control and definitive procedures sequenced in the order in which they will be provided. Most patient information systems include software functions for creating active treatment plans and for integrating such plans into the appointing and billing systems. Although the listing

# University School of Dentistry

## Draft Treatment Plan

Patient: lior lior (781952)

| Phase | Tooth | Surface | Code | Provider | Description | Patient | Insurance | Total Estimate |
|---|---|---|---|---|---|---|---|---|
| Disease Control Treatment | | | | | | | | |
| 1:0 | 30 | MO | D2150 | Stefanac, Stephe | Amal 2Surf Prim or Perm | 0.00 | 0.00 | 0.00 |
| 1:0 | 31 | MO | D2150 | Stefanac, Stephe | Amal 2Surf Prim or Perm | 0.00 | 0.00 | 0.00 |
| 1:1 | | | D1110 | Stefanac, Stephe | Adult Prophy | 0.00 | 0.00 | 0.00 |
| 1:2 | 3 | MOL | D2160 | Stefanac, Stephe | Amal 3Surf Prim or Perm | 0.00 | 0.00 | 0.00 |
| 1:2 | 13 | MOD | D2160 | Stefanac, Stephe | Amal 3Surf Prim or Perm | 0.00 | 0.00 | 0.00 |
| 1:2 | 18 | MO | D2150 | Stefanac, Stephe | Amal 2Surf Prim or Perm | 0.00 | 0.00 | 0.00 |
| | | | | | Estimated Fee for this Phase: | $0.00 | 0.00 | $0.00 |
| Corrective Treatment | | | | | | | | |
| 2:1 | FM | | D5986C | Stefanac, Stephe | Home Bleaching (2arches) | 0.00 | 0.00 | 0.00 |
| 2:2 | 7 | F | D2962 | Stefanac, Stephe | VenrPorcLamntLab | 0.00 | 0.00 | 0.00 |
| 2:2 | 8 | F | D2962 | Stefanac, Stephe | VenrPorcLamntLab | 0.00 | 0.00 | 0.00 |
| 2:2 | 9 | F | D2962 | Stefanac, Stephe | VenrPorcLamntLab | 0.00 | 0.00 | 0.00 |
| 2:2 | 10 | F | D2962 | Stefanac, Stephe | VenrPorcLamntLab | 0.00 | 0.00 | 0.00 |
| 2:3 | H | F | D2330 | Stefanac, Stephe | Anterior Resin 1 | 0.00 | 0.00 | 0.00 |
| | | | | | Estimated Fee for this Phase: | $0.00 | 0.00 | $0.00 |
| Maintenance Treatment | | | | | | | | |
| 3:1 | 19 | D | D0170WS | Stefanac, Stephe | Observe Tooth Surface N/C | 0.00 | 0.00 | 0.00 |
| | | | | | Estimated Fee for this Phase: | $0.00 | 0.00 | $0.00 |
| | | | | | Estimated Total Fee: | $0.00 | 0.00 | $0.00 |

I consent to begin the procedures listed above. I have had an opportunity to have the proposed procedures and alternative treatments explained to me, including risks and potential complications. Any questions I have concerning the proposed treatment have been answered to my satisfaction.

I understand that the fees listed on this treatment plan are only an estimate of my costs. Additional charges will be made for unforeseen changes in the treatment plan. I understand that the School of Dentistry fees change annually and I will be charged current fees at the time service is rendered. I understand that some services as indicated above may not be covered or may require pre-authorization by my dental plan. If I or my dependent choose to obtain any non-covered services, I agree to be personally responsible for paying the School of Dentistry's charges for these services.

**FIG 4-7** An example of an active treatment plan.

of fees is optional from a legal standpoint, they are often included to provide the patient with an estimate of cost. Active treatment plans will have an end point, often a posttreatment evaluation (see Chapters 9 and 10). In contrast, the **perpetual treatment plan** has no end point. The perpetual plan addresses patient concerns, issues, and needs that will remain relevant beyond the completion of the active plan—and that may continue for the life of the doctor-patient relationship. Perpetual treatment plans commonly include specific systemic and maintenance procedures and actions. Examples of perpetual plan actions are listed in Box 4-2. A detailed discussion of how such actions can be incorporated into the patient's plan of care will be found in Chapter 11. Although tracking the need for periodontal maintenance intervals is common in patient information systems, other perpetual plan items can more challenging for systems to record, follow, and inform the clinician when an action is required.

Finally, an **appointment plan** lists the activities and procedures that will occur at each appointment. This will be a separate document from the active treatment plan (Box 4-3). An appointment plan is useful for providing an estimate of the number of appointments that will be necessary and the overall time that will be required to complete the treatment plan. A well-thought-out appointment plan enables the dentist and staff to be prepared and efficient at each appointment as they work with the patient to complete the active plan.

### BOX 4-2 Examples of Perpetual Plan Items

- Systemic actions and actions necessary for improving patient comfort
- Evaluation for use/refill of medications
  - Premedication and other medications
- Active warnings
  - Examples: "Avoid penicillin," "Take BP at every appt."
- Anxiety management
- Special chair positioning
- Preventive and periodontal maintenance procedures
- Periodontal evaluation
- Oral hygiene recommendations
  - Fluoride and other product recommendations
- Evaluation for new radiographs
- Periodic examination
- Head and neck, soft tissue and oral cancer evaluation
- Dental conditions
  - Caries evaluation
  - Evaluation of current restorations
  - Evaluation of occlusion
- Reevaluations
- Pathology/lesions (clinical and radiographic)
- Endodontic posttreatment evaluation
- Preventive actions and reevaluation
- Diet analysis
- Smoking cessation
- Other habits
- Review of treatment declined by the patient (examples: third molar removal, full coverage restorations, replacement of missing teeth)

### BOX 4-3 A Treatment Plan Versus an Appointment Plan

**Clinical Summary**

A patient presents for a new patient examination. It has been 5 years since the individual's last visit to a dentist. The patient complains of a loose maxillary denture, a broken lower molar, and a dark area on a lower canine tooth. After examination, the dentist diagnoses a poorly fitting denture, a broken cusp on a lower left molar, caries on the distal surface of the right mandibular canine, and generalized marginal gingivitis.

**Treatment Plan**

- Comprehensive examination
- Prophylaxis
- Porcelain crown left mandibular first molar
- Composite restoration distal right mandibular canine
- Maxillary denture
- Reevaluation

**Appointment Plan**

Appointment 1 (60 minutes)
- Examination
- Radiographs
- Preliminary denture impression

Appointment 2 (60 minutes)
- Prophylaxis, oral hygiene instructions

Appointment 3 (90 minutes)
- Composite restoration, distal lower right canine
- Prepare porcelain crown
  - Two-week laboratory turnaround for crown fabrication

Appointment 4 (90 minutes)
- Adjust and cement crown
- Final impression for the maxillary denture, lower alginate impression
  - Two-week laboratory turnaround to pour impression and fabricate wax rim

Appointment 5 (60 minutes)
- Wax rim adjustment, occlusal records and tooth selection
  - Two-week laboratory turnaround to fabricate wax try-in

Appointment 6 (30 minutes)
- Wax try-in and patient approval
  - Two-week laboratory turnaround to process denture

Appointment 7 (30 minutes)
- Deliver maxillary denture
  - Reevaluate in 1 week

Appointment 8 (30 minutes)
- Reevaluate denture
- Periodontal reevaluation

## CONCLUSION

The well-constructed treatment plan provides a foundation for the long-term relationship between dentist and patient. A functional treatment plan is dynamic, not static, evolving in response to changes in the patient's oral or general health. A sound and flexible treatment plan facilitates communication and strengthens the doctor-patient relationship. Its contribution to good patient care and effective practice building makes it well worth the time and thought required for its development.

## REVIEW QUESTIONS

- How are treatment objectives developed with and for a patient?
- What role does "visioning" play in establishing the nature and scope of the treatment plan?
- What are the five treatment plan phases? What is the purpose of each?
- Identify "dos" and "don'ts" when presenting treatment plan options to a patient.
- What is the importance of sequencing in dental treatment planning? Create a list of sequencing guidelines.
- What constitutes informed consent, and how is it achieved?
- What is the difference between an active and perpetual treatment plans?

5

# Interprofessional Treatment Planning

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## OUTLINE

**Definition of Interprofessional Care**
**What is Required for Shared Decision Making**
**Members of an Interprofessional Team**
- The Patient and His or Her Social Support
- Dental Team Members
- Other Health Professionals

**Communication or Referrals to Other Health Professionals**
- Patient Evaluation
- Treatment Planning
- Active Treatment
- Maintenance Care

**Dentistry as Part of the Medical Team**
- Oral Disease Contributing to a General Health Problem
- Dental Issues That Arise During Examination by a Non-Dental Healthcare Provider
- Specific Referrals to the Dental Team

**Conditions Best Managed by an Interprofessional Team That Includes Dentistry**
- Head and Neck Cancer
- Cleft Palate/Craniofacial Anomalies
- Temporomandibular Joint Disorders/Orofacial Pain
- Obstructive Sleep Apnea
- Head and Neck Trauma (Gunshot, Explosion, Motor Vehicle Accident)
- Combined Treatment in an Operating Room Setting

**Conclusion**

## DEFINITION OF INTERPROFESSIONAL CARE

The general dentist has a central role in oral healthcare delivery. Every day, general dentists treat patients with increasingly complex dental, medical, and behavioral conditions and needs. In addition to providing comprehensive oral healthcare and planning and coordinating multidisciplinary dental treatment (*intra*professional collaboration), the dentist must also work collaboratively with other health professionals, as well as with family members and patient caregivers, to develop a mutually acceptable dental treatment plan focused on the patient's needs and values. Some patients, especially the frail elderly and individuals with craniofacial anomalies, cancer, or chronic illnesses, receive ongoing care from a wide variety of healthcare providers, including dentists. An interdisciplinary model of care and coordinated treatment planning will be essential for such patients.

**Interprofessional care (IPC)** is defined as the provision of comprehensive health services to patients by multiple healthcare providers in various fields working collaboratively to deliver quality care within and across settings. IPC has great potential to improve patient safety and quality of care. Global health agencies, including the World Health Organization (WHO), the Institute of Medicine (IOM), and a variety of national health authorities[1] now advocate interprofessional education and collaborative care as a way to achieve the following three aims[2]:

1. Improve how patients experience care in terms of quality, efficiency, and overall patient satisfaction.
2. Improve the health of populations.
3. Reduce the per capita cost of healthcare.

Although a thorough understanding of the whole patient and his or her healthcare needs is always necessary to provide optimal dental care, in certain specific circumstances, some of which will be described throughout this chapter, it is essential that the dentist collaborate with the other members of the healthcare team to develop a dental treatment plan with goals that are *aligned* with the overall treatment goals of the patient, and that ensures that treatment delivery is *coordinated* with the overall management of the patient's diverse health problems. In the following pages we will illustrate how, in these situations, the presence of complex and competing patient needs requires effective communication and coordination to optimize patient safety and quality of care. In these circumstances, the dentist may need to adjust an otherwise ideal dental treatment plan to accommodate urgent needs

that must be addressed by other members of the healthcare team. Ideally, in a truly integrated care model, the patient's dental treatment plan is integrated into an overall treatment plan that has been developed in partnership with the patient and the other members of the healthcare team.

The most urgent health problems confronting the world's populations are increasingly complex and reflect the interdependent nature of chronic illnesses. Emerging evidence suggests that collaborative care has the potential to improve health, enhance the patient's healthcare experience, and, at the same time, reduce healthcare costs. Collaborative care models engage a collaborative practice-ready healthcare workforce trained to take on complex or emergent problems and solve them together. These healthcare workers have gained the skills needed to collaborate with colleagues from other professions and put their interprofessional knowledge into action, doing so with respect for and in concert with the expertise and skills of their colleagues.

Notable benefits of interprofessional collaborative care include the following:

1. Benefits to patients: Collaborative practice can improve access to and coordination of health services, improve health outcomes for people with chronic diseases, and enhance patient care and safety. This includes avoiding medication errors and adverse events, such as bleeding, infection, and other medical emergencies that could have been prevented with proper precautions.
2. Benefits to healthcare providers and payers: Collaborative practice can decrease the total number of patient complications, length of hospital stays, tension and conflict among caregivers, staff turnover, hospital admissions and re-admissions, clinical error rates, mortality rates, and medicolegal risk.
3. Benefits to society: Collaborative practice can reduce the costs of care, as well as improve the overall health of the population.

Collaborative care models will increasingly include dentistry as an essential component of primary care, while retaining elements of our current oral healthcare delivery systems. Even though most oral healthcare today is delivered in a uniprofessional practice model (private practice dental offices, large group dental practices), the complex healthcare needs of a global population will require dentists to practice collaboratively with other members of the healthcare team to provide the best treatment outcomes for patients.[3]

An emphasis on the role of *intra*professional collaboration in dentistry can already be observed. Oral health professionals recognize the importance of collaboration among the various kinds of clinician within dentistry: general dentists, dental specialists, dental hygienists, dental assistants, and, in some settings, mid-level providers, such as expanded function dental hygienists and dental therapists. Extending this collaboration to other members of the healthcare team requires the same competencies: a basic knowledge of each other's roles and responsibilities, an attitude of mutual understanding, respect and patient-centeredness, and well-developed communication and teamwork skills. *Shared decision making* is a hallmark of collaborative care.

Depending on the patient population, this interprofessional (IP) team may include primary care physicians, nurses, physician assistants, medical specialists, pharmacists, psychologists and mental health counselors, physical therapists, occupational therapists, speech and language pathologists, dieticians, and other allied health professionals, as well as the patient's family and social support. The team may actually work together in one location or, more

## IN CLINICAL PRACTICE

### Fully Integrated Interprofessional Practice: An Emerging Model

An example of a single-location, collaborative-practice approach can be seen in a community-based primary care facility that houses medical and dental primary care under one roof. In such an environment, care providers from multiple disciplines can readily review the medical and dental records of patients scheduled for the day during a morning huddle, planning care for patients identified as needing a coordinated approach. This strategy allows the dentist to work collaboratively with the other healthcare providers in the facility to provide optimal care for individual patients. The dentist can provide patient education and treatment recommendations for patients with chronic conditions such as diabetes, hypertension, obesity, smoking, and asthma while other healthcare providers reinforce the value of oral health and appropriate oral healthcare to general health and wellness. This type of management is associated with reductions in barriers to care (often supported by the aid of social workers), increases in active patient involvement in their own care and quality of life, and reductions in total care cost.

This type of treatment setting can pose some challenges. For example, patient autonomy and right to privacy can be more difficult to manage. The patient must understand how the team collaborates and provide explicit consent for inter-practitioner communication. Also, a collaborative approach to patient care emphasizes the value of a shared understanding of all the patient's problems and chief concerns, communication between team members to prioritize problems and treatment options, and coordination of care, all with "the whole patient" at the center of care. For this approach to work, these values must be embraced and practiced by all healthcare providers.

In a community health clinic, *coordination* of care is essential for team-based comprehensive treatment. *Coordinated* care requires the dentists to collaborate with other healthcare professionals to develop *shared treatment goals and priorities,* and a treatment plan aligned with these goals and priorities, and optimally sequenced for efficiency and effectiveness of care. The dental treatment plan is integrated into and sequenced within this overall treatment plan. Team-based collaboration requires professionals to understand each other's roles and responsibilities, respect each other's expertise, and work effectively to share the decision making for the patient who requires multidisciplinary care. Ultimately, the rewards of improved treatment outcomes and cost reductions are worth the challenges, and this construct may be considered an emerging model for future general practice.

commonly, as a "virtual team," connected through electronic communications, such as an electronic health record, or by telephone, email, or video communications. In this environment, it is essential to respect the patient's autonomy and right to privacy. The patient must consent to these communications with any healthcare providers, as well as with family members and caregivers.

## WHAT IS REQUIRED FOR SHARED DECISION MAKING

*Shared decision making* is a hallmark of IP team-based collaborative care. Organizations such as the Center for Interprofessional Education (IPE) at University of Toronto and the Interprofessional Education Collaborative (IPEC) have identified *core competencies* for collaborative care.[4,5] These competencies can be organized into four domains:

- Values and professionalism
- Teams and teamwork
- Communication and collaboration
- Roles and responsibilities

To ensure that patients receive the *right care at the right time* from the *right providers* is dependent on adherence to the following principles that are reflected in the core competencies for collaborative care:

1. Practitioners need to recognize that they are part of a diverse team. Collegiality in a setting involving competing interests and varying perspectives is essential for continuity and effectiveness in delivering care.
2. Practitioners must communicate effectively with the patient and family, as well as with other members of the team. Identification of what questions to ask is essential, and a willingness to address gaps in information requires openness among providers.
3. To limit duplication and avoid gaps in care, it is important for each team member to have some understanding of the other team members' specialties.
4. Practitioners must be prepared to work with each other to optimize care so that the patient's journey from one healthcare setting to the next is experienced as a seamless transition. Such coordination should eliminate inefficiencies and avoid gaps in optimization of care and missed opportunities for early and ordered intervention.[4]

## MEMBERS OF AN INTERPROFESSIONAL TEAM

### The Patient and His or Her Social Support

The patient is both the central focus and an integral member of the team. In many cases, the family and caregivers will also be part of the team. For example, an older man with Alzheimer's disease may depend on his spouse to assist him with most activities of daily living (ADL), as well as serving as his advocate, making decisions relating to his medical treatment. The spouse would need to be involved in any decision making related to treatment priorities and the patient's needs and desires, and to have a realistic understanding of the situation when faced with an urgent decision, such as to whether to restore a tooth or extract it. If the patient has other urgent healthcare needs (for example, a pending surgical procedure), then extensive dental treatment may not be in his best interest. The spouse's own healthcare needs may play a role as well. As a couple, what is the best decision for both?

The community may also play an important role in the team, as when public health approaches to disease prevention and health promotion are considered as part of the context of care. For example, a dentist working in an urban community with underserved patients may encounter many children with extensive dental caries. In this setting, many patients will have a variety of health problems related to poverty, lack of access to healthy food choices because there are no grocery stores within the neighborhood, and an unfluoridated municipal water supply. In such cases, a public health approach will include community engagement to develop urban farming, legislation to fluoridate the water, school-based oral health programs, and tax incentives to businesses that provide healthy food choices to the community. The dentist treats the patient but must also partner with other health professionals and the community to modify the environmental risk factors for dental and systemic disease. The patient's dental treatment plan will include consideration of all of these activities and goals.

### Dental Team Members

Depending on the context of care and patient population, the oral healthcare team may include some or all of the following:

- General or primary care dentist, dental assistant, and dental hygienist
- Midlevel provider, dental therapist, expanded duty hygienist
- Dental laboratory technician
- Denturists
- Dental specialists

### Other Health Professionals

Depending on the patient, other health professionals may include the providers listed in Box 5-1, as well as others not listed here.

**BOX 5-1 Other Providers That Dentists or Patients May Seek**

Athletic trainer
Clinical geneticist/genetic counselor
Clinical psychologist
Doctor of chiropractic
Ethicist
Occupational therapist
Optometrist
Orthotist/prosthetist
Podiatrist
Religious/spiritual counselor

### Primary Care Physician/Family Practice Physician

The primary care physician (PCP) or family practice physician provides general medical care, including assessment and identification of previously undiagnosed medical conditions; health maintenance; and management of medical conditions. He/she provides detailed histories of positive responses to the health questionnaire and contributes to decisions relating to preoperative risk assessment and evaluation of severity and stability of medical diagnoses, and offers insights related to long-term prognosis, treatment compliance, and mutual treatment goals. Similar to the role of the general dentist, the PCP can serve as a coordinator of care and provide referrals to appropriate specialists, as described in the following sections. The PCP is the default primary resource for most medical consultations.

### Physician—Medical Specialties

Dental professionals may also interact with medical specialists in neurology, dermatology, radiation oncology, medical oncology, hematology oncology, psychiatry, pain medicine, and infectious disease, as well as with emergency physicians. For example, when treating a patient with dental pain that triggers trigeminal neuralgia, the dentist will need to collaborate with a neurologist. The dentist will treat the acute dental problem and coordinate care with the neurologist who treats the neuralgia, which is typically a chronic condition requiring long-term medical treatment. A neurosurgeon may be involved if the patient has a neurologic problem that has not responded to therapy.

### Physician—Surgical Specialties

In addition to working with oral and maxillofacial surgeons (who often have also earned a medical degree), dental professionals may interact with specialists in otolaryngology, plastic surgery, transplant medicine, or cardiac surgery. Consider a patient who suffers from injuries resulting from maxillofacial trauma received in a motor vehicle accident (MVA). The dentist assesses and manages traumatic injuries to the teeth and alveolus. To restore the occlusion in setting a mandibular or maxillary fracture, the clinician may coordinate dental treatment with a surgeon (otolaryngology, plastic and reconstructive surgery, or oral and maxillofacial surgery), who will reduce and immobilize the jaw fracture with rigid fixation.

### Physician Assistant or Associate

The physician assistant or associate (PA) is licensed to practice medicine under the direct supervision of a physician, and his or her role overlaps significantly with that of the physician (doctor of medicine [MD] or doctor of osteopathic medicine [DO]). PAs are involved in primary care medicine, as well as in the medical and surgical specialties; their responsibilities depend on the setting in which they work, their level of experience and training, and regional laws. Similarly to a physician, the PA conducts histories and physical assessments, provides detailed medical information, orders and interprets diagnostic tests, and diagnoses and treats illnesses, including prescribing medications. Physician assistants (usually medical, not surgical, PAs) frequently provide direct patient care in such facilities as nursing homes or group homes.

### Nurse/Registered Nurse/Licensed Practical Nurse

The registered nurse (RN) is responsible for the daily care tasks and administration of medications, often in an inpatient setting, but also in outpatient and home care settings. The nurse is trained to closely assess patient needs and detect small, yet significant, changes in function and status, which can be critical for any necessary treatment modifications. A licensed practical nurse (LPN) has been trained to provide home health or nursing care under the supervision of an RN or a medical doctor. These individuals, along with nurse's aides, provide direct patient care, such as oral cleansing. An LPN provides regular reminders and support services, reinforces exercise and good nutrition regimens, and may provide daily oral home care. Hospice nurses provide palliative care, including emotional and spiritual support, for individuals with chronic or terminal illnesses.

### Nurse's Aide or Nursing Assistant

The nursing assistant works directly with patients, providing assistance with ADL, including oral home care, eating, drinking, dressing, toileting, and bathing.

### Advanced Practice Nurse, Including Nurse Practitioner

The advanced practice nurse or nurse practitioner (NP) has completed advanced training beyond the RN and is trained for expanded practice capabilities, including independent practice, depending on training and jurisdiction.

### Certified Registered Nurse Anesthetist or Anesthetist

The certified registered nurse anesthetist (CRNA) has completed advanced training beyond the RN with a focus on administration of anesthesia, sedation, and control of pain and anxiety. Nurse anesthetists provide work in collaboration with surgeons, anesthesiologists, dentists, podiatrists, and other qualified health professionals.[6] They may be the primary providers of anesthesia care in rural settings and often provide general anesthesia in an operating room or outpatient treatment setting for patients unable to tolerate dental care in a routine clinic setting.

### Pharmacist

The pharmacist is a health professional who dispenses medications prescribed by other health professionals and provides health screening, health education, and valuable health information on drug interactions and contraindications. Some pharmacists also provide direct patient care, as well as compounding drugs as prescribed by the dentist when commercial drugs are not available or when custom formulations will better suit the patient's needs. In an inpatient setting, the pharmacist may administer daily medications and titrate to appropriate doses; provide expertise on drug combinations, interactions and efficacy; identify patient allergies to medications; and make recommendations regarding discontinuation

or alteration of anticoagulants or chemotherapy agents when acute side effects are noted. In an outpatient or retail setting, the pharmacist provides patients with access to prescription and over-the-counter (OTC) medications, administers some immunizations, performs health screenings, monitors drug combinations and interactions, and educates patients and other health professionals about drug side effects and frequency of administration. The pharmacist can be an excellent resource to the dental team, suggesting strategies for improving patient compliance in taking the medications and enhancing drug efficacy. The dental team may contact a patient's pharmacist to obtain a list of an individual patient's medications.

### Social Worker/Case Worker/Case Manager

These professionals can provide essential emotional and social support to the patient/client, caregiver, and family. When the patient, the patient's family or friends, or the community at large becomes aware that an individual is no longer able to effectively provide for his or her own daily needs, a social worker (SW) is often called on to assist in identifying strategies for improving the situation. The SW's role typically includes locating, activating, and facilitating the provision of medical care, social services, transportation, home care, and assisted living or nursing home care as needed. Such individuals are skilled in identifying funding sources, including private insurance, public assistance, religious groups, and nonprofit charitable organizations. In so doing, they help patients meet basic needs, identify resources to pay for oral and general healthcare, and improve the patient's quality of life. This includes coordination of care for patients who require healthcare coverage and access to treatment. This activity may involve working with a legal guardian to aid in facilitating healthcare decisions on the patient's behalf, contacting family members to obtain informed consent, responding to family members who disagree with recommendations, and helping patients with understanding recommendations. Often, the SW will implement discharge planning for an admitted hospital patient. SWs can provide valuable medical, social, and financial information about the patient to the dental team.

### Mental Healthcare Professional

This provider routinely works to develop strategies and plans to enhance patient well-being, cooperation, and compliance for individuals with special challenges or distractions, specifically those who may have cognitive impairment or mental illness, or exhibit unhealthy behaviors or self-destructive habits. Collaborative efforts with oral health professionals can aid in facilitating care. For example, patients with dental fear are often treated in a team-based clinical setting. The mental healthcare professional can provide cognitive behavioral therapy or biofeedback to help the patient manage fear and anxiety, so that he or she can receive dental treatment with less discomfort. The dentist may augment this therapy with pain or anxiolytic medications as well. In some situations, the patient may also be receiving treatment from a psychiatrist for underlying mental illness. All of the team members work together with the patient to determine the best treatment plan for the individual.

### Speech and Language Pathologist

The speech and language pathologist can provide evaluation and rehabilitation for the patient who has suffered a stroke or received head trauma, or for the patient with head and neck cancer who has undergone surgical and/or radiation therapy. A speech and language pathologist will have expertise in the evaluation of such patients and in therapies for treating difficulty in swallowing (dysphagia), aspiration, or voice and articulation, all of which affect quality of life. Therapists in these areas also care for patients with neurologic disorders and craniofacial anomalies affecting speech and swallowing, as well as assessing patients for functional swallowing capacity before tracheostomy or feeding tube removal. Working with a speech and language pathologist may assist the patient in achieving improved, mitigated, or corrected communication function. An improved ability to communicate with the dentist can have multiple benefits for the dental team and will help to make the provision of oral healthcare services more efficient and effective.

### Audiologist

The audiologist may contribute to the care of the patient with a suspected hearing deficit. This provider assesses hearing function and communication skills and the ways in which these problems may affect social interactions and relationships in various environments, including school and workplace. Audiologists are a critical component of the craniofacial and cleft lip/palate team.

### Physical Therapist

This professional provides therapy, stretching and exercises to address muscle-associated temporomandibular disorders (TMDs), as well as **trismus** (defined as any restriction to mouth opening, including restrictions caused by trauma, surgery or radiation) and **microstomia** (a congenital or acquired reduction in the size of the oral opening that is severe enough to compromise physical appearance, nutrition, and quality of life). Although the dentist and other healthcare providers have some strategies to address these issues, the physical therapist has specific training and expertise that will be essential for the optimal and comprehensive management of such problems.

### Dietitian

This licensed healthcare professional assists and advises patients about healthy diets and dietary alternatives, especially individuals with metabolic diseases, such as diabetes or hypercholesterolemia, and those with hypertension, vitamin deficiencies, or food allergies. They have expertise in determining nutrient/caloric recommendations for patients undergoing head and neck cancer treatment or who suffer from protracted forms of stomatitis. The dietician can prescribe medical therapeutic nutrition.[7]

### Anaplastologist/Maxillofacial Prosthetist and Technologist

This provider focuses on the prosthetic rehabilitation of an absent, disfigured, or malformed anatomically critical segment of the face or body. These providers can work in collaboration with a maxillofacial prosthodontist and/or ocularist to customize the fabrication of a facial prosthesis, including ocular within orbital, nasal, and auricular prostheses. See Figure 5-1 for treatment photographs of a patient with a maxillofacial prosthesis.

## COMMUNICATION OR REFERRALS TO OTHER HEALTH PROFESSIONALS

Several time points throughout the course of patient assessment, diagnosis, treatment, and continuing care can be identified at which the dentist may need to communicate with or refer the patient to other health professionals. The following section will illustrate when and how collaboration should occur in those cases in which the complexity of the patient's problems requires collaboration to provide safe and effective treatment. In some situations, it may not be *feasible* for dental treatment to proceed, because key information is lacking or because there are barriers to care that cannot be overcome without teamwork and the participation of all team members. The extent to which dental care and care provided by other health professionals is integrated into a cohesive treatment plan depends on a *shared understanding* of all the patient's problems and chief concerns, the *prioritization* of problems and treatment options, and the *coordination* of care.

The oral health provider must consider several factors when coordinating care or consulting with other health professionals (Box 5-2). A **consultation** involves referring a patient to another clinician for an opinion and/or treatment for a specific problem or communicating with the patient's current healthcare providers to obtain specific information about the patient's condition, history, treatment, or prognosis.[8] When determining the need for a consultation request, the dentist should consider the following questions:

1. Is a consultation needed, and with whom?
2. How could this help the patient?
3. When (timing) would the consultation be requested?
4. What focused questions will be asked?

The following section illustrates how collaboration with the physician and other members of the healthcare team may be needed at various times during the course of patient care, including in relation to initial patient evaluation, treatment planning, and active treatment, and during maintenance care.

**BOX 5-2 Decision-Making Checklist**

- Do I need to modify my treatment to prevent a medical emergency or other complications?
  - Does my patient have any significant allergies?
  - Is there a risk of medical emergency during dental treatment?
  - Increased risk of bleeding?
    - How to prevent? Manage?
  - Increased risk of perioperative infection?
    - How to prevent? Manage?
  - Medications?
    - Any interactions with drugs I will prescribe/recommend/administer?
  - Any oral side effects?
- Do I need information from the physician? How will this alter my treatment plan?
- Does the patient's medical condition affect oral disease risk?

### Patient Evaluation

At the time of examination and assessment, the dentist screens the patient for signs and symptoms of systemic

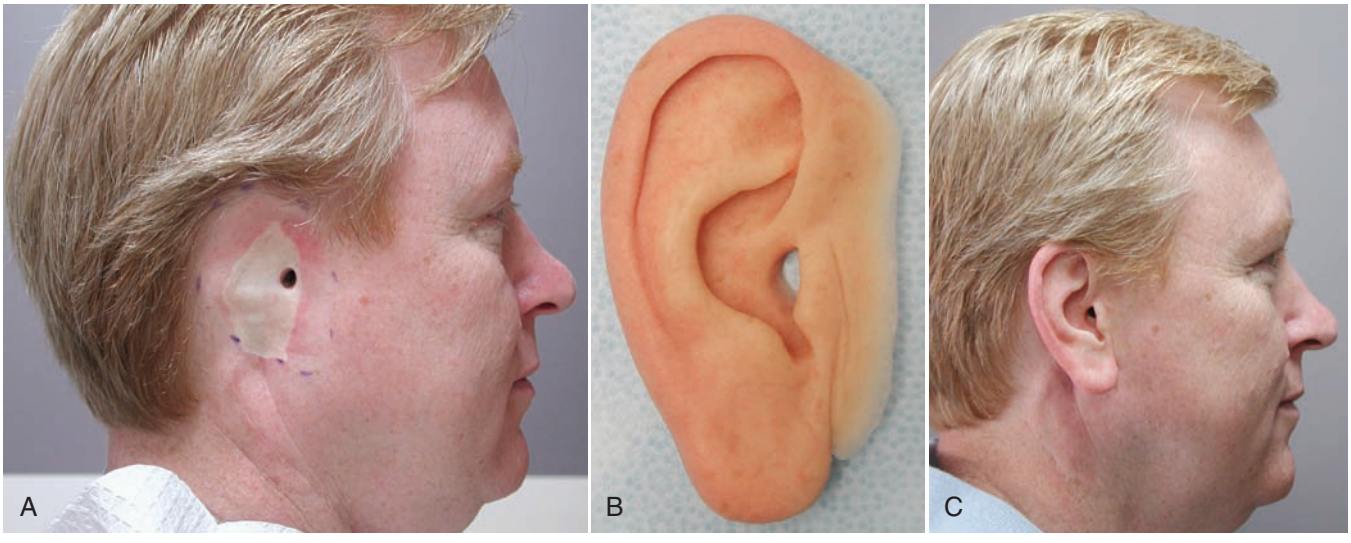



**FIG 5-1** Photos of a patient requiring a prosthetic ear, or auricular prosthesis, with postoperative/pre-prosthetic **(A),** auricular prosthesis **(B),** and post-prosthetic **(C)** photographs. (Courtesy Stephanie Kline, MSE, MS, Ann Arbor, Mich.)

conditions that may affect oral health or dental treatment, as well as conditions that could have an effect on systemic health and the management of medical conditions (see Chapter 1). The dentist may observe and recognize the need to manage oral manifestations of systemic diseases or oral reactions to systemic medications, such as dry mouth and taste disorders. Collaboration with other members of the healthcare team will be necessary to ensure that oral problems are appropriately addressed (see Chapter 7). Common reasons for requesting an evaluation or consultation with non-dental care provider include the following.

### Screening for and Optimal Management of Systemic Conditions

For example, the dentist routinely obtains blood pressure readings for each patient at the time of initial or recall examination. Repeated elevated blood pressure readings may indicate undiagnosed hypertension or a loss of control of hypertension in a patient who is already under treatment for it. Similarly, a patient seeking dental care for recurrent oral fungal infections or a recurrent periodontal abscess may exhibit elevated blood glucose readings and elevated HbA1c, indicators of possible undiagnosed diabetes. In such cases, it is appropriate for the dentist to consult with the patient's primary medical care provider for further evaluation of the patient.

### Systemic Conditions Contributing to an Oral Health Problem

A patient with posttraumatic stress disorder, anxiety, or depression may be taking psychoactive medications, many of which can cause dry mouth. As the number of such medications increases, the likelihood of xerostomia greatly increases. Consider the situation in which such a patient presents to the dentist with multiple carious lesions and toothaches, secondary to dry mouth and dietary factors. Eliminating current pain is an urgent priority. After this, however, optimal control of the mental illness and its symptoms is the highest priority for the patient, although preventing long-term dental disease and its associated pain and costs of care are also high priorities. To treat the active caries and reduce the long-term risk of recurrence, the dentist must collaborate with the primary prescriber to consider selection of alternative medications that will be less likely to cause dry mouth while accomplishing the higher-priority goal of managing the patient's mental illness. The pharmacist, with deep expertise in pharmacotherapeutics, can be involved to help solve this difficult problem and offer solutions that will achieve the competing goals for treatment. The dietician may assist with diet counseling to minimize long-term caries risk. This type of teamwork should be active at the time of the patient's initial evaluation, as expert input is necessary to prioritize treatment goals that will affect the prognosis as well as the dental treatment options available.

### Oral Manifestations of Systemic Conditions

Often, the early signs of Sjögren's syndrome or other autoimmune diseases include dry mouth and increased caries activity. The dentist may sometimes be the first healthcare provider to recognize this problem. The dentist then refers the patient to either the primary care medical provider or a medical specialist in rheumatology for evaluation and diagnosis. It will be important to have information about the diagnosis before beginning dental treatment, because such information may significantly alter the patient's dental prognosis and the development of an appropriate treatment plan. A team approach allows the dentist to design and prioritize treatment so as to manage all of the relevant complications associated with this disease. The team will probably include an ophthalmologist to treat eye symptoms, a speech and language pathologist to manage swallowing problems, a dietician to determine an appropriate diet, a rheumatologist to diagnosis and treat the Sjögren's disease itself, and a pharmacist to help select medications and products, such as saliva substitutes, that will optimize salivary function.

### Oral Health Problems Associated with Medical Treatment

An example can be seen in the patient who develops mouth pain and ulceration during the course of cancer chemotherapy. With the rest of the oncology team, the dentist helps to identify the source, rule out or treat active dental or other oral disease, and assist the patient in oral hygiene practices and pain management to restore and maintain oral health and facilitate adequate nutritional intake.

### Quality of Life and Life Expectancy Concerns

Oral health-related quality of life in patients with cancer can have a major effect on long-term prognosis. Similarly, dysgeusia and other taste disorders are associated with a significant reduction in the quality of life. A persistent bad taste in the mouth often requires a team approach to diagnosis and management. The first step is to determine whether there is an intraoral cause of the bad taste, such as dental caries or periodontal disease. The patient may be convinced that the cause is in the oral cavity—for example, that dental restorations need to be replaced—but in the absence of positive oral findings, the dentist must comprehensively assess the patient, in collaboration with others—for example, otolaryngologists, neurologists, or psychiatrists. The team-based taste disorders clinic includes all of these disciplines, along with dentistry. In another example, patients with a reduced life expectancy may need simplification or modification of the dental treatment plan and a realistic assessment of the effect of dental treatment on his or her quality of life. This patient may benefit from the psychosocial support of a social worker, mental health worker, religious or spiritual counselor, or psychologist. When death is imminent, hospice care may be appropriate, and the dental treatment plan may be modified to provide urgent treatment of pain and manage other sources of discomfort, such as dry mouth; treatment of active disease not likely to cause pain or infection becomes a low priority.

## Treatment Planning

During the course of treatment planning, the dentist may consult with other members of the healthcare team. For

example, dental care for the patient with head and neck cancer will be planned in concert with a head and neck tumor board. The dentist plays an integral role in the shared treatment planning, for such a patient and the treatment options and prognosis will often determine what dental treatment will be optimal. For example, the patient who will be treated by resection of a portion of the mandible will have very different dental treatment options than a patient whose primary curative therapy is radiation therapy. The dentist must present the concerns about oral health and their management in a way that can be well understood by other team members to ensure that the best treatment plan for the patient can be designed.

For example, the otolaryngologist/head and neck surgeon may recommend surgical treatment of a tumor in the floor of mouth or lateral sides of the tongue to be followed by soft tissue reconstruction that will result in limited tongue mobility and/or a reduction in the depth of the floor of mouth. These treatment side effects can be expected to impede oral hygiene practices and compromise the prognosis of any retained teeth. The dentist and the rest of the healthcare team need this information before any treatment is provided, as extraction of teeth near the surgical site may be necessary to avoid complications. Post-surgical radiation therapy may also be recommended. In this case, any mandibular posterior teeth in the field may need to be extracted because of dental caries, extensive restorations, or periodontal disease, as these conditions increase the risk for postradiation complications, and the affected teeth should be extracted before the radiation for optimal results. The dentist must ensure that the other team members understand the need to extract these teeth before radiation therapy, and ideally these extractions should be planned to be done at the time of the tongue surgery, to ensure adequate surgical access for the extractions. Otherwise, the tumor resection, oral reconstruction, and dental extractions are potentially compromised and the patient's overall prognosis negatively affected. As much as the rest of the team must understand the dental diagnosis and recommended treatment, the dentist also must not proceed with treatment until all aspects of the patient's overall treatment plan, sequence of care, and overall treatment goals are well defined and understood.

## Active Treatment

Through the course of active dental treatment, the dentist may collaborate with other members of the healthcare team to provide an evaluation of the patient's response to treatment—for example, in the case of a diabetic patient, to evaluate response to treatment for periodontal therapy and make subsequent modifications to other treatments to change the course of treatment. During treatment, the dentist may also need to consult with other healthcare team members for patients requiring additional medical care. For example, a patient receiving comprehensive dental treatment who suffers from oral-facial pain may need to be referred to other specialists (physical therapist, counseling psychologist, neurologist) or oral health specialists (oral and maxillofacial radiologist, orofacial pain specialist) for management of persistent facial pain before initiation of the rehabilitative phase of the dental treatment.

## Maintenance Care

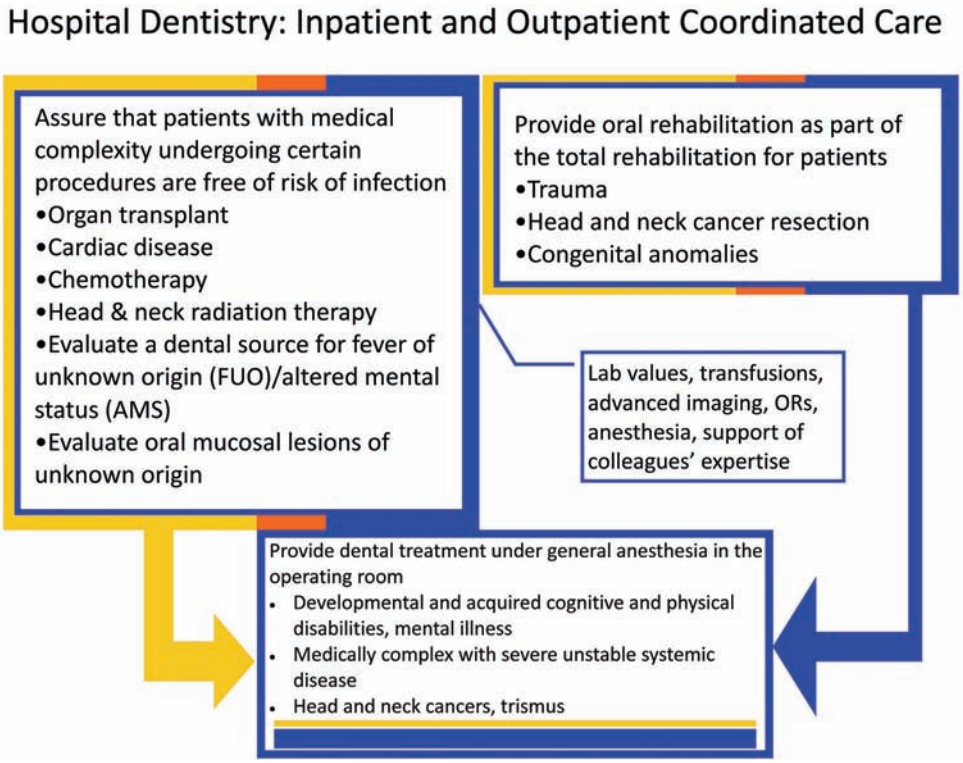
During the maintenance phase of dental treatment, the dentist will collaborate with other healthcare providers to (1) help minimize the risk for recurrent or relapse of oral diseases and (2) minimize the side effects and complications of treatment. In the case of an oral cancer survivor, for example, the dentist shares responsibility for recurrence surveillance with the head and neck surgeon, the medical oncologist, and the radiation oncologist through periodic oral and head and neck examinations and reinforcement of tobacco cessation. A patient who resumes smoking will need to be referred back to a behaviorist and/or pharmacist for tobacco cessation counseling and to the head and neck surgeon for additional biopsies and other diagnostic tests if new oral lesions are detected. Consultation with the pharmacist and other prescribing providers to reduce xerostomia associated with medications and other cancer therapies may also be necessary to ensure continued oral health.

### IN CLINICAL PRACTICE

**Interprofessional Collaboration in a Hospital**

The most integrated example of IP collaboration in oral healthcare occurs in the hospital dentistry practice setting (although collaborative care involving oral healthcare professionals can and should also occur outside the hospital setting). Dental professionals working in a hospital contribute to team-based decisions in daily practice, in addition to providing care in an environment similar to a private dental practice.

Dental professionals in a hospital setting integrate their practice within the larger scope of collaborative care in several ways. This includes not only inpatient care of admitted patients with a focus on urgent care, but also comprehensive outpatient and operating room care of patients with special healthcare needs, head and neck cancer, or congenital anomalies of the head and neck. Hospital dentists have ready access to the use of operating rooms and general anesthesia experts for those patients unable to tolerate care in a routine outpatient clinic setting. With the use of an electronic health record, they can readily access patient medical data and make thorough medical assessments, as well as communicate with other medical providers. They can rapidly consult with other specialists or emergency services for patients with medical complexity and special healthcare needs, including collaborative services for patients requiring emergency treatment around the clock. Examples of such emergency treatment include significant odontogenic infection, maxillofacial trauma, and posttreatment complications, such as bleeding. Blood products can be ordered, coordinated, and administered relative to the timing of invasive dental procedures. Advanced imaging modalities are accessible for diagnosis and treatment planning. Dental professionals in a hospital setting provide medically necessary dental care and constitute a significant element in collaborative care. The scope of hospital-based dental care is further depicted in eFigure 5-1 found in the expanded chapter on Evolve.




**eFIG 5-1** This flow chart depicts inpatient and outpatient coordinated care of a hospital dentistry practice.

In the United States, practitioners must obtain clinical privileges for the hospital in which they wish to work. In most instances, postdoctoral training is required to become such a provider. In the United States, this training is typically achieved by participating in a general practice residency (GPR) program. A GPR program not only provides an advanced general dental education, but also includes additional training in anesthesiology, pharmacology, operating room procedures, and treatment of medically complex patients. In the hospital setting, verification of healthcare practitioners' credentials and approval of the procedures they are allowed to perform based on these credentials are required to increase patient safety, reduce medical errors, and ensure high-quality healthcare services. **Credentialing** is the process of assessing and confirming the qualifications of a healthcare practitioner. This complex process includes collecting and verifying information about a practitioner, assessing and interpreting the information, and making decisions as to the individual's qualifications. **Privileging** is the process that healthcare organizations use in authorizing practitioners to provide specific services to patients. A health center must verify that its licensed or certified healthcare practitioners possess the requisite skills and expertise to manage and treat patients and to perform the procedures that are required to implement the authorized services.[9]

## DENTISTRY AS PART OF THE MEDICAL TEAM

A dentist may work with other healthcare providers as part of a collaborative healthcare team that has been assembled to treat patients with complex problems—for example, individuals with craniofacial anomalies. A team assembled to support a cancer clinical trial to treat head and neck cancer with a new agent or technique is another example. In these settings, all patients are assessed and managed by all team members, often with coordinated appointments and regular team meetings, to discuss diagnosis, treatment planning, and outcomes.

The three major reasons that the dentist may be consulted or asked to collaborate in the care of a patient who is being managed primarily by another health professional are:

- Oral disease is contributing to or has the potential to contribute to a general health problem or compromise its treatment.
- During examination, dental issues are detected that raise concerns to a healthcare provider who is not a dentist.
- Specific referrals are made to the dental team for assessment, diagnosis, and treatment.

### Oral Disease Contributing to a General Health Problem

The link between oral health and systemic health has been described in great detail in the literature.[9a-9g] Several systemic diseases may be associated with periodontal disease, for example, including adverse pregnancy outcomes (preterm birth or low birth weight); increased risk of heart attack, stroke and other cardiovascular events; increased risk of kidney disease; and increased risk of dementia. Oral infection, as occurs with a dental abscess or active periodontal disease, can contribute to systemic infection in an immunocompromised patient who is about to undergo surgery (for example, cardiac valve replacement) and increase the risk of infective endocarditis. Oral infection can cause dysgeusia and halitosis. Other healthcare professionals may refer the patient to a dentist to assess whether an oral health problem is contributing to a patient's general health problems. An obstetrician may consult with a dentist concerning a pregnant patient to help ensure an optimal pregnancy outcome, as well as the optimal health of the child after delivery. Halitosis or dysgeusia (bad breath and/or bad taste) can be associated with dental disease but may also be associated with conditions such as sinus infections or digestive problems. After the dentist has ruled out oral problems, he or she will need to consult with the patient's primary healthcare provider, who may refer the patient to an otolaryngologist or gastroenterologist for examination and treatment.

### Dental Issues That Arise During Examination by a Non-Dental Healthcare Provider

Oral health is important to overall health. Increasingly, dentistry is included in the primary care setting, and this regular interaction has afforded other health professionals the opportunity to learn more about oral health and its importance. Also, some patients may seek care from another healthcare provider, such as the emergency physician or primary medical provider, for dental complaints, because they have limited access to dental care. Dental problems may also be detected during the course of evaluation for nondental problems—for example, during an annual health maintenance examination.

Common oral conditions that non-dental providers will recognize and refer to the dental team include caries, signs and symptoms of periodontal disease, fractured or missing teeth, broken or defective restorations, and limited chewing function or inability to chew properly. Through collaboration with dental team members, other healthcare professionals can be sensitized to recognize that oral health problems contribute to more general issues, such as social isolation and anxiety and poor school performance due to oral pain and oral pathology that may cause an altered facial appearance—for example, facial asymmetry or swelling.

### Specific Referrals to the Dental Team

There are many contexts in which referrals are routinely made to the dental team. These include referrals for comprehensive evaluation and treatment—for example, preprocedural oral evaluation or dental clearance, and oral healthcare for patients in supportive care facilities, as well as for management of a specific problem (e.g., evaluation for a potential oral source of systemic infection or oral evaluation in an emergency clinic). These are further described in the following sections.

#### Pre-Procedural Oral Evaluation

Providing **dental evaluation and clearance** is a routine practice in areas such as transplant medicine, head and neck

oncology, and cardiac surgery to ensure provision of any necessary treatment that could minimize the risk of infection and oral complications before such procedures. Whether a patient presents before systemic chemotherapy, bone marrow transplant, full organ transplant, cardiac surgical procedures, or head and neck cancer therapy, dentistry is an integral part of the overall management of the patient. Untreated dental infection or periodontal disease has the potential to compromise the patient's overall health by increasing the risk of systemic or localized infection and sepsis, rejection of grafted organs/tissues, and complications such as **osteoradionecrosis** (ORN) or medication-related osteonecrosis of the jaw (MRONJ). Dental treatment goals and planned treatment must be aligned with the overall treatment goals, as well as the timing and sequencing of the proposed medical treatments. Dental treatment options will depend on the patient's prognosis and the natural history of the disease.

### Clear and Timely Communication and Collaboration

**Clear and timely communication and collaboration** between all of the medical specialties involved is essential in situations in which the potential for morbidity and mortality is high. The dentist must have a clear understanding of the patient's health status, prognosis, and medical treatment plan before initiating any dental treatment. For example, the patient with end-stage liver disease who is a candidate for liver transplant will be scored using the Model for End-Stage Liver Disease (MELD) score. This score, a predictor of the patient's mortality risk, is used to prioritize care for such individuals. The dentist who is treating such a patient must know the MELD score to understand how much time is available for provision of the necessary dental treatment and the likelihood of the patient's receiving an organ transplant within the next few months. Extensive restorative treatment may not be appropriate for a patient with a high MELD score. Before any invasive dental care, laboratory studies are needed to assess and manage risks, such as the excessive oral bleeding and infection associated with end-stage liver disease. Necessary dental care to treat pain, infection, and active disease must be completed before the medical procedures for the transplant. For example, any oral conditions that pose a risk for infection must be treated before a patient's official listing for organ transplantation.

(NOTE: Refer to eFigure 5-2 for further details regarding the considerations and ordered logistics of providing dental clearance. Healthcare providers may use a specified format to communicate dental clearance status, as well as planned medical treatment decisions. See eFigures 5-2 through 5-4 for examples.)

MRONJ is a possible complication related primarily to the use of intravenous bisphosphonates. The long-term use of oral bisphosphonates poses a risk, as do newer antiresorptive agents.[10] Appropriate patient education and aggressive management of dental disease with invasive dental treatment provided before the start of the medication can help prevent this devastating complication. The entire healthcare team must collaborate to ensure that dental treatment is provided before the initiation of therapy and also that regular oral examination and follow-up are provided to optimize oral health and prevent long-term complications. Decisions to modify medical therapy must be shared by the team that includes the patient, the dentist and/or oral surgeon, and the medical oncologist or endocrinologist.

### Oral Health Status in Supportive Care Facilities

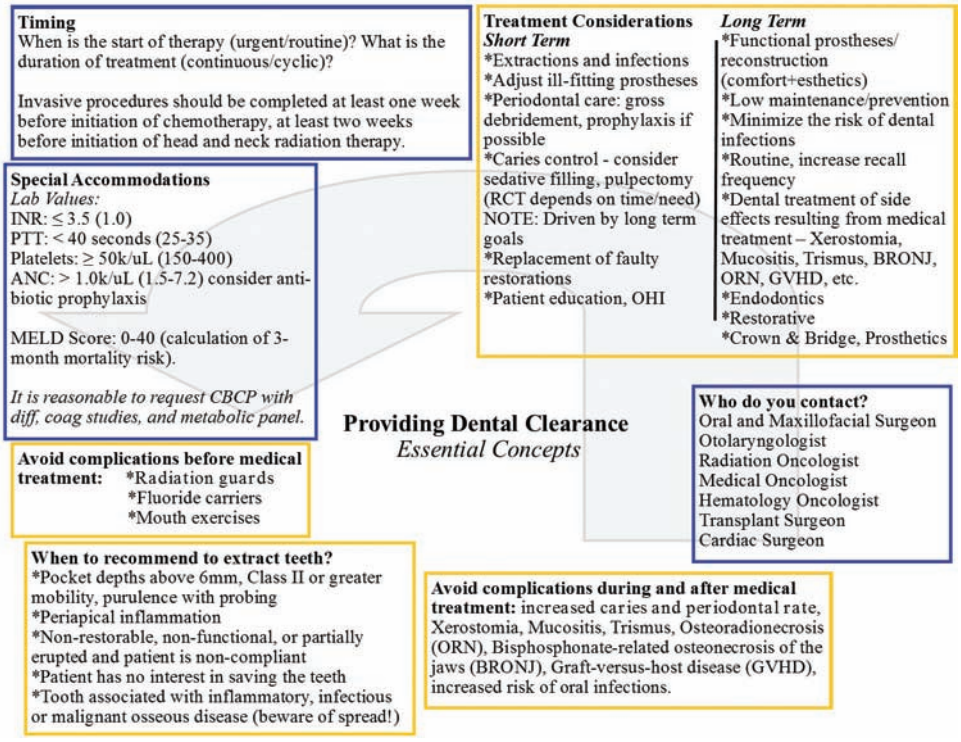
Patients who reside in assisted living, nursing home or group home facilities require a special degree of monitoring and continued assessment of oral health. Collaborative efforts with staff in these facilities, including caregivers, nurses, and physicians who provide care routinely, can improve the oral health status of these patients through preventive education in daily oral hygiene strategies and monitoring for signs and symptoms of pain and infection.

A staff member or health professional may be the most accessible individual and the person most familiar with the patient available to provide screening for oral health problems. The dental team can play a significant role in advocating for appropriate oral health assessments through education and calibration of the direct care staff in these facilities. When a patient has a known oral health diagnosis, a collaborative effort among the dental team, care facility staff, and the patient or his or her caregiver will be essential. The treatment plan may involve improved oral hygiene, use of a daily fluoride rinse, treatment of oral ulcerations or trauma, monitoring for signs and symptoms of pain after recent dental treatment, and even maintenance of removable prostheses.

These patients may express concerns relating to esthetics, function, or other problems; they may be unable to communicate that they have oral pain or tolerate routine daily oral care owing to cognitive or physical limitations; or they may exhibit uncooperative or combative behavior. (See Chapters 12 and 17 for further details on this topic.)

### Evaluation for Possible Oral Source of Infection

This type of evaluation may most often occur in a hospital setting, and as a result of the severity and urgency of the patient's condition, the oral health professional may be consulted regarding a possible source of infection in the oral cavity. A patient may present with a fever of unknown origin or an altered mental status, and an oral cause of infection may become the identified source. Similarly, a patient may present with a serious, life-threatening sepsis of unknown source, and culture of blood-borne bacteria may suggest an oral origin of the infection—for example, *Streptococcus.* In this situation, the medical team, including infectious disease specialists and critical care medicine providers, will rely on the dental team to identify the source of the infection and treat it appropriately. This process will require ongoing dialogue between the dentist, infectious disease specialist, and pharmacist to determine an optimal antibiotic therapy. If the patient has other medical and/or social problems, each of the healthcare professionals responsible for his or her care may be involved in the long-term management of these problems.




**eFIG 5-2** This flow chart depicts essential considerations and ordered logistics for providing dental clearance.

# TRANSPLANT CENTER

Liver Transplant Pre-operative Dental Clearance

Dear_____

As part of your liver transplantation evaluation, we need to determine if you have any significant dental health problems. You need to be seen by your local dentist and have them fax us this completed form once you have attained dental clearance. We will not be able to put you on the liver transplant waiting list until we have received this form or written clearance from your dentist.

Pre-operative dental clearance should include:
Full mouth films (as indicated)
Full mouth inspection
Treatment of active caries
Treatment of abscessed teeth
Extraction of chronically diseased teeth

Please note that cosmetic repairs including crowns, small cavities, orthodontic therapy and implants are not required for pre-operative clearance.

Please make arrangements to see your dentist promptly (i.e. within 4 weeks).

Your most recent blood work indicates that your clothing parameters are:

INR _____ ___ /___ /___ (<2.5 acceptable for most extractions)

Platelets _____ ___ /___ /___ (>50 K acceptable for most dental procedures)

If you have any questions, please contact the liver transplant coordinators at (XXX) XXX-XXXX.

---

**Dentist to Complete**
I have examined this patient and provide dental clearance.

Dentist Name: _____ ODS
Signature: _____ Date: ___ /___ /___
Phone Number: _____

Please fax completed form to Liver Transplant office (XXX) XXX-XXXX

*The United Network for Organ sharing provides a toll-free patient service line to help transplant canidates, recipients, and family members understand organ affocation procedures and transplantaion data. You may also call this number to discuss a problem you may be experiencing with your transplant center or the transplantation system in general. The toll-free patient services line number is 1-888-894-6361.*

**eFiG 5-3** This is a sample form used by dentists to communicate dental clearance status of patients before listing for liver transplantation to a hospital transplant center.

UNIVERSITY OF MICHIGAN HOSPITALS & HEALTH CENTERS
Radiation Oncology

## Head and Neck Radiation Referral to Dentistry

BIRTHDATE
NAME *(stamp patient's card here)*
REG NO.

To: Hospital Dentistry Today's date: ____/____/____ (MM/DD/YY)
From: Dr. _____ Pager #: _____

The patient is being referred for dental consultation and evaluation, as part of his/her radiation therapy.

**Diagnosis**: _____ **Date of simulation**: ____/____/____ **Time**:_____ A.M./P.M.

TNM Classification: T ____ N ____ M ____ Stage:_____ ICD-9 Code:_____

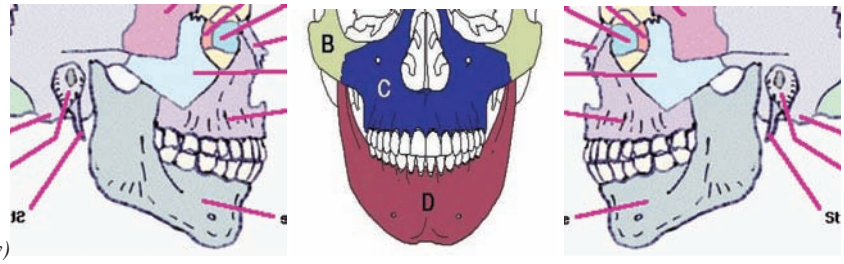
Describe location of primary site: _____

**RADIATION THERAPY**

Type: ☐ External Beam ☐ Interstitial ☐ Implant

Daily Dose: _____ cGy ☐ Once daily ☐ Twice daily Intent (i.e., curative, palliative) _____

Cumulative Dose (to primary tumor site): _____ cGy




Target :*( Please draw)*

Give anticipated cumulative doses to following areas (cGy):
Rt posterior mandible_____ Rt mid-mandible_____ Anterior Mandible_____ Lt mid-mandible_____ Lt posterior mandible ____
Right maxilla_____ Anterior maxilla_____ Left maxilla_____ Other (describe: _____) _____
(Anticipated) Starting Date: ____/____/____ Ending Date: ____/____/____ (MM/DD/YY)

**CHEMOTHERAPY** anticipated or completed? ☐Yes ☐No Oncologist(s): _____
*(If yes, indicate dates, chemotherapeutic agents, schedule, etc.)* _____
_____

**SURGERY** anticipated or completed? ☐Yes ☐No Surgeon(s): _____
(If yes, indicate extent of surgery, dates, reconstruction, etc.) _____
_____

Request for radiation prosthesis/ guard (specifics): _____
_____

**Please examine this patient, and make recommendations for dental therapy and appropriate preventive measures to avoid, or limit in severity, the oral side effects of radiation therapy.**

**Provider Signature**: _____ Provider #: _____ Date: ____/____/____ Time: _____ A.M./P.M.



| POD-0646 | Rev: 08/10<br>HIM: 08/10 | Medical Record | University of Michigan Hospitals and Health Centers | Head and Neck Radiation Referral to Dentistry |
|---|---|---|---|---|

**eFIG 5-4** This is the form used by University of Michigan Radiation Oncology to communicate to Hospital Dentistry about the planned anatomical locations and projected cumulative doses of head and neck radiation therapy for the purpose of dental treatment planning and coordination of care. (Courtesy Dr. Avraham Eisbruch and Dr. Samuel Zwetchkenbaum.)

### Oral Evaluation in an Emergency Medicine Setting

Patients may present to a hospital emergency department (ED) with a chief concern related to the teeth, periodontium, jaws, or other oral structures or tissues. Common concerns include pain, infection, dentoalveolar trauma, and bleeding. The perspective and accessibility of a dentist can aid in the evaluation and treatment of a patient with emergency oral treatment needs. Procedures that are commonly carried out by the dental team in a hospital emergency setting include the following:

- Identification of an oral source of infection and management with intravenous or oral antibiotic therapy
- Incision and drainage of an oral abscess
- Splinting or stabilization of traumatized teeth
- Pulpal management of fractured teeth
- Achieving hemostasis in a patient with oral bleeding

It is important to recognize that patients may have avoided seeking treatment in a dental office because of lack of funds or fear and anxiety. It may not be possible, or even appropriate, to execute definitive dental treatment in the ED. Nevertheless, the oral health professional can play a pivotal role in the assessment and diagnosis of the patient's oral problems and make treatment recommendations regarding both acute phase (see Chapter 8) and long-term (see Chapter 10) definitive treatment. If the ED has a dental component, some urgent care dental treatment, such as pulp extirpation, simple extraction, or a provisional restoration, can be provided on site by the dentist or dental team. This lessens the burden on medical colleagues who may not have the expertise to provide these services.

## CONDITIONS BEST MANAGED BY AN INTERPROFESSIONAL TEAM THAT INCLUDES DENTISTRY

This section discusses six conditions that are best managed by an IP team that includes dentistry. The first two are often administratively organized around all-inclusive regular IP team meetings (e.g., the head and neck oncology tumor board or the craniofacial and cleft lip/palate team). Typical members of these teams are listed in Box 5-3.

### Head and Neck Cancer

The dental team plays an essential role in recognizing, diagnosing, treating, and managing follow-up for patients with oral cancer and is solely responsible for managing and treating any dental problems for the patient throughout this process. The following discussion delineates the sequential roles of the general dentist and dental specialists and highlights the ways in which those roles are integrated with those of other IP team members.

#### Initial Recognition of Oral Cancer

The American Dental Association reports that 60% of the U.S. population sees a dentist once a year. These visits provide an excellent opportunity for the conduct of a thorough head and neck cancer screening. According to the National Cancer Institute, as of 2011 there were an estimated 281,591 people living with oral cavity and pharyngeal cancer in the United States. There were an estimated 42,440 new diagnoses of oral cavity and pharyngeal cancer in 2014, which represents 2.5% of all new cancer cases. This represents 11 new cases per 100,000 men and women per year. Head and neck cancers have an approximate 5-year survival rate of 62.7%. These survival rates are contingent on the cancer stage at diagnosis, a categorization that refers to the extent of a cancer in the body. Extent may be described as localized, regional, distant, or unknown. Early diagnosis, especially at the local stage, can lead to survival rates of up to 82.6%.[11]

**BOX 5-3 Examples of Specialties Involved in Organized Collaborative Team Care**

**Example 1: Tumor board**
Oral and maxillofacial surgery
Otolaryngology
General dentistry
Maxillofacial prosthodontics
Radiology
Radiation oncology
Medical oncology
Speech and language pathology
Social work

**Example 2: Craniofacial, cleft lip/palate multidisciplinary team**
Oral and maxillofacial surgery
Plastic surgery
Pediatric/general dentistry/orthodontics
Maxillofacial prosthodontics
Audiology
Nutrition
Speech and language pathology
Social work

#### Referral for Definitive Diagnosis and Treatment of Oral Cancer

The dental team should arrange for appropriate referrals when head and neck cancer is suspected. With many intraoral and perioral cancers, the oral and maxillofacial surgeon is often the first resource when a biopsy of a suspicious lesion is necessary. Lesions found on the skin of the face, neck, or scalp may be referred to a dermatologist or plastic surgeon for evaluation and treatment. Suspicious lesions in the pharynx or changes in the voice may be referred directly to an otolaryngologist (ear, nose, throat [ENT] surgeon) or to the patient's primary healthcare provider. The written referral should describe the appearance and location of the lesion, the length of time the patient has been aware of it, and any other symptoms. The results of any tests or treatment performed by the dental team should also be included.

The dental professional should notify the PCP of the cancer diagnosis and any specialist referrals that have been and are being made. The referring dentist should follow up with the

specialist to confirm the diagnosis and proposed plan of care. The general dentist will need to be available to answer patient questions. Patients will often ask the dental team about what to expect if the lesion is found to be malignant. Although the dentist will not be providing definitive cancer treatment, he or she will play a supportive role during the course of therapy. If a complete management team is not already in place, the dentist may appropriately provide additional referrals to a psychologist, medical social worker, or other health professionals and support groups. For the distraught, anxious patient facing a potentially life-threatening event, the compassionate professionalism provided by the dental team can be invaluable.

Treatment for cancer often involves a multidisciplinary team. Such teams, usually found at major teaching hospitals or academic health centers, are often called a **tumor board** and typically include a medical oncologist, radiation oncologist, and surgical specialist. For head and neck cancer patients, the team would include an oral and maxillofacial surgeon or an ENT surgeon. Often, a maxillofacial prosthodontist or general dentist is also included. Team-based decision-making provides the foundation for developing the next steps in a patient's head and neck cancer care.

## Planning Dental Treatment after Diagnosis of Head and Neck Cancer

Once the diagnosis of head and neck cancer has been made, the dental team, in collaboration with the other health professionals, will need to treat the cancer and provide long-term rehabilitative and preventive care for the patient. These patients present unique challenges for the dental team from the time of the initial visit through the diagnosis and treatment planning phases, and continuing through the remaining years of life. Throughout the process of treatment, rehabilitation, and maintenance, the dental team fills a pivotal role. Both the patient and dentist must be knowledgeable about the short- and long-term effects of the cancer and its treatments. Often, there are difficult treatment choices to be made—selecting from among multiple options, all with serious potential hazards and complications. Helping the patient to select from among several challenging treatment choices can be intellectually taxing and emotionally wrenching, but is also an integral part of being a holistic healthcare provider.

The dental patient diagnosed with head and neck cancer should have a complete dental assessment in preparation for treatment. A comprehensive dental examination, including radiographs and periodontal assessment, will be necessary to determine the extent of dental care necessary before the start of cancer therapy.[12-16] The presence of untreated oral disease can increase the risk of adverse effects from the cancer therapy.

As part of the dental treatment planning process, even the patient without dental disease must be informed of the transient and residual adverse effects of cancer therapies on both the hard and soft oral tissues. The edentulous patient should receive a dental examination before cancer therapies, including panoramic radiographs to identify any residual roots, impacted teeth, or cysts. Precancer treatment concerns, such as denture sores, candidiasis, bony exostoses, and tori, may be identified in the edentulous patient.[14,17,18] After a comprehensive assessment of the patient's oral condition has been made, treatment planning for pre and postcancer therapy can be addressed. Factors to be considered in planning urgent dental treatment for a patient with oral cancer must include the dental examination findings, head and neck cancer prognosis, head and neck cancer treatment plan and potential adverse effects, and individual characteristics of the patient.

The patient's dental history and motivation are important factors to consider when planning dental treatment. A patient's financial situation may also affect dental treatment decisions, because it will affect the individual's ability to maintain his or her teeth after cancer therapy.[12,14,15] Even the patient who is normally diligent with oral hygiene measures and regularly seeks routine dental care can be expected to be less diligent with personal oral care during this difficult time of cancer therapy. After successful cancer treatment, some long-term adverse effects, such as limited mouth opening and discomfort, may make oral hygiene a challenge. In addition, the change in the quantity and composition of saliva greatly increases susceptibility to dental caries. This is especially critical for the patient who has a history of dental caries and multiple restorations and/or endodontic therapy. Even a patient who has previously had a low incidence of dental caries may develop radiation caries after cancer therapy. Carious lesions may be found encircling the cervical surfaces of the teeth and on the incisal edges, as seen in Figure 5-2. These

**FIG 5-2 A,** Typical clinical appearance of radiation caries of cervical and incisal surfaces. **B,** Typical radiographic appearance of radiation caries. (From Hupp JR, Ellis E, Tucker MR: Contemporary Oral and Maxillofacial Surgery, St. Louis, Mosby, 2014.)

rapidly progressing carious lesions affect all remaining teeth, not just those in the field of radiation. This condition is attributed to an alteration of the saliva's buffering capacity, resulting in an acidic change in the patient's saliva.[12]

The type and location of the head and neck cancer are also important for dental treatment planning. The cell type and stage of the cancer will determine what therapies will be necessary and adverse effects that can be expected. Some head and neck cancers are treated with only local surgical excision, whereas others may require a combination of modalities (surgery, chemotherapy, and/or radiation therapy). The location and extent of the cancer will determine the dose and area of exposure to radiation therapy. The dentist needs to know which, if any, teeth will be in the field of radiation and whether the salivary glands will be affected. This must be communicated before initiation of radiation therapy. For example, a total radiation dose of less than 5500 cGy to the mandible is not associated with the same high risk of ORN as would be found with doses higher than 6500 cGy to the same area. In advanced stages of head and neck cancer, the prognosis for the patient's survival should be considered. In very advanced cancers, the treatment may be planned only to palliate symptoms. In these patients, the dental treatment plan may be primarily focused on pain management and the treatment of infection rather than on future oral rehabilitation.

The potential adverse effects of each type of cancer therapy must be taken into account in planning dental care. This is especially important for potentially permanent changes that will affect future dental treatment. Examples of adverse effects from cancer surgery or radiation therapy that may limit future prosthetic treatment options include oral structural changes caused by loss of hard or soft tissues or limited ability to open the mouth. Severe xerostomia may also follow surgery or radiation therapy and can lead to the development of caries and difficulty wearing dental prostheses. See eFigure 5-4C, Radiation Therapy Template.

## Coordinating Dental Care in Patients Before Cancer Therapy

Any urgent dental treatment should be provided without delaying the onset of therapy for the cancer. It is critical that any invasive dental treatment be performed as soon as possible, because the oral cavity must be given time to heal after dental treatment and before initiation of chemotherapy or radiation therapy. Early involvement of the dental team ensures optimal planning and timing of dental treatment before cancer treatment, so as to prevent debilitating complications, such as pain and oral infections.

An essential goal of dental treatment before any cancer therapy is to eliminate oral sources of bacteria and dental infection, such as periodontal disease, pericoronitis, and periapical pathosis.[12,15,16] If chemotherapy is planned to treat the head and neck cancer, infection should be eliminated before the onset of chemotherapy, because the agents used can cause the patient to become immunocompromised. In some cases, the patient may only need a dental prophylaxis, but any teeth with significant periodontal disease involvement should be extracted. This would include teeth at risk for an acute periodontal infection—for example, teeth with periodontal pockets 6 mm or larger, and those that are grossly mobile or have alveolar bone loss involving the furcation. Carious teeth need to be restored or removed. If there is a question of the caries involving the pulp, the tooth should be extracted to minimize the risk of continued or recurrent pulpal infection. Teeth with periapical pathology should be more strongly considered for extraction rather than performing initial or retreatment root canal therapy.[16] There are, however, exceptions to this recommendation. These include the patient who may not require chemoradiation therapy, the patient who is highly motivated to retain and maintain his or her dentition and demonstrates excellent home care, and the patient with abutment teeth that are or will be important for retention of a current or future prosthesis.

If the cancer therapy plan includes radiation therapy with or without surgery and/or chemotherapy, the dental treatment may need to be more aggressive, especially for a patient who has a history of poor oral hygiene practices and sporadic dental care. In areas of irradiated bone, a significantly increased risk is associated with the development of dental infection or complications after the extraction of teeth—most notably, ORN can be anticipated. In addition to extractions for caries, pulpal disease, or periodontal disease, as described previously, any other teeth with questionable long-term prognoses in the areas affected by radiation should be removed. In determining prognosis, the dentist must remember that even a patient with very good hygiene and regular dental visits will have great difficulty preventing radiation caries. Patient motivation is crucial, as is the patient's dental history. A significant change in the patient's habits is highly unlikely. Current dietary sugar intake, effectiveness of personal oral hygiene practices, and frequency of visits to the dental office must all be taken into account. Ideally, atraumatic extractions, alveoloplasty, and removal of exostoses should be performed using primary surgical closure. It is advisable to prescribe an antibiotic for patients with an acute infection at the time of oral surgery or at risk for infection during healing.[12,19] Patients who have an implant-supported dental prosthesis at the time of cancer diagnosis will need to have the metal components of the prosthesis removed before radiation therapy to prevent increasing the radiation dose to adjacent tissues as a result of radiation scatter. Healing caps may be placed on the osseointegrated implant fixture.[12] Often, the onset of radiation therapy is planned to begin within 6 weeks after cancer surgery. A delay in beginning this therapy can reduce the chances for cure and survival. Oral surgery must be completed at least 14 to 21 days before onset of radiation therapy to allow adequate time for soft tissue healing.[12,15,16,19] If at all possible, any oral infection should be eliminated before the onset of radiation therapy. Unfortunately, such a patient may be severely debilitated, have a poor prognosis or rapidly progressive disease, and require an immediate start of radiotherapy.

If any teeth are retained, the patient needs to be aware of the critical importance of maintaining oral health during and after cancer therapy. Before initiation of radiation therapy, radiation guards or a tongue-depressing stent should be provided to patients with metal restorations and must be coordinated to be delivered before the planning session for radiation therapy. As with any highly caries-prone dental patient, the fabrication of fluoride trays and initiation of daily home fluoride treatment is indicated. Patients are instructed to apply a 1.1% neutral pH sodium fluoride gel for 5 minutes daily. Fluoride treatment should be begun before cancer therapy, continued throughout cancer therapy, and considered for maintenance as well. Study casts may be necessary for constructing surgical stents or obturators, or for planning of future prosthetic rehabilitation.[12,17]

## Supportive Dental Care During Cancer Therapy

Maintaining oral hygiene and monitoring for adverse effects are two of the more important tasks to be implemented during cancer therapy. Side effects such as **mucositis** (the development of painful mouth sores), trismus, and xerostomia may develop during treatment. Many patients will be uncomfortable performing their usual oral hygiene regimens. Normal oral hygiene routines may cause excessive gingival bleeding, and the patient may only be able to tolerate oral rinses during this time. Encourage the patient to continue with the regimen for oral care using a soft toothbrush, antimicrobial oral rinses, and fluoride trays. An alternative to tooth brushing is to use wet gauze or sponge-tipped swabs to gently wipe plaque and debris from the teeth and gums. Dietary counseling is also important during this phase of treatment. Caloric and protein intake must be monitored and maintained during cancer therapy. Many prescribed dietary supplements have high concentrations of sucrose in a thick liquid that adheres to teeth. Patient education in oral hygiene is critical so as not to increase risk of dental disease.

Symptomatic care is continued as necessary. In the absence of infection, mucositis usually resolves within 2 to 4 weeks after completion of cancer therapy. Healing of oral tissue after radiation treatment may take as long as 6 weeks. Periodic oral examinations to evaluate the condition of the mucosa are needed. Any complication, such as an exposed bone spicule, should be treated promptly. It is helpful to review the potential signs and symptoms of adverse effects with the patient and his or her caregiver.

## Coordinating Dental Care After Cancer Therapy

After cancer therapy, the dentist continues to serve in an essential, often central, role, helping the patient to maintain optimal oral health, managing any oral complications or problems that arise, alerting other members of the healthcare team to any medical complications or recurrence of the cancer, and providing (or supporting the provision of) long-term prosthodontic reconstruction and oral rehabilitation. Treated successfully, these patients will value and appreciate a return to oral health, masticatory function, and an improved quality of life. Reconstruction of an esthetically problematic facial disfigurement can allow the individual to return to a more normal routine with an improved self-image and renewed purpose for living.

## Prosthetic Rehabilitation

Replacement of teeth may be indicated for patients who have received therapy for head and neck cancer. Prosthetic devices replacing both hard and soft tissue may be used to restore function and improve esthetics. This may include medically necessary maxillofacial prosthetics, such as a maxillary obturator, a mandibular resection prosthesis, and/or a palatal augmentation prosthesis, which may be retained or supported by natural teeth, the residual edentulous alveolus, or, in certain scenarios, dental implants. In planning prosthetic rehabilitation, the overall oral condition must first be evaluated, and the prosthesis should be specifically designed and maintained to minimize mucosal trauma and irritation while optimizing speech, chewing, and swallowing functions. Such prosthetic rehabilitation can restore both form as well as function, improving nutrition and restoring a sense of normalcy (see Figure 5-3 for an example of a maxillary obturator prosthesis).

## Long-Term Follow-Up: Maintenance and Surveillance

Scheduling regular dental appointments with the dental team is extremely important for patients who have been diagnosed and treated for head and neck cancer. The reasons include maintaining oral health, preventing oral disease, and monitoring for complications or recurrence of the cancer. A close follow-up of head and neck cancer patients is crucial to ensure diagnosis of a recurrence at an early stage (Figure 5-4). The patient and dental team must keep this in mind at each recall visit. Head and neck cancer recurrences have a much less favorable prognosis than the original disease and require more aggressive treatment. The patient may need additional surgery, chemotherapy, or radiation therapy, or a combination of these therapies. The dental team should be vigilant to ensure provision of an early diagnosis and to prepare the patient for any additional cancer therapy if recurrence occurs. Edentulous patients, in particular, must be seen for regular oral examinations to evaluate the condition of the soft tissue and monitor for disease or complications of previous therapy. Patients wearing removable prosthetics may have an increased risk of ulcerations caused by decreased quality and quantity of saliva. Without adequate saliva, the friction of the denture base against the mucosa increases; soft liners, therefore, are to be avoided, and special attention should be given to the fit of the denture, especially in undercut areas.

It is also the standard of care that the treating non-dental care provider will also perform routine surveillance evaluations to monitor for recurrence and manage any associated medical complications that may emerge. There may be other health professionals who can help the patient cope with issues of facial disfigurement, changes in personal relationships, ability to function in society, and financial consequences of the cancer and its treatment. In these cases, the dentist plays a particular role on the team with the other health professionals who contribute to the patient's cancer care.

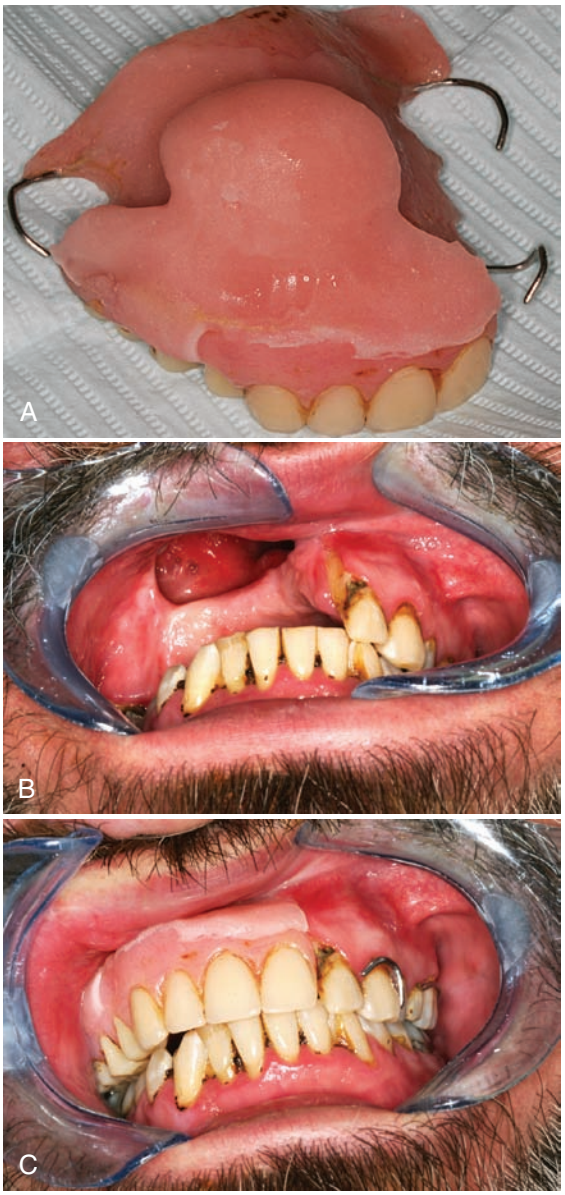



**FIG 5-3** An example of an obturator used to restore a maxillary defect in a patient after cancer surgery. **A,** Partial denture with obturator bulb. **B,** Postsurgical defect. **C,** Obturator in place, restoring appearance, speech, and masticatory function. (Courtesy Dr. Samuel Zwetchkenbaum.)

## Cleft Palate/Craniofacial Anomalies

The cleft palate/craniofacial (CP/CF) team provides expert, coordinated, collaborative, and comprehensive care for patients with congenital and acquired craniofacial anomalies and also collaborates with the patient's community-based healthcare providers, including the family dentist. Because these problems are less common and are complex and often unique, the healthcare providers' experience and special expertise greatly affects patient outcomes. Furthermore, coordinated care is essential to maximize patient safety and quality of care. Most CP/CF teams are located in tertiary care children's hospitals, often in larger cities or university communities, where the team can provide the care necessary to reconstruct the anatomic defects and coordinate plastic and reconstructive surgery, otolaryngology, and oral surgical care with dentistry, nursing and dietetics, and the anesthesiology team.

There are two primary roles for the cleft palate/craniofacial team:

- *Provide expert coordinated care for complex problems.* Most surgical and surgical/orthodontic treatment, prosthodontic rehabilitation, and subspecialty medical care is provided by the team at the children's hospital. Social workers and psychologists/mental health professionals play an important role in providing support to the patient and his or her family during the treatment and recovery period and between surgeries. To reduce the risks associated with general anesthesia, efforts are made to perform several necessary surgical procedures during a single operation (e.g., ear tube placements, dental extractions, and lip revision surgery).
- *Provide shared treatment plan recommendations for providers* who will treat the child in the community—for example, pediatric or general dentistry, orthodontics, school-based speech and language pathology, and primary pediatrics. The CP/CF team typically sees the patient once yearly for a periodic assessment. During this visit, which may require several hours, the various team members assess the patient, perform diagnostic imaging and other tests, and then meet to share their findings and recommendations and negotiate a final treatment plan. This

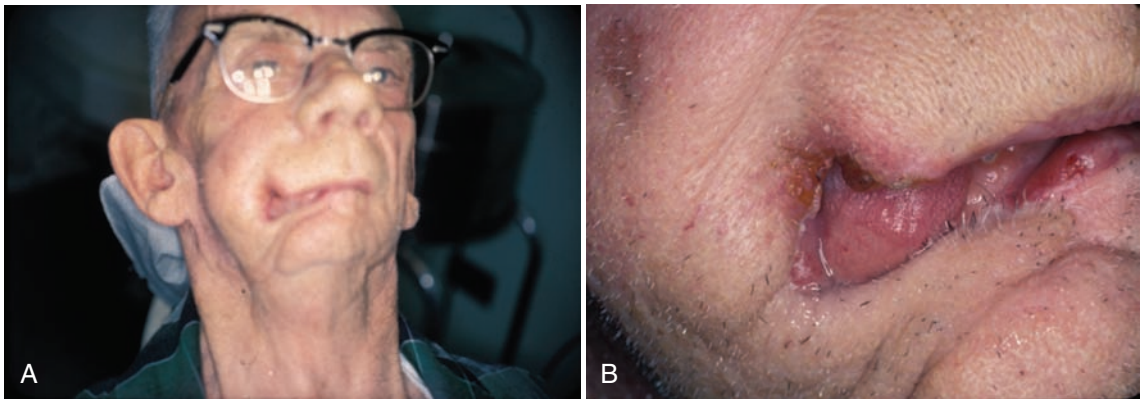



**FIG 5-4** **A,** Facial defect after surgery for squamous cell carcinoma of lip. **B,** Recurrence of cancer on anterior border. (Courtesy Dr. H. Dean Millard, Ann Arbor, Mich.)

plan is communicated to the patient and the patient's family and to the patient's primary healthcare providers—for example, the general dentist, pediatrician or family doctor, and school speech and language pathologist.

The child with cleft lip/palate will typically undergo several surgeries, sometimes beginning in the first 3 postnatal months, to support feeding and parental bonding with the infant, and then periodically throughout childhood and adolescence. Surgery is planned to coincide with critical stages of growth and development to repair the lip, close the palate, place bone grafts in the site of the cleft, place dental implants to replace missing teeth, and, in some cases, perform orthognathic surgery to facilitate proper function and esthetics, as well as soft tissue surgical revisions to the lip and nose. The orthodontist teams with the oral and maxillofacial surgeon and plastic and reconstructive surgeon to coordinate tooth movement and jaw surgery. Clinical psychologists and developmental pediatrics specialists work with the families to prepare the individual and his or her family for these difficult surgeries and postoperative challenges, and to provide support for the child's overall growth and development. At each step of the way, good oral health will be critical to the long-term success of the treatment.

Oral health must be established and maintained to support complete rehabilitation of these anomalies. Dental infections and active disease must be controlled before surgery to minimize postoperative complications. Dental care may be provided by a pediatric dentist or a general dentist who is a member of the team, but in many cases this care is provided by a dentist in the community, under the guidance and recommendations of the CP/CF team. Recall and routine dental care can be safely provided by the patient's own community dentist, but he/she must know when to contact the CP/CF team to better understand the long-term plan for the patient or discuss problems detected that must be addressed by the team.

## Temporomandibular Joint Disorders/ Orofacial Pain

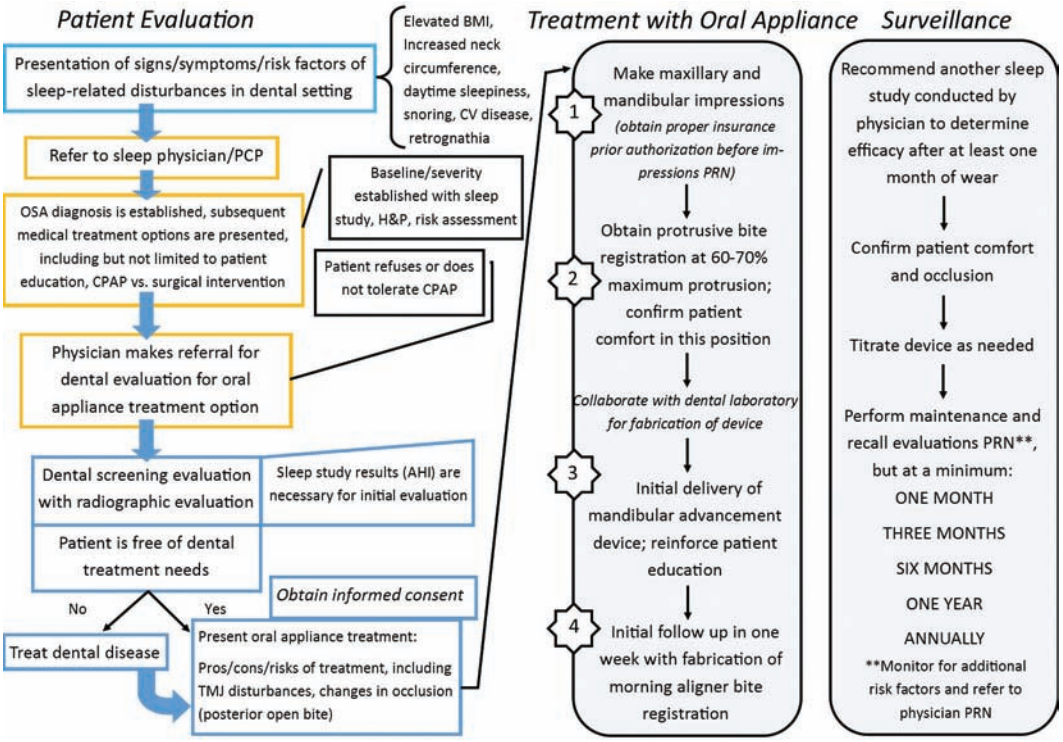
Orofacial pain and headaches are often diagnosed and managed by a team, including a general dentist or orofacial pain specialist, neurologist, physiatrist (a specialist in rehabilitative medicine), physical therapist, and clinical or behavioral psychologist. Patients with chronic facial pain, either post trauma or as a component of a complex chronic pain syndrome such as fibromyalgia, will often benefit from a multidisciplinary approach to pain management and rehabilitation. For example, a patient who presents with a chief concern of jaw pain and headache after an MVA may require treatment by the dentist, physical therapist, and counseling psychologist/behaviorist. Once neurologic pathology is ruled out by the neurologist, the dentist will rule out or treat dental causes for the pain and diagnose the source of the jaw pain through a comprehensive assessment of the patient, including diagnostic imaging of the temporomandibular joints (TMJs) and associated structures provided by an oral and maxillofacial radiologist. The physical therapist can help the patient improve range of motion and reduce pain through a combination of therapies that may include spray and stretch exercise, massage, and postural education. The counseling psychologist can identify coexisting mental health conditions that may contribute to the patient's pain experience or interfere with recovery and provide cognitive behavioral therapy and stress management to help the patient cope with the pain, as appropriate, or recommend referral to a psychiatrist for diagnosis and medical management of underlying depression or anxiety. If medication is needed to help manage pain, and the patient is already being treated for chronic pain and/or a mental health disorder, it will be desirable for one prescriber to provide the pharmacotherapy required to manage all of the patient's pain complaints to avoid complications associated with drug interactions or the development of dependence/abuse of opiate analgesics. The dentist must work with this provider if acute dental problems and treatment require short-term opiate analgesics. The dentist or a prosthodontist may provide occlusal appliance therapy. In some cases, the dentist may lead the team in the assessment and management of such patients; in other cases, the neurologist or general physician may lead and coordinate care. Some dental schools and medical centers have established facial pain clinics that provide IP team-based care for patients with complex orofacial pain conditions. The comprehensive diagnosis and shared treatment plan, developed with the patient at the center, anchor the care of patients with chronic and/or complex facial pain conditions.

## Obstructive Sleep Apnea

Multiple risk factors associated with obstructive sleep apnea (OSA) may be identified by an oral health provider, including body mass index (BMI) and/or neck circumference that is larger than normal, irritability and difficulty concentrating on tasks, daytime sleepiness, snoring, cardiovascular disease, and retrognathia. The oral health provider may identify these signs and symptoms and recommend consultation with a sleep specialist to establish a diagnosis. The diagnosis can be determined with a sleep study that records the number and extent of apneic or hypoxic events, measured in terms of an apneic hypoxic index (AHI). Standard treatment includes the use of a nocturnal continuous positive airway pressure (CPAP) device, but surgical intervention may also be considered. For patients who may be unable to tolerate a CPAP device or who would prefer to avoid an invasive surgery, an oral appliance may be an alternative treatment. In that case, the sleep specialist or primary physician may also refer the patient to a dentist for this therapy. The efficacy of the appliance is tested with a posttreatment sleep study, and further modifications may be necessary (eFigure 5-5).

## Head and Neck Trauma (Gunshot, Explosion, Motor Vehicle Accident)

Multidisciplinary care of the head and neck trauma patient is essential in optimizing and achieving a stable and functional result. A surgical service with specialization in the head and neck, such as oral and maxillofacial surgery,




**eFIG 5-5** This flow chart depicts the order and importance of involving other healthcare professionals in the management of obstructive sleep apnea with an oral appliance.

otolaryngology, or plastic surgery, is essential if the patient has sustained facial trauma, skull or jaw fractures, lacerations, or compromised airway. Neurology may also be critical if the patient has sustained neurologic or brain damage. The dental professional may not be consulted early in critical care but has an important role to play in assessment of the dentition and occlusion. Stabilization of a fractured maxilla or mandible requires the expertise of a dentist to determine a stable and functional occlusion for fixation. Nonrestorable teeth may pose the risk of aspiration in the traumatized patient and should be extracted as soon as possible. Such extraction will also minimize the risk for infection in the fixated patient. Traumatized patients requiring significant and urgent reconstruction will benefit from the dentist's specialized knowledge of the maxilla-mandibular relationship of the jaws if no other anatomic landmarks are available owing to the extent of the trauma. After stabilization of the patient's trauma status, rehabilitation often requires intraoral and extraoral maxillofacial prosthodontic treatment to optimize form and function. Specialists involved may also include a maxillofacial prosthodontist, an anaplastologist, and an ocularist.

### Combined Treatment in an Operating Room Setting

General anesthesia (GA) in an operating room setting can provide safe and predictable treatment of patients who are unable to tolerate care in a routine clinic setting or who require complicated or invasive procedures. Medically complex patients may require a general anesthetic if a systemic disease condition is unstable or if the provision of blood products may be necessary. Although surgical repair of a cleft lip and wide local excision of an oral cancer are obvious examples, comprehensive dental treatment in an operating room setting is also possible, especially for those patients with cognitive or physical impairments, mental illness, severe anxiety, or trismus.

GA is associated with medical risk, even for healthy patients. Performing multiple procedures at the same operation under GA can help minimize these risks by limiting the number of episodes of GA. Some medical procedures can be safely performed along with oral surgery and dental treatment. Examples of coordinated care include placement of ear tubes, performing a gynecologic examination, obtaining advanced imaging, and even trimming finger and toenails. The operating room theater for a typical dental case is exhibited in Figure 5-5.

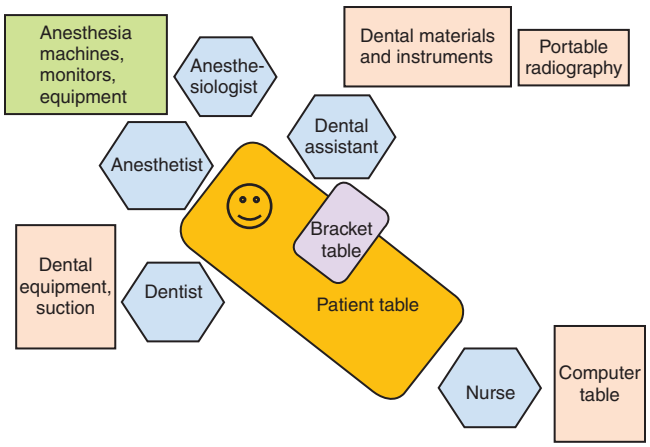



**FIG 5-5** The arrangement of a typical operating room theatre for dental treatment.

## CONCLUSION

This chapter has described ways in which dental treatment planning and delivery of care are performed in the context of an IP team-based collaborative approach. Around the world and in the United States and Canada, integrated collaborative care models are emerging that include dentistry as an essential component. In addition to providing comprehensive oral healthcare and coordinating multidisciplinary dental treatment (*intra*professional collaboration), the dentist must work collaboratively with other health professionals, family members, and caregivers to develop a mutually acceptable dental treatment plan centered on the patient's needs and values. Some patients, especially the frail elderly and those with craniofacial anomalies, cancer, or complex chronic illnesses, receive ongoing care from a wide variety of healthcare providers, including dentists. These patients are particularly well served by an interprofessional model of care and coordinated treatment planning.

IP education and IPC aim to improve healthcare systematically through improved outcomes, improved patient experiences and reduced costs ("Triple Aim" Healthcare Improvement).[3] In the past, dental care has been provided primarily in a delivery system external to the medical healthcare system. New and emerging public health models include dentistry as an integral branch of healthcare teams responsible for the health of an increasingly medically complex patient population. All health professionals on the team must recognize and value the role and responsibilities of each provider. Team-based care requires this interdependence and a certain essential openness and flexibility to meet the challenge of synchronizing varying perspectives on the patient's healthcare needs and requirements.

## REFERENCES

1. Government of Canada Publications: *Building on values: the future of health care in Canada*. http://publications.gc.ca/pub?id=237274&sl=0/. Accessed February 23, 2015.
2. Institute for Healthcare Improvement: *Triple aim for populations*. http://www.ihi.org/Topics/TripleAim/Pages/default.aspx/. Accessed February 23, 2015.
3. Craig C, Eby D, Whittington J: *Care coordination model: better care at lower cost for people with multiple health and social needs. IHI innovation series*, Cambridge, Massachusetts, 2011, Institute for Healthcare Improvement. http://www.ihi.org/resources/Pages/IHIWhitePapers/IHICareCoordinationModelWhitePaper.aspx. Accessed February 23, 2015.

4. Nelson S, Tassone M, Hodges B: *Creating the healthcare team of the future: The Toronto model of interprofessional education and practice*, Ithaca, NY, 2014, Cornell University Press.
5. Interprofessional Education Collaborative: *Core competencies for interprofessional collaborative practice: report of an expert panel*, May 2011. http://www.aacn.nche.edu/education-resources/IPECReport.pdf. Accessed February 23, 2015.
6. American Association of Nurse Anesthetists (AANA): *Certified registered nurse anesthetists fact sheet*. http://www.aana.com/ceandeducation/becomeacrna/Pages/Nurse-Anesthetists-at-a-Glance.aspx. Accessed February 23, 2015.
7. Academy of Nutrition and Dietetics: *Certified Registered Nurse Anesthetists Fact Sheet*. http://www.eatrightpro.org/resources/about-us/what-is-an-rdn-and-dtr/what-is-a-registered-dietitian-nutritionist. Accessed February 23, 2015.
8. Lockhart PB: *Oral medicine and medically complex patients*, ed 6, Ames, IA, 2013, Wiley-Blackwell.
9. *U.S. Department of Health and Human Services, Health Resources and Services Administration. Credentialing and privileging of health center practitioners, Policy Information Notice 2001-16*. http://bphc.hrsa.gov/policiesregulations/policies/pin200116.html. Accessed February 23, 2015.

9a. Mawardi HH, Elbadawi LS, Sonis ST: Current understanding of the relationship between periodontal and systemic diseases, *Saudi Med J* 36(2):150–158, 2015.

9b. Otomo-Corgel J, Pucher JJ, Rethamn MP, Reynolds MA: State of the science: chronic periodontitis and systemic health, *J Evid Based Dent Pract* 12(Suppl 3):20–28, 2012.

9c. Teles R, Wang C-Y: Mechanisms involved in the association between periodontal disease and cardiovascular disease, *Oral Dis* 17(5):450–461, 2011.

9d. De Souza CM, Braosi AP, Luczyszyn SM, et al: Association among oral health parameters, periodontitis and its treatment and mortality in patients undergoing hemodialysis, *J Periodontol* 85(6):169–178, 2014.

9e. Lee CF, Lin CL, Lin MC, Lin SY, et al: Surgical treatment for periodontal disease reduces risk of end-stage renal disease: a nationwide population-based retrospective cohort study, *J Periodontol* 85(1):50–56, 2014.

9f. Sanz M, Kornman K, working group 3 of the joint EFP/AAP workshop: Periodontitis and adverse pregnancy outcomes: Consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases, *J Periodontol* 84(Suppl 4): S164–S169, 2013.

9g. Holtfreyer B, Empen K, Glaser S, et al: Periodontitis is associated with endothelial dysfunction in a general population: a cross-sectional study, *PLoS One* 8(12):e84603, 2013.

10. Ruggiero SL, Dodson TB, Fantasia J, et al: *Medication-related osteonecrosis of the jaw—2014 update. American Association of Oral and Maxillofacial Surgeons Special Committee on Medication-Related Osteonecrosis of the Jaws*. https://www.aaoms.org/docs/position_papers/mronj_position_paper.pdf?pdf=MRONJ-Position-Paper. Accessed February 23, 2015.
11. National Cancer Institute: *Surveillance, Epidemiology, and End Results Program (SEER) stats fact sheets: oral cavity and pharynx cancer*. http://seer.cancer.gov/statfacts/html/oralcav.html. Accessed February 23, 2015.
12. Silverman S: *American Cancer Society atlas of clinical oncology: oral cancer*, ed 5, Hamilton, Ontario, 2003, BC Decker.
13. DeWitt KD, Lee N: Benign and malignant lesions of the oral cavity, oropharynx, and nasopharynx. In Lalwani AK, editor: *Current diagnosis and treatment in otolaryngology—head and neck surgery*, New York, 2004, Lange Medical Books/McGraw-Hill.
14. Lockhart PB, Clark J: Pretherapy dental status of patients with malignant conditions of the head and neck, *Oral Surg Oral Med Oral Pathol* 77(3):236–241, 1994.
15. Bruins HH, Jolly DE, Koole R: Preradiation dental extraction decisions in patients with head and neck cancer, *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 88(4):406–412, 1999.
16. Bruins HH, Koole R, Jolly DE: Preradiation dental decisions in patients with head and neck cancer: a proposed model for dental decision support, *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 86(3):256–267, 1998.
17. Beamer J, Marunick M, Esposito S: Maxillofacial rehabilitation: prosthodontic and surgical management of cancer-related, acquired, and congenital defects of the head and neck, Hanover Park, IL, 2011, Quintessence Publishing Co, Inc.
18. Beumer J, Curtis T, Morrish LR: Radiation complications in edentulous patients, *J Prosth Dent* 36:183, 1976.
19. Sulaiman F, Huryn JM, Zlotolow IM: Dental extractions in the irradiated head and neck patient: a retrospective analysis of Memorial Sloan-Kettering Cancer Center protocols, criteria, and end results, *J Oral Maxillofac Surg* 61(10):1123–1131, 2003.

6

# Ethical and Legal Considerations When Treatment Planning

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## CHAPTER OUTLINE

**Ethical Foundations in Dentistry**
- Societal Expectations of Health-Related Professions
- Principles of Biomedical Ethics

**Relationship Between Ethics and Law**
- Types of Law
- Law and Ethics

**Dentist-Patient Relationship**
- Confidentiality
- Accepting Patients into Dental Practice
- When Does the Dentist-Patient Relationship Begin?
- Who Must Be Treated?
- Terminating the Dentist-Patient Relationship
- Referring Patients
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**Applying Ethics and Law to Diagnosis and Treatment Planning**
- Informed Consent
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**Malpractice and Professional Liability**
- Duty
- Breach of Duty
- Damages
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- Other Factors
- Common Causes for Litigation
- Suit-Prone Patients

**Risk Management**
- Liability Insurance

**Conclusion**

A hallmark of any profession is the privilege of self-governance accorded to its members. This privilege is based on the expectation that members will put the needs of those it serves above their own needs. This chapter explores how treatment planning is shaped by the higher aspirations of the profession and the ethical and legal foundations that guide modern dental practice.

The successful practice of dentistry involves more than simply the delivery of technically excellent treatment. To be truly skilled in the art and science of dentistry, the dentist must assess each patient's condition help the patient to understand the risks and benefits associated with various treatment options, achieve agreement about a plan of care and then deliver oral healthcare at a level that meets or exceeds the **standard of care**. Underlying each of these aspects of successful practice are the ethical principles that are applicable to all healthcare professions. The dentist-patient relationship is built on a foundation of trust fostered by the dentist who is skilled, empathetic, and invested in working with each patient to determine what is in his or her best interest.

This chapter provides an introduction to the ethical aspects of treatment planning in dentistry and introduces legal considerations that affect the ways in which oral healthcare is delivered. The chapter highlights the importance of building a relationship of trust with patients through excellent communication and adherence to the core principles of bioethics. The value of confidentiality and of obtaining informed consent before evaluation and throughout the development and delivery of a treatment plan are discussed, together with the requirement for and importance of accurate and complete written documentation. Strategies for minimizing legal risk in treatment planning and the practice of dentistry are also introduced.

It is important to recognize at the outset that simply meeting minimal legal requirements will not fully satisfy the expectations held by individual patients, the profession, and society at large. The successful professional is aware of relevant laws and professional standards and can characterize the moral and ethical rationale for each law or rule. The accomplished dentist is prepared to apply systematic and critical thinking to reach a rational resolution when rules, laws, or ethics appear to be in conflict.

## ETHICAL FOUNDATIONS OF DENTISTRY

### Societal Expectations of Health-Related Professions

The selflessness that grounds all healthcare professions is an ancient expectation expressed in the Hippocratic Oath. That oath formalizes the expectation that physicians are obligated to act for the benefit of the patient, demonstrate skill and good judgment, and maintain confidentiality. The core values expressed in the oath form the foundation for contemporary societal expectations of all healthcare professionals, including dentists.

Medical and dental students often participate in the public statement of a professional oath (whether the Hippocratic Oath or a discipline-specific oath; Box 6-1). Many training programs hold a specific "white coat" ceremony to mark entry into the profession, the transition to clinical work, or graduation, and these ceremonies include a personal and public promise to fulfill the expectations of the profession.

**BOX 6-1 Examples of Oaths Taken by Healthcare Professionals**

**A Generalized Medical Oath (Taken by Some Dental Students or Graduates)**

I solemnly pledge myself before God and in the presence of this assembly, to pass my life in purity and to practice my profession faithfully. I will abstain from whatever is deleterious and mischievous, and will not take or knowingly administer any harmful drug. I will do all in my power to maintain and elevate the standard of my profession, and will hold in confidence all personal matters committed to my keeping and all family affairs coming to my knowledge in the practice of my calling. With loyalty will I endeavor to aid the physician in his work and devote myself to the welfare of those committed to my care.

**Another Oath Taken by Some Dental Students or Graduates**

I, as a member of the dental profession, shall keep this pledge and these stipulations. I understand and accept that my primary responsibility is to my patients, and I shall dedicate myself to render, to the best of my ability, the highest standard of oral healthcare and to maintain a relationship of respect and confidence. Therefore, let all come to me safe in the knowledge that their total health and well-being are my first considerations. I shall accept the responsibility that, as a professional, my competence rests on continuing the attainment of knowledge and skill in the arts and sciences of dentistry. I acknowledge my obligation to support and sustain the honor and integrity of the profession and to conduct myself in all endeavors such that I merit the respect of patients, colleagues, and my community. I further commit myself to the betterment of my community for the benefit of all society. I shall faithfully observe the Principles of Ethics and Code of Professional Conduct set forth by the profession. All this I pledge with pride in my commitment to the profession and the public it serves.

### Principles of Biomedical Ethics

Five core principles form the basis for the "The Principles of Ethics and Code of Professional Responsibility" published by the American Dental Association.[1] Respect for **patient autonomy** asserts that dentists "have a duty to treat the patient according to the patient's desires, within the bounds of accepted treatment, and to protect the patient's confidentiality."[1] **Nonmaleficence** or "do no harm" *(primum non nocere)* requires that dentists act to avoid harm or risk to patients, a responsibility that requires that the dentist recognize his or her own limitations. The principle of **beneficence** requires that dentists act to maximize the patient's welfare at all times. **Justice** asserts that dentists "have a duty to be fair in their dealings with patients, colleagues and society."[1] Justice prohibits dentists from discrimination against individual patients (or groups of people) and obligates dentists to assure access to oral health services for all members of society. The fifth principle, **veracity**, stipulates that dentists maintain truthfulness in all professional relationships. Each of these core principles of bioethics is shared among the health professions and are also reflected in parallel language within the U.S. legal system.

Although dental students are not eligible to be full members of the American Dental Association (ADA), the Student Code of Conduct of the American Student Dental Association (ASDA), which is based on the ADA Code of Conduct, applies to students throughout their training. The American Dental Education Association (ADEA) Code of Ethics applies ethical principles in the context of dental education, including treatment of patients in student clinics and the enrollment of patients as participants in research involving human subjects. Students may also be held to specific codes of conduct within their academic program or university.

## RELATIONSHIP BETWEEN ETHICS AND LAW

### Types of Law

In the United States, three main areas of law relate to the practice of dentistry: civil law, criminal law, and administrative law. **Civil law** governs the private legal relationships between two or more parties, as in cases involving negligent actions or **torts**. Civil law is relevant in cases involving malpractice. **Criminal law** is invoked when an individual commits a wrongful act against society or the public, as, for example, driving while under the influence of alcohol. A nonsanctioned act directed toward an individual, such as an assault or battery, may also be a crime. In the U.S. legal system, attorneys typically represent clients in any civil or criminal case. Whether in criminal or civil (tort-based) proceedings, the adversarial nature of the legal contest is designed to promote fact finding and to result in a fair decision based on law. Criminal or civil cases may be decided by a jury or by a judge alone.

The third type of law in the United States is **administrative law,** a smaller division of law governing state and federal regulatory areas relevant to the practice of dentistry—for

example, coverage and billing rules applicable to U.S. Medicare and Medicaid programs. In addition, states typically have an administrative code or set of laws that define the qualifications required to practice a specified profession and requirements for licensure, as well as state-specific regulations relating to the practice of that profession. For example, states may define the circumstances under which an adolescent is considered a mature minor and, as a result, legally allowed to give informed consent under the law.

### Law and Ethics

Law and ethical standards have many parallels and often provide similar conclusions in "gray" areas of practice. As a result, it is tempting to look first to the legal system to provide clear guidance. In practice, however, professionals must be capable of applying ethical principles and critical thinking when faced with uncertainty. In many clinical situations, there are no specific laws or previous case law on which to rely. Where case law exists, patterns of legal response can prove helpful but may also provide conflicting outcomes because of variations in specific cases. Some administrative laws simply state acceptable alternatives but do not provide clear guidance. For example, the law may *allow* a clinician to disclose information about infectious disease but not *require* such disclosure. Although it is helpful for the professional to understand that the law permits either disclosure or nondisclosure, the dentist is left to make a reasoned decision between the two alternatives. The dentist's decision and justification for the decision is, therefore, best grounded in ethical decision making.

Clinicians should be knowledgeable about relevant administrative law in the area in which they practice but should also be aware that these benchmarks serve as the *minimal* requirements for professional conduct. Simply adhering to these minimal standards will not satisfy patients' or the public's expectations of a dentist.

## DENTIST-PATIENT RELATIONSHIP

The dentist-patient relationship is founded on the assumption that patients and the public can trust the dentist to uphold the best interests of those served. Any relationship grounded in assumed trust is referred to as a **fiduciary relationship**. The dentist's duty in a fiduciary role is to offer every patient oral healthcare informed by the skills and judgment consistent with those held by any "reasonable" dentist. In legal terms, a "reasonable" dentist is expected to adhere to established standards of care that are usually established through expert witness testimony. It is clear from case law that educational program standards, readily available continuing education, and access to the evidence base found in the professional literature serve as the foundation for broadly accepted standards of care.

### Confidentiality

**Confidentiality** is the expectation that disclosures made to healthcare professionals will be protected. Confidentiality is a long-recognized duty of the members of any clinical profession and is described in the Hippocratic Oath. Confidentiality serves to build trust within professional-patient relationships and without it, patients may be reluctant to share details about their health that could be relevant to the overall outcome of care.

Aspects of the patient's history that are particularly sensitive, such as a history of substance abuse or mental health problems, often require additional protection by health professionals. For example, U.S. federal law and the Health Insurance Portability and Accountability Act (HIPAA) uphold the right to nondisclosure of certain aspects of healthcare, such as mental health records. State-specific administrative laws may place an even higher burden of confidentiality on healthcare providers and the records they maintain. The expectation of confidentiality extends to all employees of a dental practice, all of whom must also honor the confidential nature of the contents of the dental record and other healthcare information related to the patient. This may include statements by the patient that are not recorded in the chart or information gathered through the normal course of business in the office. Under the legal theory of ***respondeat superior***, the dentist, as employer and master under the law, can be found liable for damage to a patient resulting from breach of confidence by any employee in the dental practice. Therefore, dentists are responsible for training their staff and should have specific written policies related to confidentiality (See the *Confidentiality Case*.)

For both legal and ethical reasons, any disclosure of personal, financial, or health-related information within a treatment facility should be limited to those individuals who have a need to know the information to perform their official duties. Under HIPAA, monetary fines can be assessed for breaches of patient privacy, even unintentional or accidental ones. The law specifies that knowledge of private healthcare information must not be shared among staff who have no need to receive the information and that other private non-health-related information, such as financial data, must also be given the same protection.

Ethical and legal exceptions to the health professional's requirement to maintain confidentiality include identification of abuse and neglect, as well as specific health-related findings, such as certain infectious diseases. In the United States, every state requires licensed health professionals to report suspected physical abuse and neglect of a child, domestic partner, or elderly person. Some infectious diseases, including sexually transmitted diseases, may require disclosure to the state health department. There is considerable variability in these reporting requirements, however, and the requirements may also change over time. For example, in the United States, some states require disclosure of human immunodeficiency virus (HIV) infection, whereas others specifically forbid it.

Because confidentiality is not absolute, clinicians may encounter difficult dilemmas relating to disclosure of health-related information. For example, should an individual patient's infectious disease status be shared with parents, guardians, partners, or

other family members? In many states, disclosure guidelines are permissive, meaning that the dentist *may* disclose to another party without fear of repercussion, but is not required to do so. When the law is not conclusive and there are competing ethical considerations, the dentist will have to make a systematic and reasoned decision. Various guides for making ethical decisions are available in the literature (see, for example, eBox 6-1 *American College of Dentists' ACD Test for Ethical Decisions, and* eBox 6-2 *A Model for Ethical Decision Making adapted from Dental Ethics at Chairside* in the expanded chapter on Evolve).

These stepwise approaches to ethical decision making can be applied when the dentist is faced with any ethical dilemma. If the dentist perceives that the patient or patient's family may pursue litigation, it is also appropriate for the dentist to seek legal counsel.

## Accepting Patients into Dental Practice

Is a dentist obligated to accept all comers as patients? Although the dentist has no legal obligation to accept all prospective patients into the practice, caution must be exercised in this area. The principle of justice is highlighted in the ADA's Principles of Ethics and Code of Professional Conduct: "the dentist's primary obligations include dealing with people justly and delivering dental care without prejudice."[1] The refusal to appoint, examine, or treat a patient cannot be based on a legally impermissible reason. For example, in the United States, it is illegal for a dentist to refuse to treat a patient if the refusal can be shown to be based on the race, creed, or gender of the patient, because such status is constitutionally protected. Laws such as the Americans with Disabilities Act have broadened the list of persons with legally protected status to include, among others, persons with acquired immunodeficiency syndrome (AIDS) or those who are HIV positive.

After the initial oral evaluation, there may be patients whom the dentist may decline to treat. Examples include patients who are known to be overtly litigious, patients with unrealistic expectations, or patients who require treatment that is beyond the dentist's skill level or capability. Although it is expected that a general dentist would provide relief of pain or treatment of acute infection to a patient who is new to the practice, it is not required that the dentist accept such a patient into the practice for comprehensive care.

## When Does the Dentist-Patient Relationship Begin?

Although not always subject to precise definition, treatment begins when the dentist moves beyond the examination stage and implements treatment. Implied within this definition is the understanding that the dentist who initiates treatment has entered into the **dentist-patient relationship**. The establishment of such a relationship creates ethical and legal responsibilities for the dentist. Creation of a treatment plan that has been signed by the patient is clear confirmation of an established relationship.

In certain circumstances, a dentist may limit the clinical relationship to consultative services only. This might include an examination conducted to give a second opinion. Similarly, when a specialist accepts a referral for a particular procedure, the clinical relationship is usually limited to the procedure needed in that phase of treatment. However, when multiple dentists are involved, there may be questions about which professional is responsible for immediate as well as long-term follow-up care. Similar difficulties may arise in cases in which treatment must be interrupted: How, when, and at whose direction should treatment be restarted? Any limited-care arrangement should be expressly discussed between dentist and patient, agreed to, and documented in the record beforehand.

## Who Must Be Treated?

The dentist has an obligation to relieve pain and treat acute infection when possible. Therefore, a patient must be thoroughly examined to diagnose the cause of the pain or infection. Consultation with the patient should include discussion of proposed treatment and overall prognosis and take into account the dentist's skills and ability to provide the treatment in question. Through the proper disclosure in advance of the examination, it is possible to limit the care of the patient to the examination only, provide only the urgent care necessary, or provide a limited-scope treatment plan.

## Terminating the Dentist-Patient Relationship

If personal issues interfere with the dentist's ability to care adequately for the patient at any stage in treatment, treatment may be terminated. In such cases, the dentist must document the circumstances in the patient record. The entry should be factual and nonjudgmental, noting the problem (e.g., failed appointments, the patient's repeated noncompliance with clear and agreed-on instructions, failure to honor financial commitments) and any attempts that have been made to rectify it.

It is advisable to establish clear, documented policies related to patient behaviors, such as repeatedly failing to keep appointments or nonpayment of charges. These policies should be given and explained to patients at the time of enrollment in the practice and again in the event of a missed appointment or payment, and must be readily available in paper or digital form when requested by a patient.

In those cases in which ongoing treatment is interrupted or suspended, a letter should be mailed to the patient outlining the facts and any related practice policy, specifying the intent to sever the relationship, and providing options for continuity of care, access to records, and a list of other equally qualified dentists. The dentist should usually offer to complete treatment already begun. In cases involving multi-visit definitive prostheses, at a minimum, the patient should be provided with a foundation or stable provisional restoration. It is customary (and required in some jurisdictions) to provide emergency services for 30 days after notification of intent to terminate the relationship. If the patient's oral status will not be negatively affected by a reasonable delay in accessing continued care, this judgment should be documented in the patient record. A copy of the letter sent to the patient should be retained in the patient record (Box 6-2).

## eBOX 6-1 The ACD (American College of Dentists) Test for Ethical Decisions

- Assess:
  Is it true?
  Is it accurate?
  Is it fair?
  Is it quality?
  Is it legal?
- Communicate:
  Have you listened?
  Have you informed the patient?
  Have outcomes been explained?
  Have alternatives been presented?
- Decide:
  Is now the best time?
  Is it within your ability?
  Is it in the best interests of the patient?
  Is it what you would want for yourself?

Courtesy American College of Dentists, Gaithersburg, Maryland.

## eBOX 6-2 A Template for Ethical Clinical Decision Making.

**A Model for Ethical Decision Making*:**

Identify the alternatives (What choices are available and what might be their outcomes? What is the probability of each outome?)

Determine what is professionally at stake (What are the implications of each alternative from a professional perspective?)

Determine what else is ethically at stake (What are the implications of each alternative from a broader ethical perspective?)

Rank the alternatives in light of the professional and ethical issues at stake and the expected outcomes

Determine what ought to be done and do it (note: actualizing this step includes both *judging* and *choosing*)

*Adapted from Ozar D, Sokol D: *Dental ethics at chairside: professional principles and practical applications,* ed 2 , Washington D.C., 2002 Georgetown University Press.

**BOX 6-2 The Four-Paragraph Dismissal Letter**

*First paragraph:* Establish the facts—describe the diagnosis and the agreed-on treatment, stressing the role the patient was to play. State that the patient's active participation (e.g., cooperation or attendance for appointments) was vital to the success of the treatment. Include reference to any relevant policies and include copies of the policies as attachments.

*Second paragraph:* Describe and document the patient's failure to uphold his or her end of the bargain. State that this failure has negatively affected the prognosis for care and created a situation in which the dentist can no longer continue treatment.

*Third paragraph:* State the intent to sever the relationship. Suggest realistic alternatives for care. Point out the need for action on the patient's part, such as scheduling an appointment with another dentist.

*Fourth paragraph:* Discuss the availability of records and willingness to forward records (duplicates only). Emergency care is commonly offered on an interim basis. Close politely and include contact information.

### Referring Patients

When referring a patient, whether to a specialist, general dentist, or physician, it is particularly important that the referral and reasons for it are noted in the patient record. In most situations, the referral to another professional should be made in writing. A copy of the letter should be kept in the patient's record. In addition, the dentist should note in the record any follow-up phone calls or other communications with the other professional, as well as with the patient (see additional discussion of referral letters in Chapters 5, 7, and 12).

Designed to protect patients' confidential health information, HIPAA makes important exceptions for the exchange of health information among providers, most notably the Treatment, Payment, and Operations (TPO) exceptions. A practice (a covered entity under HIPAA) may exchange clinical information with other providers to further the treatment of a patient. The information exchanged between the providers should adhere to the "need to know" guideline previously described for confidential health information. But the receiving professional also must have all necessary historical and clinical information to be able to make an accurate diagnosis and treatment recommendation. Because the purpose of referral and consultation is to benefit the patient, these communications generally fall under the TPO exception. Nevertheless, it is good practice to inform the patient before communicating or sharing protected health information.

The principle of beneficence also helps to guide decisions relating to communicating with and referral to other healthcare providers. If the goal of the communication is to enhance the patient's well-being, the communication is justifiable. In practice, it is wise to maintain respect for patient autonomy and uphold the principle of beneficence by notifying the patient before making a referral. Should the patient object, the referral should not be made to that particular specialist, and other options should be explored in consultation with the patient. The referral, the patient's agreement to the referral, and the follow-up plan for the patient should all be documented in the patient record. Typically, the referred-to practitioner will communicate with the referring dentist to confirm the acceptance of the referral and again at the completion of specialty treatment. If no communication is received, the primary dentist is responsible for contacting the patient to resume care. All follow-up communication with the referred-to specialist should be noted in the patient's record.

### Nonreferral of Patients

The dentist must also be aware of issues surrounding failure to consult or make appropriate referral to specialists. Cases in some jurisdictions have attributed negligence to a dentist for failure to refer a patient if expert testimony can demonstrate that a specialist would have likely had a better result or even that the patient might have had a better chance at a positive result if the referral had been made. Negligence may also be found in cases in which referral to another practitioner was appropriate, but the referring dentist knew or should have known that the referred-to dentist was not capable of successfully treating the patient.

## APPLYING ETHICS AND LAW TO DIAGNOSIS AND TREATMENT PLANNING

The principle of respect for patient autonomy underlies the necessity for the dentist to work with each patient to reach an agreed-on plan of care. The patient is not expected to know and understand all of the factors a professional takes into account in developing a treatment plan, so it is the dentist's responsibility to educate the patient so that he or she can make an informed choice. This process is often referred to as **shared decision making**. In the United States, the courts have long recognized the right of a legally competent adult to decide what may happen to his or her own body. In 1914 in *Schloendorff v. Society of New York Hospital* Justice Cardozo wrote, "every human being of adult years and sound mind has a right to determine what shall be done with his own body; and a surgeon who performs an operation without his patient's consent commits an assault, for which he is liable in damages, except in cases of emergency, where the patient is unconscious, and where it is necessary to operate before consent can be obtained."[2] This right applies in all healthcare settings, including dentistry, and in practice requires that dentists obtain informed consent before engaging in any evaluation or treatment procedures.

### Informed Consent

**Informed consent** is the process of shared decision making that allows a patient to make a voluntary decision based on an understanding of the clinical problem, options available, and risks and benefits of each option.

### The Process of Informed Consent

The process of obtaining informed consent requires that the dentist explain the treatment plan, potential complications, alternatives, and any anticipated consequences of nontreatment in a way that the patient is likely to understand. During the conversation, the dentist must allow the patient an opportunity to ask questions and discuss options. The dentist must provide clear, understandable answers to any questions posed by the patient. The dentist should make every effort to observe and respond to both verbal and nonverbal signs of concern and convey genuine interest in ensuring that the patient understands the options and is not feeling pressured into making a decision. This process helps dentist and patient arrive at a shared understanding before the patient freely commits to what may be an irreversible course of treatment. Meaningful informed consent cannot be obtained when a patient is in acute pain, is highly anxious, or after he or she has been sedated for surgery, because under such circumstances the individual is unable to ask meaningful questions, understand the choices, or use clear reasoning to make decisions.

Dentists should identify any administrative laws in their jurisdiction that address additional requirements for consent. Some statutes require disclosures associated with specific procedures or may specify when written consent is required.

### Who Can Give Informed Consent? Competence and Decision-Making Capacity

In most countries, the right to make independent medical and financial decisions, as well as other legally binding commitments, is granted to adults when they have reached the legally defined age of majority. In the United States, this construct is called **legal competence** and is assumed on the eighteenth birthday for any individual who has not been declared incompetent through a legal hearing. Thus, most adults are considered legally competent to make health-related decisions. However, among adult patients, changes in cognitive capacity may occur in association with medications, anxiety, injury, illness, or other degenerative conditions. As a result, the individual may lack the cognitive capacity to provide voluntary, informed consent in a clinical setting.

Through the process of obtaining informed consent, the dentist should assess the extent to which the patient exhibits evidence of understanding the proposed treatment, including its risks and benefits, as well as the other options available, and the consequences of nontreatment. In addition, the patient must exhibit rationality in weighing the options and must communicate a choice. If all these criteria are met, the patient is considered to have decision-making capacity.[3] Capacity for informed decision making is not static. Patients may temporarily lose capacity after taking a sedative but regain it again when the effects of the medication diminish. Capacity is considered as a sliding scale, which means that patients may have capacity for some decisions, yet lack sufficient decision-making skills for more significant or irreversible decisions (e.g., orthognathic surgery). Because capacity can vary over time and with seriousness of the decision, dentists should assess patients' capacity to consent for each evaluation and treatment decision presented.[2]

### When a Patient Lacks Decision-Making Capacity

Adults with developmental, acute, or chronic cognitive disorders may lack the capacity to make their own dental and other healthcare decisions. In cases in which a judge has deemed a patient to be incompetent for healthcare decisions, a legal guardian is appointed by the court to serve as the patient's surrogate, and permission to evaluate or treat should be obtained from the legal guardian. In many cases, no legal ruling on the patient's competence will be available, so a determination that an individual lacks the capacity to give consent must be made by the clinical professional or a team of clinical professionals. When a patient is unable to make an informed choice, the dentist must identify another person to serve as the patient's representative. The person who speaks for the patient is referred to as a **surrogate decision maker** or proxy.

Under such circumstances, the dentist should establish whether the patient has identified an individual to serve as a surrogate decision maker. In the United States, this role can be formalized using a Durable Power of Attorney for Health Care (DPAHC) document. If the patient has not identified a DPAHC, the surrogate will most often be someone in the "next of kin" hierarchy: spouse, adult child, parent, adult sibling, adult grandchild, close friend, or guardian of the estate.[4]

Patients who are deemed legally incompetent or lack the capacity for informed consent should still be provided with an explanation of diagnoses and treatment plans and have an opportunity to ask questions, much like the model for obtaining assent used in pediatric and adolescent care (see Chapter 16). Most dental care requires patient cooperation, and including the individual with confusion, dementia, or developmental delay in the discussion may strengthen the clinical relationship and facilitate cooperation.

When the patient's cognitive capacity is unclear, the dentist should seek further guidance from the patient's physician or other health professionals involved in the patient's care, such as a social worker or nurse, before accepting the patient's consent to receive treatment. If the cause of uncertainty about capacity appears to be temporary—for example, self-medication before the appointment—the appointment should be suspended and the consent process conducted at a later time when the patient is capable of giving informed, voluntary consent.

### Informed Refusal

The process of shared decision making includes the possibility that the patient will make an informed decision to refuse the dentist's recommended plan. As with informed consent, the dentist should ensure that the patient is fully informed, the refusal is voluntary, and the patient demonstrates decision-making capacity. In some instances, the decision by the patient to refuse treatment will require more explicit evaluation

of his or her decision-making capacity with careful documentation because the patient is electing to elevate his or her level of risk. For example, if the patient's refusal poses an overall health risk, the dentist should ensure that the patient understands the risk. The associated discussion and decision should be carefully documented.

When a patient refuses treatment, the dentist should seek to understand the reason or reasons for the refusal but avoid trying to coerce the patient into accepting treatment, because such efforts obviate the voluntary nature of informed consent. If the reason for refusal can be addressed (e.g., cost), the dentist should make every effort to do so. The dentist should make a clear treatment recommendation, discuss the risks and benefits of secondary options or nontreatment with the patient, and convey a level of concern about the patient's health appropriate to the situation. The discussion should be carefully documented and include the information provided to the patient, the patient's reason for refusal, and examples of the patient's statements that document comprehension of the risk. It is preferable to leave open the possibility of the patient returning for treatment at a later date.

The dentist is not obliged to provide treatment that the patient has requested when the dentist believes the treatment would be professionally unsound or pose a danger to the patient. Similarly, the dentist is not obligated to continue to provide care for a patient when the patient is refusing treatment that the dentist believes to be critical for the health and safety of the patient.

Two issues illustrate this point: the patient who has what the dentist believes to be oral cancer (see *In Clinical Practice: An Ethical Dilemma* box), and the patient who refuses to have periodic dental radiographs (see Chapter 11, *In Clinical Practice: The Patient Who Refuses to Update Radiographs* box).

## IN CLINICAL PRACTICE

### An Ethical Dilemma

After graduation from dental school more than 20 years ago, some classmates kept in close touch as our practices were beginning. One classmate called during the first winter to discuss a new patient. When the patient had presented for his first examination, my friend noticed a lesion on the upper lip that he suspected might be cancerous. He called the lesion to the attention of the patient and suggested a biopsy. The patient declined; he only wanted his teeth restored. When the patient returned 2 weeks later, the lesion had increased in size and my friend's clinical impression was that this was a melanoma—a frightening prospect. He again pointed out the extreme urgency of seeking prompt and thorough intervention. He even considered removing the lesion without the patient's consent while the area was anesthetized for a nearby restoration. He felt strongly that he should intervene, but the patient was adamant in refusing the recommended treatment, even though it might be lifesaving. After the second visit, my friend wondered if he could ethically continue to treat this individual. One could argue that refusing to provide further care could only make matters worse, because by the time the patient had found a new dentist, the melanoma might be too advanced for effective treatment should the patient change his mind. The outcome? Unknown. The patient never returned for that third visit. He was, as is so often noted in our professional journals, "lost to follow-up."

When you have completed your study of this chapter, ask yourself what this dentist might have done to communicate the seriousness of the concern to the patient. How could he have better motivated the patient to seek treatment? Were there other management options that the dentist could offer short of dismissing the patient? What will you do if faced with a similar circumstance? (See further discussion on this in the *In Clinical Practice: Informed Consent* box in the expanded chapter on Evolve.)

## Documenting Informed Consent or Informed Refusal

The essential element in generating informed consent is open dialogue between the dentist and patient. The routine use of written consent forms has significant benefits, and when used appropriately provides *prima facie* evidence that informed consent has been achieved. Nevertheless, consent documented with a written and signed consent form should be viewed as an adjunct to, but not a replacement for the consent conversation between dentist and patient. It is also advisable to supplement the consent form with progress notes, detailing the treatment alternatives discussed, the questions asked by the patient and the answers provided, and including the reasons (if given) that a particular treatment recommendation was accepted or declined. These notes provide more patient-specific verification of the process of consent than does a signed standardized form alone, particularly if the patient does not (or cannot) read the form before signing it.

Although written evidence of consent is preferred, the court may *attribute* consent in certain cases. The lowest level of agreement or minimal consent (also called assent) is often sufficient when patients are new to the practice and seeking an initial examination, although explaining examination procedures will contribute to building trust between dentist and patient. It may also apply to patients who are established in a practice and undergo a routine procedure, such as a periodic examination and oral prophylaxis. This informal agreement is acceptable if the dentist ensures that the patient has an ongoing understanding of the purpose of the procedure, has previously experienced the same or similar procedures, and has previously been informed about and has an understanding of the benefits, risks, and alternatives. Changes in the patient's oral or general health status may necessitate a return to verbal and/or written consent.

When the dentist chooses not to use a signed consent form—for instance, with a "simple" restorative treatment plan and no notable alternatives to the treatment proposed—it is required that the dentist document in the dental record that the procedure was discussed, the elements of consent were covered, and the patient gave verbal agreement to the proposed treatment. With or without the completion of an informed consent document, the process of informed consent should be recorded in the progress notes. One format for such notes is to document the following points:

**P**rocedure, **A**lternatives, **R**isks, and **Q**uestions (PARQ). A **PARQ note** should include the following:

**P**rocedure: A summary of the proposed treatment plan or procedures and why the plan or procedures are necessary.

**A**lternatives: A list of possible alternative treatments.

**R**isks: The adverse outcomes possible as a result of the treatment plan or procedures, as well as the risks of *not* receiving treatment.

**Q**uestions: Any questions raised by the patient and the responses given. If the patient had no questions, that must also be documented. (See eFigure 6-1, a sample of a *PARQ Note* in the expanded chapter on Evolve.)

### Role and Limitations of Informed Consent in the Law

Legally and ethically, proceeding with treatment in the absence of patient consent is considered an assault or battery, a form of unprivileged touching. As such, it may be actionable as an intentional tort under United States law.

Verification that informed consent was obtained can be a crucial factor in a malpractice allegation. It is important to recognize that a signed consent form does not inherently demonstrate that valid and voluntary informed consent was obtained. Should the validity of the consent given be questioned, the patient may allege that insufficient information was provided and that if the facts at issue had been known, then consent for the treatment would not have been given. Consent forms should include required elements such as a clear location for reporting the date, patient's name, dentist's name, diagnosis, treatment plan, options, known risks, space for specific details to be written in, clear acknowledgement of understanding and satisfactory opportunity to have questions answered, and agreement to the described treatment (Box 6-3).

Blanket consent to an unspecified course of dental treatment is not considered valid. For that reason, in addition to a general consent for dental assessment and treatment, it is advantageous to have specific consent forms for use in conjunction with various specialty and higher-risk procedures that are performed in the practice. Special consideration should be given to endodontic procedures, extractions, implant placement, periodontal surgery, orthodontic treatment, and procedures to be provided under sedation or general anesthesia. Patients must be advised of changes in the status of their disease and of any modifications that might be advisable or undertaken. A long, continuing course of treatment may require periodic renewals of consent.

It is important to note that obtaining informed consent is not protective of the dentist when the treatment does not meet the standard of care or is considered negligent. A patient cannot give valid consent to a course of "maltreatment" or malpractice.

### Can Informed Consent Be Obtained by Another Staff Member?

Usually the provider cannot delegate this duty to a less-qualified employee, because the provider alone has the full intimate knowledge of the case and treatment objectives and must be ultimately responsible for ensuring that the patient has decision making capacity and has given fully informed consent.

**BOX 6-3 Designing a Consent Form**

Although the elements of consent remain generally the same across all disciplines of dentistry, certain procedures (perhaps entire disciplines) are better served with more detailed consent forms. To demonstrate that the consent is freely given and informed, every consent form must include the following:

**Demographics:** The date, patient's name, dentist's name, and office location or location of proposed treatment.

**Diagnosis:** The diagnosis, disease, or condition that led to the proposed procedure being undertaken.

**The Plan:** The procedure itself explained in straightforward nontechnical language (e.g., "cutting" rather than "incision" and "stitches" rather than "sutures").

**The Goal:** State the anticipated benefit or purpose of the procedures.

**The Risks:** List the risks and possible complications associated with the treatment (including the risks associated with no treatment); alternatives to treatment, including no treatment; and the types of medications, materials, and anesthetics that may be used during the treatment, along with their associated risks.

**Acknowledgement:** A statement that the patient acknowledges that all of the above sections of the consent form have been explained clearly, he or she has read the consent form, all questions have been answered, he or she understands that dentistry/medicine is not an exact science and results cannot be guaranteed, and authorization for the treatment is given to the named dentist and that the person agreeing to the treatment does so willingly.

**Signature:** The patient, appropriate surrogate, or legal guardian must sign the document.

Although much of the form can be preprinted, the areas for listing the disease, treatment/procedures, risks, and alternatives should consist of blank lines to be filled in as necessary before the patient reads and signs the consent.

In addition to the above required components of a consent form, supplemental areas include listing the possibility that the dentist will be assisted by staff or students; consultation with other healthcare providers may occur; the disease or deformity may be greater or lesser in scope than originally recognized, requiring more or less treatment; what will happen with removed tissues; postoperative instructions and duties for the patient; and, if relevant, a release to use photographic images.

### Is Informed Consent Always Necessary?

The only exception to the necessity of obtaining consent is the existence of a life-threatening emergency, an event that is relatively rare in dental practice.

## Dental Record

### What Is Included in the Dental Record?

The patient record should include a medical and dental health history, oral health findings, diagnoses and tests, radiographs and photographs, a well-thought-out and clearly

## IN CLINICAL PRACTICE

### Informed Consent

The patient's formal written consent for treatment is based on the information the practitioner has provided to the patient about the diagnosis, prognosis, and treatment options. In some situations, the practitioner may be uncertain at the outset about the diagnosis or the risks of treatment. For example, during a planned restoration, the dentist may discover that caries is more extensive than had appeared during the assessment phase. Now, faced with a carious exposure, the dentist changes the treatment plan from a surface restoration to root canal therapy with a probable crown.

If the treatment plan is changed during active treatment, the dentist has several options for obtaining the patient's consent to proceed. Although it may be tempting to simply explain the problem to the patient and continue with little or no discussion, most patients cannot give truly informed consent while reclined in the dental chair with a rubber dam in place. The patient should be given the opportunity to ask questions and consider additional options, such as extraction. This interaction can be best achieved by removing the rubber dam and allowing the patient to sit up for a face-to-face discussion with the dentist. The revised treatment plan should be documented.

When it is necessary for the dentist to enter into a treatment plan with some uncertainty, questions about informed consent may be avoided by a thorough discussion of the possibilities before initiating treatment. If the dentist obtains consent for a straightforward restoration, but before beginning, explains that the decay may be more extensive, the patient's preferences for further discussion or proceeding immediately with more extensive treatment can be established before treatment is begun.

**EXAMPLE INFORMED CONSENT *PARQ* NOTE**

**Procedure:**

Maxillary left first premolar with vertical root fracture – tooth non-restorable. Patient elects extraction with site preservat and after 3 months healing placement of an implant, and after an additional 3 months healing placement of an implant retained crown. Patient declined the option of an immediate provisional removable partial denture.

**Alternatives:**

- No treatment
- Extraction and defer replacement
- Extraction and removable partial denture
- Extraction and fixed partial denture

**Risks & Benefits:**

Discussed the risks, benefits, and costs of the proposed treatment as well as the alternatives. Placement of the implant and implant crown while time consuming and costly in the short run, will provide the best prognosis and the best overall esthetic and functional result. Specific risks and limitations of the alternative treatment options that were explained to the patient:

- No treatment – significant risk of pain, swelling, and infection
- Extraction and defer replacement – in the absence of a tooth replacement the patient may have drifting or tipping of adjacent tooth, diminished function, and will have an obvious "tooth gap"
- Extraction and removable partial denture – removable RPD can provide a modicum of function and esthetics, but is less convenient, must be removed at night, and required special cleaning and maintenance
- Extraction and fixed partial denture – would require removal and replacement of the existing crown on the adjacent second premolar, and significant removal of healthy tooth structure on the adjacent canine tooth

**Questions:**

*Mrs. Smith* was given the opportunity and encouraged to ask questions. She declined to do so and expressed appreciation for the thorough explanation of the treatment options. *Note:* Patient's spouse was present for the consent discussion and he expressed concurrence with the proposed plan.

**eFigure 6-1** Example Informed Consent *PARQ* Note.

recorded treatment plan, and written informed consent forms signed by the patient. Progress notes are added as treatment is delivered and should include summaries of any discussions with the patient relating to evaluation, treatment, or posttreatment care. The patient's questions, concerns, or complaints should be documented in the progress note, together with the ways in which these were addressed. Telephone conversations with the patient or other health professionals related to the patient's care should be included in the progress notes. Notes relating to patient noncompliance and missed appointments, as well as records of follow-up and periodic visits, should be maintained.

Any written communications to or from the patient should be retained as part of the record. For example, copies of written postoperative instructions should be included either by reference or by the insertion of the document(s). Copies of letters of referral or formal notifications of dismissal from the practice should also be included in the record.

One area of record keeping deserves special mention—the prescribing and dispensing of medications. In the United States, specific federal requirements for documentation must be followed when controlled substances are prescribed. State laws may also affect these requirements.

Finally, agreements with health or dental insurance companies and/or with Medicare/Medicaid agencies often impose additional record-keeping requirements on the dental office in terms of documenting treatment claimed for reimbursement.

Office management documents, such as the appointment book and telephone log, are also considered to be valid and legal documents and should be preserved even if the patient leaves the practice.

## How Should Information be Recorded in the Dental Record?

The progress (or treatment) note is generally considered to be among the most valuable of the many parts of the record. A common format for progress notes, particularly in the acute care patient, is to document the **S**ubjective findings, **O**bjective findings, **A**ssessment, and **P**lan (SOAP) as described in Chapter 8. Documenting treatment for the patient undergoing active care is described in Chapter 1 (see Figure 1-20, *Treatment Note Entry*). Progress notes for the periodic recall visit are described in Chapter 11.

All entries in the written record must be legible and should be in ink (in the past, black was preferred; today many prefer blue ink because it may distinguish copies from the original), and should be organized in chronologic order. Explanations for any out-of-sequence entries should be included. Any incorrect entries should be struck through with a single line so that they remain decipherable and should be initialed by the person making the change. The correct entry, including the reason for the change, should be made in the next available space. These notes do not need to be handwritten by the dentist; however, if written by office personnel, the note should be initialed by the writer, and the office should have some method for later identification of the initials should the need arise. If notes are dictated and transcribed, the dates of dictation and transcription should be made a part of the record, and the dentist should review, correct, and sign the final note.

## Electronic Health and Dental Records

Electronic health records (EHR) are increasingly used in all healthcare settings. Dental practice management software integrates all aspects of the dental practice into a single digital file containing all of the types of entries that were commonly found in written patient records.

There are many significant benefits to use of an EHR system. Laboratory test results, photographs, radiographs, and other images, as well as all consultation and progress notes, are all housed within a single record. From a legal perspective, the EHR has some clear advantages because the record is optimally organized and the notes are more legible. Progress notes are generally more structured, with fewer recording errors and missed components. In addition, electronic systems encourage timely completion of notes, and the availability of rapid information retrieval promotes more efficient delivery of patient care. Additional quality assurance benefits include the following:

- Errors related to misreading handwritten notes are reduced.
- Prescription writing errors are reduced.
- Authorship of each note is clearly indicated.
- Changes in the notes are readily identifiable.

On the other hand, the EHR complicates some processes that were once relatively simple. For example, a signed informed consent document was simply added to the paper chart in the past but is now either an electronic "document" signed via signature pad, or it must be scanned and attached to the patient's file. Many EHRs adopt a "menu" system for the entry of notes and other information. Although the physical act of entering the note may be delegated, the dentist remains responsible for ensuring that a complete and accurate note is entered. If changes are made to an electronic progress note, it is imperative that the date of the original entry and the original text be recorded and archived. Although there is no relevant dental case law as yet, it is clear from business and criminal cases in other areas that forgeries and alterations to electronic documents remain detectable.

## Who Owns the Dental Record?

Although the dental record is owned by and made for the benefit of the dentist, patients (or their legal representatives) may request copies of their own records, and these must be provided at a nominal (or no) fee. Because financial records and accounting records serve different purposes, unrelated to healthcare per se, such records should be maintained separately from the clinical dental record. Similarly, the dentist has a legal right to maintain an "incident report" as a separate file in case a litigious or potentially litigious situation should arise. Such a report or file can include personal reflections or judgments that would not be appropriate to

include in the patient record but that may be valuable to the dentist or the dentist's insurance carrier and/or attorney. As long as such notes are not attached to the patient record or referenced in it, they are **nondiscoverable** and are, therefore, subject to the confidentiality maintained between attorney and client (dentist).

If the patient requests that his or her dental records be forwarded to another dentist, the dentist must comply with this request. Dentists should be aware of administrative law with respect to any protected parts of the record, however, (such as HIV status) that may only be forwarded with the patient's explicit permission. When records are to be transferred with the sale of a practice, the patient must be given the opportunity to object to the transfer of the record to the new owner. In that circumstance, the patient may request that his or her records be transferred to a dentist of the patient's own choosing rather than to the new owner.

### Legal Value of the Dental Record

The importance of a well-organized patient record cannot be overemphasized, as this record serves as core evidence of professional competence. The dental record is the repository of the patient's history and all clinical findings identified at the initial examination the diagnoses, evidence of informed consent, plan of care, and all treatment rendered to the patient. It, therefore, provides the best evidence as to whether the dentist has performed due diligence in providing professional care for the patient. When questions arise as to whether the dentist has provided treatment that is appropriate and safe, and that meets the standard of care, the patient record becomes the focal point of the analysis. In addition, successful defense of malpractice claims often hinges on the clinician's ability to produce all original radiographs, documented clinical findings, and progress notes pertaining to the case. Juries tend to rule against dentists who cannot produce records, whose record keeping is sloppy or lax, or who have been shown to have altered the patient record.

## IN CLINICAL PRACTICE

**Importance of Good Records**

Louisiana law requires that, before most cases alleging negligence against a healthcare provider can proceed to trial, the allegations must be submitted to a panel of three practitioners for review. Several years ago, the author was asked to be the third member of such a panel with two other dentists—one chosen by the plaintiff and one by the defendant. A non-voting attorney served as chairperson and coordinated the review. The defendant dentist had removed a lower third molar, and the patient now complained of temporomandibular joint (TMJ) dysfunction secondary to the extraction. The extraction had been done on an emergency basis on a Saturday morning. The facts that the patient had called the dentist at his home and that the dentist had made a special trip to meet the patient at the office were undisputed. Unfortunately, the dentist's record was incomplete, and thus, doubt entered into every other aspect of the encounter. The record contained no SOAP note, only the notation that the patient had a toothache (in her handwriting and only on the dental/medical questionnaire—patient registration sheet) and no dental charting. An abbreviated progress note referred to the tooth number, charge, and amount and brand of local anesthetic injected, along with the abbreviation "EXT." The only diagnostic material, a single preoperative radiograph, was unreadable because of silver deposition resulting from incomplete fixation. A postextraction radiograph was available, but it was unclear whether it had been taken during or at the conclusion of the extraction, or at a follow-up visit. Reference to a follow-up visit and to a telephone prescription completed the record. No telephone log or notation in the appointment book had been made for any of the visits.

The patient alleged that the tooth was only chipped and that she merely wanted it filed smooth. She also alleged that this molar had been her sole remaining occluding posterior tooth on that side of the mandible, and that its extraction had led to loss of vertical dimension and TMJ dysfunction. She maintained that the extraction had taken an extraordinary amount of time, that the tooth had fractured during the procedure, and that the dentist had failed to remove all tooth fragments from her jaw, resulting in an infection. The dentist had a differing recollection: The fracture had extended into the pulp, the patient had been in extreme pain, and several tests, including percussion, had demonstrated that the tooth was not salvageable without root canal therapy, and it was not the sole remaining occluding tooth. Finally, the dentist maintained that because of the difficult extraction, a follow-up telephone call was made to the patient that evening with several follow-up appointments which ceased when the patient missed two scheduled appointments. Unfortunately, the dentist's lax record keeping failed to substantiate this version of events.

Because the sole preoperative radiograph was unreadable, the three-dentist panel concluded that a material question of fact existed; therefore, the case went to trial—twice. The first trial resulted in a hung jury. Before the second trial, the defense team made an exhaustive effort, using an expert in dental radiography who rendered the preoperative radiograph readable. At the second trial the defendant's deposition testimony regarding the patient's past dental history, and the records from other treating dentists, were used to show that only a single other tooth had been extracted from the affected side before the visit in question. The clarified radiographic image and the new evidence allowed the defense experts to conclude that the plaintiff's recounting of the experience was probably inaccurate. The jury ruled in favor of the defendant dentist.

Although the dentist can be said to have "won" this case, in reality, the dentist lost. The verdict came 6 years after the incident and there was extensive local publicity about the case and trials. Although the dentist's liability insurance paid the direct costs of the defense, none of the indirect costs, such as the stress involved and the costs of closing the office for legal meetings and trials, were covered.

Had there been an adequate record, such as a SOAP note, or had the radiograph been properly stored, this case would never have gone to trial. This dentist learned an expensive lesson.

Robert E. Barsley

Dental records also have important economic value as part of the "good will" on the sale of a practice. In the event that the practice and records are sold, however, the seller should arrange a mechanism that will ensure his or her continued access to the records of prior treatment if necessary—for example, to assist in the defense of a malpractice claim filed after the sale is final.

### How Long Should Dental Records Be Kept?

It is advisable to retain dental records as long as is practical. It is generally easier to store and maintain electronic rather than paper patient records, but the dentist must continue to back up the EHR to a secure remote site. Many jurisdictions specify a minimum number of years for which healthcare records must be retained. Additional requirements concerning record retention may be imposed by contracts with insurance carriers or by employment or affiliation contracts. For example, Medicaid regulations require that records be kept a minimum of 3 years from the date a claim is filed for reimbursement. Because federal income tax issues can arise up to 6 years after taxes are paid, many experts advise keeping records a minimum of 7 years. Many jurisdictions suspend the typical statute of limitations for children until they reach the age of majority, so a case of alleged negligence involving a very young patient may arise as many as 16 to 18 years after treatment.

## MALPRACTICE AND PROFESSIONAL LIABILITY

To be successful, a malpractice claim must fulfill four elements: (1) a duty owed to the plaintiff, (2) a breach of that duty, (3) the breach of the owed duty must result in damage to the plaintiff, and (4) the breach of duty must be shown to be the proximate cause of the damages. Each of these four components is explained below.

Malpractice claims usually allege that the breach of duty was negligence or fault by the dentist. The negligent act may arise as a result of either something the dentist did (commission) or something he or she failed to do (omission) during evaluation or treatment. In malpractice cases, the patient, known as the plaintiff, bears the "burden of proof" and must provide a preponderance of credible evidence that addresses each of the four elements. Failure to address and prove each element can result in dismissal of the case in the defendant's favor.

### Duty

The dentist owes each patient the degree of skill, care, and judgment possessed by a "reasonable" dentist. This is the benchmark against which an alleged negligent act is judged and is most often established by expert testimony. Courts have cited the greatly increased opportunities for professional communication and education as the foundation for a prevailing standard of care in dentistry. In many jurisdictions, however, a plaintiff cannot use the testimony of a *specialist* to establish the standard of care for a *general* dentist. However, general dentists who hold themselves out as specialists (and in some jurisdictions, even those who do not) are held to the national standard when performing treatment that clearly falls within the realm of the specialist. In essence, the courts require all dentists to properly diagnose and appropriately treat disease.

The **duty to treat** arises from the doctor-patient relationship. This relationship may be either an expressed or tacit agreement. A patient may unilaterally sever the dentist-patient relationship, or it may be terminated by mutual consent, but the dentist may not sever the relationship arbitrarily. To sever the relationship, a dentist must adhere to certain guidelines (see *Terminating the Dentist-Patient Relationship*, earlier in this chapter). An improper termination of the dentist-patient relationship may constitute negligent abandonment of the patient, leaving the dentist open to liability for damages.

In most instances, a patient enters the dental office expecting treatment and does not differentiate between the examination, presentation of the treatment plan, and actual treatment. If the treatment plan is not agreed to for any reason, both the dentist and patient must clearly understand the next steps to be taken. It is important to realize that even if the relationship is properly severed, the dentist may still owe a duty to arrange for the opportunity of continuing treatment, including providing referrals and making copies of records available.

### Breach of Duty

A **breach of duty** owed to a patient is a negligent action defined as doing or failing to do something that the ordinary, prudent, or "reasonable" dentist would do or not do in the same or similar circumstances. A less-than-optimal result or unforeseen result does not constitute negligence per se.

Negligence is established by one of two general methods. The first and perhaps the simplest is through the doctrine known as *res ipsa loquitur,* in which the deviation from the standard of care is so obvious that expert testimony does not need to be offered to prove the departure. For example, a patient who sustained injury as a result of a radiographic unit toppling over or because a dental instrument was dropped in the patient's eye need only show that the injury occurred. It is commonly understood that such injuries are not the normal expected results of a dental visit. The extraction of the wrong tooth would also fall into this category of claims, although the services of a dental expert may be required to provide comment on the extent of the injury sustained.

The majority of malpractice cases require a demonstration of the standard of care from which the defendant is alleged to have deviated negligently. The degree of skill, care, or judgment required of the defendant dentist is that of the reasonable and prudent practitioner. As pointed out previously, another qualified dentist must testify as to exactly what that means in each case. The standard of care testified to by the expert should not be "what in my opinion I would have done," but rather whether the treatment (or lack thereof) is one that the reasonable (average) dentist might have provided under similar circumstances. Because errors associated

with diagnosis have the potential to deprive a patient of the future opportunity for proper treatment, courts have often held that the highest standard of care applies in the area of diagnosis. (See *In Clinical Practice: Breach of Duty* for case illustration).

## Damages

It is important to differentiate between a negative outcome associated with the known risks of a procedure that are explained through the consent process and damages associated with negligence. The breach of duty and finding of negligence must be shown to have resulted in **damage** to the patient (in legal terms, the plaintiff). The nature of the damage is usually, but not necessarily, in the form of a physical injury. This undesired result must be shown to be directly related to the breach of duty. The facts must show that the event must also have been avoidable by the dentist. Although it is not necessary that the dentist anticipate the exact type or extent of damage, at a minimum, the facts must show that some type of damage was foreseeable under the circumstances.

Damages must also be quantifiable, not speculative. Commonly, a monetary amount is established that the court may award to a successful plaintiff as compensatory damages. The awarded amount is designed "to make the plaintiff whole" or to restore plaintiffs to the condition they were in before the negligent act. Compensatory damages include amounts for actual damages, such as past and future medical or dental expenses, loss of earnings, loss of consortium (e.g., love and affection), and any other damages proven during a trial. Compensatory damages may also include nonmonetary damages, such as pain and suffering. In certain jurisdictions, an additional award, known as punitive damages, may be assessed to punish the wrongdoer or hold that individual up as an example to others to deter similar occurrences in the future.

At one time, case law in some jurisdictions included a charity exemption that prevented monetary awards or "recovery" by patients who had received treatment without charge. Similar exemptions also once protected nonprofit and government-operated healthcare organizations from liability. This is no longer the law in most (if not all) U.S. jurisdictions. In today's litigious society, even the dentist who provides treatment at no cost, whether for charity or even as a gift to friends or family, remains at risk should negligence be proved. Regardless of the funding source, the dentist owes every patient the same level of skill, care, and judgment.

## Proximate Cause

The patient with a malpractice claim must demonstrate that the damages claimed flow directly from the negligent action of the dentist without another intervening cause, and that the damages would not have occurred, but for that negligent act. This is referred to as **proximate cause**. Even in instances in which the dentist (defendant) deviated from the standard of care, if the patient (plaintiff) did not suffer any injury, then the case will fail the proximate cause test. Similarly, even if the plaintiff sustains an injury, the results may not be any different from the result that would have been likely to occur in the absence of negligence. For example, the extraction of a hopelessly periodontally involved tooth without the patient's informed consent may not result in actual damages.

Two notable actions that the courts have upheld as proximate cause include failure to refer and referral to a specialist shown to be incompetent.

## Other Factors

In considering the facts of the case, the judicial system uses the standard of the reasonable person to judge the actions of the individuals involved in the case. The standard of care is established based on the treatment that would have been provided by a reasonable dentist under the same circumstances. The actions (or failure to act) of a patient are also subject to this test. The law does not expect perfect action, merely the action that a prudent person possessing the degree of knowledge, foresight, and discretion attributed to the average individual would be expected to take.

## Common Causes for Litigation

Dentists who build a practice based on strong dentist-patient relationships with a foundation of trust and mutual respect tend to reduce the likelihood of malpractice litigation. Nevertheless, even excellent dentists may be sued for malpractice by a patient. It will be useful to understand the most common reasons for litigation. This knowledge allows dentists to design practice and documentation patterns to avoid common pitfalls in practice.

Statistics relating to the types of legal cases filed are difficult to obtain, because many cases are resolved or settled privately and these data are not widely shared. One large national liability insurer points to the "failure to diagnose, treat, or refer" as the three most frequent causes of litigation. Some of the largest monetary awards have been made for failure to diagnose conditions, such as abscesses and other infections, that in some cases led to death. Recently, an increasing number of claims have alleged that the dentist failed to diagnose head and neck cancer. Because modern treatment modalities offer an increasingly good prognosis for this condition when coupled with early detection, the question then becomes: at what point should the reasonable dentist have included cancer in a differential diagnosis and referred the patient for a biopsy or other definitive treatment? Failure to diagnose periodontal disease remains a common claim by patients who have lost teeth or undergone extensive periodontal therapy. Recent advances in periodontal therapy treatment modalities have increased the likelihood that what once may have been only a weak claim could be judged meritorious today.

Another category of lawsuits involves the failure of the dentist to properly interpret (or sometimes even to solicit) the relevant health history of the patient. The *In Clinical Practice: Health Questionnaires* box discusses a rare but serious consequence of failing to obtain information about the patient's health history. Prescribing the wrong medication, prescribing incorrect dosing or frequency, or not informing the patient about known deleterious side effects of a medication can be

## IN CLINICAL PRACTICE

**Breach of Duty**

Some years ago, the author was asked to review, before trial, a case of alleged dental negligence from a neighboring state. A woman in her early twenties faced the imminent loss of several molar teeth because of severe periodontal bone loss. At her request, her dentist had furnished his complete dental record documenting the treatment that she had received from age 10 years through the prior year. The record consisted of a single-page form combining an odontogram and progress notes. Numerous bitewing and periapical radiographs were included in the chart folder. According to the notes, she had been seen every 6 to 8 months throughout the period in question. The notes mentioned that approximately seven teeth had been restored with Class II amalgams during this time. Additionally, she had received "prophy, BWX, P.A. × 2" at nearly every visit. The record included no charting of or mention of periodontal probing or any other diagnostic testing, nor was there a treatment plan or any updated health history beyond the one completed by her mother at her first visit.

The bitewing radiographs revealed no calculus, but when viewed sequentially, showed a clear progression over time of generalized periodontal destruction. Bone loss was greatest in the areas between the teeth that had been restored, apparently because nearly every interproximal box restored by this dentist had resulted in overfills with large overhangs. Corresponding maxillary and mandibular periapical views of the incisor teeth were included for each of the bitewing sets. When questioned at deposition, the dentist maintained that his abbreviation "P.A." actually stood for "periodontal assessment" rather than "periapical." Of course, this case settled before trial. This patient may have had a systemic condition that accelerated her response to the local irritants, or she may have been the victim of an aggressive form of early-onset periodontitis. Nevertheless, this dentist's failure to recognize the progress of the disease, or if he had recognized it, to inform her of her deteriorating oral condition, cost her several teeth and his insurer tens of thousands of dollars.

This case illustrates the importance of assessing and recording the findings from current diagnostic aids in the light of previous tests and aids and of regularly updating the patient's health history. I suspect that this dentist viewed each session's radiographs in a vacuum as it were, never comparing them with any others beyond the most recent and thereby missing the insidious, but relentless, progress of her disease.

Robert E. Barsley

fertile ground for litigation, especially if the systemic effects of such errors can include long-term disability or death.

## IN CLINICAL PRACTICE

**Health Questionnaires**

A briefly described but truly frightening case involves a dentist who commonly made "one-stop painless" dentures—inviting prospective patients to come in with natural teeth and leave with dentures. The dentist made an unbelievable blunder. He failed to take a health history on a patient who in fact had myriad systemic complications, including untreated hypertension. As was the dentist's normal procedure, he sedated the patient for the many extractions needed. Before the extractions could be begun, however, the patient had to be rushed to the hospital with a suspected heart attack. He was released the next day. Unbelievably, the patient returned to the dentist the following week, and even more unbelievably, the dentist again did not ask him to complete a health questionnaire or query him orally about his general health. Again the dentist began to sedate the patient for the requisite extractions. Again the patient coded, but this time he did not survive. The civil law implications of failing to take an adequate history, apparently failing to secure an informed consent, and performing admittedly risky procedures in an office setting paled next to the criminal implications—this dentist was charged with negligent homicide.

Robert E. Barsley

Areas of dentistry that most often generate litigation include difficult extractions, treatment for TMJ problems, and treatment involving implants. An increasing number of cases have involved orthodontic treatment, including orthodontic relapse, root resorption, and a lack of informed consent on the part of an adolescent patient. (See *What's the Evidence? Disciplinary Actions Against Dentist by State Dental Boards* box in the expanded chapter on Evolve.)

The dentist has an ethical and legal obligation to disclose to the patient any mistakes or untoward events that occur during treatment—for example, a broken endodontic file or reamer. Failure to disclose can lead to several undesirable results. First, when the patient discovers that the file separation occurred, he or she will naturally think that the dentist was less than honest and raise the question, "What else was the dentist dishonest about?" The patient may feel betrayed, be more likely to blame any problems on the dentist, and be more likely to seek legal redress. The law in many states views the purposeful nondisclosure of such acts as a form of fraud. Alleging fraud may lessen the patient's burden of proof in litigation (i.e., the patient would not need to prove violation of the standard of care) and may also lengthen the time available in which to file a claim (statute of limitations and/or repose).

Clinical errors must be fully documented in the chart, and the patient should be informed as soon as is practical. If appropriate informed consent was obtained, the discussion of risks will have envisioned many of the complications that may occur in dental treatment. In any case, the dentist should be forthright about what has occurred and should explain what can and will be done to mitigate the situation. The dentist needs to maintain contact with the patient and be available to respond to questions or concerns of the patient or patient's family. It is necessary to follow through with appropriate recommendations or offers for additional treatment or referral (often at reduced or no fee) and to do so in a timely way. Throughout the process, the dentist should demonstrate genuine concern for the patient's welfare and remain committed to resolving the patient's problems. It is important to note that many jurisdictions now have a codified "apology clause" that gives sanction to the healthcare provider to apologize to the patient without automatically incurring the legal implication of negligence.

## Suit-Prone Patients

What are the chances that a particular dentist will be involved in a lawsuit alleging professional misconduct? Commentators cite an approximate annual risk of 5% to 15%, and this risk has increased substantially in recent years (R.B. author communication). Patients have become more consumer oriented in their approach to healthcare, and, at the same time, the practice of dentistry may seem more remote and impersonal to many. The solo practice, or practice with a single associate, is being replaced with large group, corporate, and institutionally based practice models. Practice management consultants commonly advocate administrative "improvements," such as multipatient scheduling, to reduce the effect of cost centers (i.e., operatories) on the financial bottom line. With these changes, the time and the quality of the interaction between patient and dentist has often diminished. As dentistry has become depersonalized, the risk of malpractice litigation has increased.

Although the overall risk of lawsuits has increased, not all practitioners are similarly affected. Primarily at risk are practitioners who may be technically competent in dentistry, but who lack competence in interpersonal skills or "chairside manner."[5] Mastery of the ability to interact effectively with patients also includes the ability to recognize quickly those individuals with whom the dentist may develop a substantive personality conflict. Certain individuals telegraph their likelihood of becoming dissatisfied patients. One cardinal warning sign is the patient who immediately complains about the care, price, attitude, office condition, and so on of his or her last dentist or who encourages the dentist to find fault with previous treatment. Many lawsuits have been initiated and many dentists have found themselves unwilling witnesses because of a hastily uttered comment about another dentist while examining or treating the patient. A dentist clearly has a duty to disclose failed or failing dentistry but should do so in a factual, nonjudgmental fashion. Often the full story is not known at the point of initial discovery—the patient may have been noncompliant or may have refused a recommended, optimal treatment. A telephone call should be made to the previous dentist to understand more fully the situation before a dentist makes a hasty proclamation alleging substandard care.

If the dentist feels stressed, anxious, or tense while treating a patient, the chance of saying or doing something inappropriate,

## WHAT'S THE EVIDENCE?

### Disciplinary Actions Against Dentists by State Dental Boards (United States)

In the year 2011 (most recent statistics available), 31 dental boards reported a total of 1,168 disciplinary actions against their licensed dentists.[1] In 2011, these same dental boards reported closing more than 5,000 other previously filed active cases. The types of discipline included reprimand or censure, probation, monetary fines/penalties and restitution, suspension from active practice, voluntary resignation/surrender/retirement from practice, and 39 license revocations. In addition, nearly 200 of these licensees were referred for remedial education, and a much smaller number were mandated to undergo medical/psychological evaluation and/or treatment. Nearly 100 were referred for substance abuse evaluation, treatment, and/or monitoring. Approximately 20 licensees had sanctions (including revocation) applied to their Controlled Substance licenses. Although less than 1% of practicing dentists, many of these individuals violated the trust placed in them by the public on numerous occasions, thus meriting the attention of the state dental board. More than 12,000 complaints were received, with more than 7,000 resulting in investigations that were closed within the year. Approximately 80% of the time, the source of the complaint was a dental patient. In most states, the second-most-common source was a law enforcement agency (and in some states, this was a much higher percentage). Surprisingly, only a very small proportion of the complaints were initiated by other practitioners or current or previous employees (who might be presumed to actually be in a position to have the best knowledge of *bona fide* cases).

### Reference

1. Composite, ed 24, Chicago, 2013, American Association of Dental Board.

or of being left with a less positive outcome, increases. When these pitfalls are recognized, the dentist can act quickly to refer the patient prior to entering a dentist-patient relationship or to develop a thoughtful, professional strategy for managing the patient. In the latter situation it is usually helpful and effective if the entire dental team is informed about, and engaged in this effort.

## IN CLINICAL PRACTICE

**Courtroom Issues**

The three situations in which a dentist may face the necessity of testifying in court or being deposed by counsel in a malpractice suit include:

- appearing as a defendant,
- appearing as an expert witness for either the plaintiff or defendant, or
- appearing as a treating (either previous or subsequent) dentist.

The first and last situations are most often not of the dentist's choosing. Only the expert witness has in effect volunteered to testify and is typically compensated for attending the court proceedings.

Whatever the reason for an appearance in court or at a deposition, the dentist should heed certain maxims.

- First, be aware that the law is unfamiliar territory, operating subject to rules that the dentist may not fully comprehend. Legal procedures move at their own pace, with the final outcome often not readily apparent during the process.
- Second, the dentist must be able to fully trust his or her attorney. This implies full and complete communication in both directions. As a defendant, it is difficult for a dentist to present a strong case if communication is lacking.
- Third, the dentist should accept the advice of counsel, who will be responsible for providing guidance through the labyrinth of the law. Often, counsel will advise the client to avoid answering hastily, sometimes to not answer at all, and to never volunteer information—advice that may be difficult for the dentist to comply with.
- Fourth, remember that, as a witness, the dentist seeks to educate the judge or jury. To do so successfully, the dentist should strive to be certain that communication is clear and technical jargon is avoided.
- Finally, resist the temptation to engage in arguments or verbal jousting with the attorneys, particularly with opposing counsel.

## RISK MANAGEMENT

The essence of legal risk management is engaging in conduct that avoids successful malpractice litigation. In broad terms, this means upholding the core principles of bioethics, building relationships of trust with patients, and excellent documentation.[6] There is a body of literature containing practical "dos and don'ts" to guide dentists and healthcare professionals in this effort (see Suggested Readings). Although it is beyond the scope of this text to explore risk management in detail, some overarching concepts are worthy of consideration.

- **Good patient care is the best risk management strategy.** In almost every instance, achieving shared decision making that demonstrates respect for autonomy and the patient's best interests is an excellent risk management strategy.
- **Adhere to the fundamental principles of ethics and professionalism.** In situations in which the applicable laws or rules of the profession do not provide guidance, or when there are conflicting interpretations of law, systematic, reasoned decision making and adherence to the ethical principles discussed earlier in this chapter provide a basis for appropriate professional conduct. In the vast majority of situations, a professional who acts on those grounds will find that a prospective plaintiff elects not to pursue litigation, a frivolous claim is dismissed, awarded damages are minimized, or a judgment is found in favor of the dentist.
- **Maintain good (and appropriate) relationships with patients.** Patients who like their dentist are not likely to pursue litigation. Patients who do not like their dentist, or perceive the dentist to be aloof, arrogant, or uncaring, are more likely to sue.

The dentist and all of the office staff should adhere to contemporary standards of care and systematically reevaluate and seek to improve policies and procedures. It is important to assess all aspects of care delivery from the patient's point of view and to assess each patient's treatment experience. These efforts will provide several important risk management benefits, including better patient care, improved patient satisfaction, better treatment outcomes, and reduced risk of malpractice litigation. When difficult situations arise, the entire practice staff should engage in developing policies or procedures to prevent similar situations from recurring in future. Policy and procedure manuals should be updated and followed by all staff, including the dentist.

Documentation in the patient record should be complete and reflect the events that are chronicled. In addition to including the progress note elements discussed earlier in this chapter, notes should include oral instructions to the patient, questions from the patient, and answers given in response. Never include derogatory comments about a patient in his or her own chart. As described earlier in this chapter, when a clinical error occurs, or if a patient shows signs of becoming litigious, it is useful to prepare an incident report that is kept separate from the dental record.

The increasing use and acceptance of various social media in all aspects of life brings with it new and growing concerns in the professional and healthcare arenas. It is beyond the scope of this textbook to address this rapidly changing environment. Certain cautions should be heeded, however. Advertising materials, including the office website, should never offer guarantees for treatment outcomes. Electronic or paper publication of recognizable images or attributed patient statements requires explicit permission from the patient and may be subject to specific federal or state laws, which vary by jurisdiction and over time. The law concerning web "rating" services currently is unsettled as to what remedies the dentist

may have relative to negative comments posted by members of the public and options for their removal. Some websites (such as Angie's List) have established procedures for resolving such disputes and arriving at a conclusion deemed satisfactory by all concerned. Dental practices should provide explicit training for all staff about the inherent risk of breach of confidentiality and inappropriate remarks about the practice, those served in the practice, or other breaches of professionalism associated with the ease of posting to various web and social media sites.

### Liability Insurance

Although a dentist may believe that the primary reason for purchasing professional liability insurance is to cover the payment of any judgment of liability, in fact, by far the most important benefit of such coverage is access to legal counsel and the payment of legal defense fees should a claim be brought. Very few claims ever reach trial and, of those, in only a small percentage is the dentist ruled liable. The failure to file a timely answer to a legal claim of negligence, however, represents an admission of liability, and the services of an attorney are vital to crafting the answer to the claim. In that light, the costs of even the "simplest" defense continue to escalate annually and may exceed the "value" of many claims. These costs include direct expenses, such as attorney fees and expert witness costs, along with nonmonetary costs, such as the necessity to be absent from the practice to attend to matters associated with the case. Enormous personal and professional costs can also accrue, including the potential for negative publicity that may surround the case if tried in court or the local press. Psychological costs may also accrue, as no professional enjoys having a patient or patient's lawyer call into question the quality of his or her services.

The professional liability insurer also serves as a valuable resource in the prevention of liability claims. A forthright discussion with the agent about actual, potential, and hypothetical cases can help point out shortcomings in the office setting, which may then be corrected in advance of formal complaints. Many professional liability insurers offer courses and materials on risk reduction and may reduce the cost of policies in exchange for successful completion of such a course. It is important to recognize that the insurance carrier should be contacted at the first hint of the possibility of a suit or even the suspicion that an unusual office occurrence may lead to a suit. Advice concerning documentation of the incident, communication with the patient, and instructions to staff could have a substantial effect on the final resolution of the matter.

Malpractice reform has resulted in a wide variance among the states concerning professional liability. For example, some states (e.g., Louisiana) *require* that a dentist participate in a professional liability insurance coverage plan (or else provide a bond) for legally imposed limits on liability to apply. Other states impose limits on the amount of damages that can be awarded, and some require that before a lawsuit claiming negligence against a healthcare provider can be filed, the potential plaintiff must meet certain procedural standards. It is the responsibility of the dentist to be knowledgeable about the relevant law in the state in which the practice is located.

## CONCLUSION

In this era of rapid advances in dental materials, technology, and techniques, and changing patient expectations for dental treatment, it is increasingly important for the dental team to keep its attention on the primary mission of any oral healthcare provider: to serve patients, partner with the patient in shared decision making, and do the utmost to promote the patient's oral and general health in both the short and long term. The knowledge and skills dentists bring to ensure proper diagnosis and treatment planning are the foundation for excellence in dental practice and must be coupled with a relationship of trust between dentist and patient.

Trust is achieved through excellence in treatment, high standards of confidentiality, and a policy of engaging each patient in a meaningful informed consent process. Careful and accurate documentation of the patient's condition, diagnoses, plan of care, and the treatment rendered provides the main benchmark by which the quality of the care provided to the patient is judged. The dentist is expected to provide every patient with a thorough and careful diagnosis and a well-founded treatment plan, whether the treatment is limited or comprehensive in scope. The dentist who builds patient care around ethical principles and practices is more likely to provide better care, achieve better relationships with patients, develop a stable and successful practice, and avoid legal problems.

*NOTE:* Only a few legal case citations are included in this chapter. This is intentional because any case referenced may be overruled or amended, or a new case may supplant it at any time. In addition, a citation to valid case law in one jurisdiction may have no validity in another jurisdiction.

This chapter is not intended by the author, editors, or publisher to serve as legal advice. In the event a legal claim is made, or if you are concerned about the possibility that a claim may be brought in the future, you are encouraged to contact your liability insurance carrier and obtain legal counsel.

## REVIEW QUESTIONS

- Define each of the core principles of bioethics: respect for autonomy, beneficence, nonmaleficence, justice, and veracity.
- Fiduciary relationships are built on trust. What are three things a dentist can do to build trust within the dentist-patient relationship?
- Must the dentist accept every patient into the practice? What are the patient's rights? What are the dentist's rights?
- What are the required components of informed consent?
- What steps must a dentist take to obtain and document informed consent?
- What are the elements of decision-making capacity?
- Why is it important for the dentist to assure that each patient has decision-making capacity before accepting informed consent or informed refusal?
- What are some limitations of relying on consent forms as evidence of informed consent? What can the dentist do to minimize these limitations?
- To be successful, malpractice claims must satisfy four elements. List and define each element.
- What are the uses of the dental record? Whose property is it? How should information be recorded in it?
- List some of the "dos and don'ts" in dealing with a potentially litigious patient.
- What are common causes of dental malpractice litigation?

## REFERENCES


1. American Dental Association: *Principles of ethics and code of professional conduct*, 2012. http://www.ada.org/en/about-the-ada/principles-of-ethics-code-of-professional-conduct/. Accessed May 27, 2015.
2. Schloendorff ME v. Society of New York Hospital, 1914, 211 N.Y. 125; 105 N.E. 92 (Lexis 1028), Court of Appeals of New York. http://academic.udayton.edu/LawrenceUlrich/schloendorff.htm.
3. Appelbaum PS, Grisso T: Assessing patients' capacities to consent to treatment, *N Engl J Med* 319:1635–1638, 1988.
4. Illinois Public Act §92-0364, 1991.
5. Marei HF: Medical litigation in oral surgery practice: Lessons learned from 20 lawsuits, *J Forensic Leg Med* 20(4):223–225, 2013.
6. Smith S, Deer T: Bad results or medical malpractice in pain medicine: Ways to prevent a suit and what to do once a suit is inevitable, *Pain Med* 9:S133–S136, 2008.


## SUGGESTED READINGS


American College of Dentists: *Ethics courses online*. https://www.dentalethics.org/. Accessed May 7, 2015.

American College of Dentists: *Ethics handbook for dentists*. http://acd.org/ethicshandbook.htm. Accessed September 3, 2015.

Beauchamp TL, Childress JT: *Principles of biomedical ethics*, ed 7, Oxford, 2012, Oxford Press.

Brennan M, Oliver R: *Ethics & law for the dental team*, Lancaster, 2006, Carnegie Books.

Krompier JA: *Defense from within: a guide to success as a dental malpractice defense expert*, Chicago, 2012, Quintessence.

Lamboden P: *Dental law and ethics*, Oxford, 2005, Radcliffe Medical Press.

Lo B: *Resolving ethical dilemmas: a guide for clinicians*, ed 5, Philadelphia, 2013, Williams & Wilkins.

Ozar DT, Sokol, DJ: *Dental ethics at chairside: professional principles and practical applications*, ed 2, Washington, DC, 2002, Georgetown University Press.

Pollack BR: *Law and risk management in dental practice*, Chicago, 2002, Quintessence.

Rule JT, Veatch RM: *Ethical questions in dentistry*, ed 2, Chicago, 2004, Quintessence.

SECTION 3

# Phases of the Treatment Plan

**Chapter 7 Systemic Phase of Treatment, 156**

**Chapter 8 Acute Phase of Treatment, 173**

**Chapter 9 Disease Control Phase of Treatment, 192**

**Chapter 10 Definitive Phase of Treatment, 226**

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7

# Systemic Phase of Treatment

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## OUTLINE

**Increasing Importance of the Systemic Phase of Treatment**
**Rationale for Systemic Therapy**
- Recognition of Systemic Disease and Patient Referral for Appropriate Treatment
- Modifying or Limiting Dental Treatment
- Prevention of Medical Emergencies During Dental Treatment
- Prevention of Postoperative Complications

**Evaluating the Patient's Current Health Status**
- Reviewing General Health History
- Findings From Physical Evaluation

**Evaluating Relationship Between Systemic Health and Dental Treatment**

**Systemic Procedures**
- Postponing or Limiting Treatment
- Consultation With a Physician
- Stress Management
- Prescribing or Altering Patient Medication
- Positioning Patient in Dental Chair
- Regularly Reviewing and Updating General Health History

**How Systemic Conditions Can Affect Treatment Planning**
- Patients Taking Oral Anticoagulants
- Pregnant Patients
- Diabetes

**Documentation of Systemic Concerns**
**Conclusion**

Before engaging in active therapy, the dentist must assess the patient's overall general health and what, if any, effect any health conditions present may have on the delivery of dental care and outcome of treatment. Characterized as the **systemic phase** of treatment, this phase provides an opportunity for the dentist to influence and ensure the best possible state of physical health for the patient before, during, and after treatment. To accomplish this, the dentist must be aware of the pathophysiology of all the patient's health problems and the implications that each alone, and in combination, will have for the delivery of dental care. Based on this knowledge, the dentist must devise a strategy for managing comprehensive dental treatment in the context of the patient's general health. The best and safest method to resolve any dental problems must be determined in light of the patient's overall condition.

Each patient has his or her own unique set of health issues and dental needs. Thus, a core function of the systemic phase is to evaluate the severity and complexity of this set of health issues and assess how those issues may affect dental treatment. Through this analysis, the dentist determines whether altering, limiting, or even postponing dental treatment will be necessary. At one end of the spectrum is the patient with few, if any, health problems, who takes no medications and requires only preventive services and no invasive dental treatment. For such a patient, the systemic phase may consist simply of evaluating vital signs followed by updating the health history at regular intervals. At the opposite end of the spectrum is the person with multiple health problems, for whom many medications have been prescribed and who presents with both urgent and complex dental needs. This patient may require a multifaceted systemic phase of care that includes consultation with the patient's healthcare provider an evaluation of medications, laboratory testing, possible modification of dental treatment, and careful monitoring of the patient's health before, during, and after each dental visit. In addition, and of at least equal importance, the dentist needs to discover, investigate, and document any previously *undiagnosed* health problems.

Systemic issues are highly variable in their relevance to and effect on the dental treatment plan. Some conditions will trigger certain automatic modifications to the way dental care is delivered—for example, a prosthetic heart valve will require antibiotic prophylaxis to prevent bacterial endocarditis. Conditions such as arthritis or asthma, on the other hand, may or may not have a significant effect on dental treatment, depending on their nature and severity.

A comprehensive survey of the relationship to dental treatment planning of all major systemic disorders is beyond the scope of this book. Instead, the purpose of this chapter is to give the reader an overview of the effect that systemic disease may have on treatment planning and suggest guidelines for evaluating the patient's systemic health, and for appropriate adaptation of the provision of treatment when the patient has significant health problems. An assessment of the patient's general health and capacity to withstand the rigors of

dental treatment physically and psychologically *should be performed at every appointment.*

## INCREASING IMPORTANCE OF THE SYSTEMIC PHASE OF TREATMENT

Systemic health has increasing relevance for dental treatment planning because (1) the population of elderly persons, many of them retaining their teeth into old age, continues to increase, and (2) as a result of recent advances in healthcare, people of all ages who suffer from serious illnesses are more likely to remain active and ambulatory and to have increased life expectancies. Until relatively recently, individuals with such severe systemic illnesses as liver, kidney, or cardiac failure did not seek dental services unless they had an acute dental problem. Nor did the medical profession always appreciate the interrelationships between oral health and overall physical health. Unfortunately, the poor prognosis for many systemic conditions provided a rational excuse for patients, physicians, and dentists to place a low priority on achieving and maintaining optimal oral health.

Today, because the medical and surgical management of patients with serious systemic problems has improved immensely, greater numbers of persons with serious general health problems can be expected to present to dentists' offices requiring a broad spectrum of treatments. As a result, dentists must be proficient in obtaining and evaluating each patient's health history and in determining how to provide dental care in a safe and efficacious manner.

Many more physicians, especially those involved with treating patients with cancer or failing organs that require a transplant, now appreciate the effect that preventing dental problems can have on the overall prognosis for their patients. For those patients who are immunocompromised because of systemic disease or immunosuppressive drugs, untreated periodontal disease, deep carious lesions, or pathologic periapical conditions represent potential sources for serious, even life-threatening, infections. Standard medical protocols now usually require the patient who will be receiving an organ transplant, radiation treatment, chemotherapy, or heart valve replacement to receive a dental evaluation and to have any oral disease controlled before undergoing treatment. Additional information about dentistry and interprofessional teams can be found in Chapter 5.

The patient's systemic health is a critical issue for the increasing numbers of dentists practicing in hospital settings. Current trends in U.S. healthcare reflect increasing use of outpatient care for chronic conditions and increased use of ambulatory surgical care facilities. As a result, those patients who are hospitalized are generally individuals suffering from more serious conditions and with more complex medical treatment requirements. For these patients, dental pain and infection can be life threatening. Treatment of dental problems for this group can be challenging, however, because hospitalized patients are often significantly debilitated, bedridden, and unable to receive treatment in a traditional dental setting. Fortunately, practitioners do have ready access to the patient's medical record and can more easily request and view laboratory tests and consult with the patient's physician and other healthcare providers.

## RATIONALE FOR SYSTEMIC THERAPY

The need for systemic therapy must be assessed when the patient first presents for treatment and at every appointment thereafter. Performing this service is important for the well-being of the patient and for overall risk management in the dental practice. The service also discharges a professional responsibility that is inherent in the practice of dentistry as a healthcare profession.

The patient's general health must be considered when planning dental treatment for the following reasons:

1. To recognize symptoms and signs of undiagnosed systemic disease and refer the patient to his or her healthcare provider for medical evaluation
2. To limit or modify dental treatment based on systemic findings
3. To prevent emergencies in the dental office
4. To prevent serious postoperative complications in conjunction with dental treatment

The clinician should perform a systemic phase review for all patients before beginning treatment (Box 7-1).

### Recognition of Systemic Disease and Patient Referral for Appropriate Treatment

Because many patients visit the dental office for maintenance care more frequently than they see a physician for evaluation, all dentists, as healthcare providers, have the responsibility to be alert for signs of undetected systemic diseases in individual patients. Occasionally, findings from the patient's vital signs, general appearance, or oral examination are suggestive of a potentially serious physical problem. If, for example, the patient has signs or symptoms suggestive of hypertension, diabetes, hyperthyroidism, or cancer, further investigation is warranted. Once the symptoms or signs of systemic disease

**BOX 7-1 Systemic Phase Checklist**

- ✓ Do I need to modify my treatment to prevent a medical emergency or other complications?
  - Does the patient have any significant allergies?
  - Is there a risk of a medical emergency during dental treatment?
  - Is there an increased risk of bleeding?
  - Is there an increased risk of perioperative infection?
  - Medications
    - Are there significant oral and systemic side effects to be aware of?
    - Are there any interactions with drugs that are prescribed, recommended, or administered?
- ✓ Do I need information from the patient's healthcare provider? How will this alter my treatment plan?
- ✓ Does the patient's medical condition affect their risk for oral disease?

(Courtesy Dr. Carol Anne Murdoch-Kinch.)

are recognized in the individual patient, the dentist is then responsible for making a timely referral to an appropriate medical colleague so that treatment can be undertaken. Screening dental patients for diabetes, high blood pressure, and high cholesterol could save the U.S. health system between $42 and $102 million a year in additional medical costs.[1]

### Modifying or Limiting Dental Treatment

A number of health problems require the dentist to modify or limit dental treatment for patients. For example, the patient with kidney failure presents several concerns that must be taken into account when providing dental treatment. Patients receiving hemodialysis have an arteriovenous shunt implanted in one arm to enable regular connection to a dialysis machine. The dentist and staff will want to avoid obtaining blood pressure measurements or placing intravenous (IV) medications in this arm. Infection of the tissue surrounding and connecting to the shunt can lead to septicemia, septic emboli, infective endarteritis, and even infective endocarditis. Although the potential is low for these problems occurring as a result of dental treatment, the dentist will want to consult with the patient's physician. Dialysis patients receive the drug heparin during treatment to prevent coagulation of blood in the dialysis machine. To prevent excessive bleeding during dental treatment, the dentist will want to provide treatment the day after dialysis therapy, when the effects of the heparin are diminished and the patient is less fatigued. Many other examples of modifying or limiting treatment for individuals with chronic illness or the potential for greater risk can be found in the chapters discussing elderly patients and patients with special needs (Chapters 12 and 17). See the table *Dental Management: A Summary.*

### Prevention of Medical Emergencies During Dental Treatment

Although uncommon, life-threatening emergencies do sometimes occur in the dental office. Patients who appear to be in relatively good health may have systemic problems that can be aggravated by seemingly routine dental treatment. Medical emergencies occur with greater frequency in patients with multiple systemic illnesses. A careful review of each patient's medical and dental health history may suggest ways to alter treatment delivery and prevent problems. When adequate precautions are taken, most dental procedures can be provided safely in a general dentistry setting.

Two of the more common medical emergencies that dentists may encounter occur when a patient faints, usually from vasodepressor syncope, or when a patient experiences chest pain.[2,3] Vasodepressor syncope may be caused by the stress and fear associated with receiving dental treatment or simply by rapid positional changes, such as sitting or standing up quickly. Careful questioning of all new patients to assess the individual's level of dental anxiety and determine any prior history of syncope may indicate that the practitioner needs to manage the patient's anxiety and pay close attention to the positioning in the dental chair. Patients who have a history of low blood flow to the heart (referred to as *angina*) may feel chest pain. Other types of medical emergencies seen in dentistry include allergic reactions to drugs and dental materials, seizures, and breathing difficulties. In most instances, the dentist can prevent these problems from occurring by carefully reviewing each patient's health history and modifying dental treatment appropriately. It may be necessary to delay treating a patient until the dentist can be certain the individual is medically stable.

### Prevention of Postoperative Complications

Most patients expect some minor discomfort after receiving dental treatment. Some procedures, especially those involving oral surgery, routinely have such postoperative sequelae as bleeding, pain, and swelling. After restorative or endodontic treatment, individual teeth may be sensitive to heat, cold, or chewing pressure. For healthy patients, most of these symptoms can be relieved with nonnarcotic analgesics and resolve in a short time.

When the patient's health is seriously compromised, however, more severe problems can follow dental treatment. Patients with compromised immune systems, poorly controlled diabetes, or kidney failure may be more susceptible to postoperative infection and, consequently, will experience more severe pain and swelling. It may be appropriate to provide these patients with antibiotic coverage before and for a short time after treatment. Blood loss can be significant if the patient does not have normal clotting mechanisms because of the use of anticoagulant medications or because of failing liver function, such as may occur with long-term alcohol use. Mild levels of pain and discomfort are normally not a problem in a healthy individual but can create increased stress in the individual who has poor health, exacerbating the consequences of other diseases and conditions.

The practitioner can prevent severe complications in patients such as these by being knowledgeable about each individual's general health and the potential for more significant postoperative problems to occur. The patient should be given instructions describing the kinds of discomfort that may occur after treatment and in what kinds of situations the office should be contacted. The dentist may also wish to call the patient at home in the early evening. The use of stress reduction procedures, including prescribing medications to alleviate anxiety, may have additional preventive value. Several of these systemic therapies are discussed in the next section.

## EVALUATING THE PATIENT'S CURRENT HEALTH STATUS

To ensure the safe delivery of dental treatment and minimize postoperative problems, the dentist must be able to recognize when a patient needs or will benefit from systemic phase treatment. The practitioner has two tools available to assist in this endeavor: (1) a thorough review of the general health history and (2) an examination of the patient for signs of systemic disease. Several elements in the medical history can point to concerns that may affect the delivery of dental care. Other significant findings can be drawn from the practitioner's review of the health questionnaire, including information about

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any medications that the patient uses regularly. The dentist may detect signs of disease through a systematic evaluation of the patient's vital signs and overall appearance, including a careful examination of the orofacial structures. *This evaluation should always occur at the initial oral examination and at the periodic examination.* The competent practitioner will be attentive to changes in the patient's appearance or general health at each dental visit.

## Reviewing General Health History

Planning for the systemic phase of treatment begins with a thorough analysis of the patient's health history. As discussed in Chapter 1, patients usually complete a health questionnaire when they first visit a dental office and at regular intervals thereafter. The dentist, dental hygienist, or dental assistant then interviews the patient regarding any new health-related information. In addition to providing important information, reviewing the health history with the patient is an important rapport-building exercise. The practitioner must exercise some interviewing skills, asking the patient both open and closed questions, remain objective, and be a good listener. Failure to discover important health information can occur for two reasons. First, the patient may accidentally or intentionally fail to report a significant health problem when completing the health questionnaire. The *In Clinical Practice* box addresses how to improve the accuracy of health questionnaires. Second, some problems, such as mental disorders, recreational drug use, or sexually transmitted diseases carry a social stigma making patients reluctant to reveal them to the dentist. Some individuals may believe that information about their general health has no relevance to dental treatment or that the questionnaire takes too much time to complete. Still others may not fully understand a health question, answering it incorrectly. For some patients, English is a second language, and the questions may not be understood. Finally, the patient who completely refuses to complete the form may actually be functionally illiterate and unable to read the questionnaire. For all these reasons, an oral interview of the patient may be important.

### Health History

The patient's health history will reveal diseases and conditions that may or may not be significant to the dentist when providing treatment. The clinician must evaluate both the *severity* of the problem and *how recently* it occurred. The patient who reports a heart attack less than 1 month ago is at greater risk for having a second attack or a significant episode of arrhythmia during a stressful dental visit than an individual who had an attack 3 years ago. The dentist also will be concerned when the patient reports a history of systemic disease that has now reappeared or is worsening.

Any past problems that have led to damage to a major organ system are highly significant. For instance, the patient who contracted rheumatic fever as a child may have residual heart damage, predisposing the individual to an infection of the heart, **infective endocarditis,** after certain types of dental treatment. On the other hand, a healthy patient who had syphilis 30 years ago and was treated promptly with antibiotics is probably not at risk for systemic complications during dental treatment.

**IN CLINICAL PRACTICE**

**Improving the Accuracy and Reliability of the Health Questionnaire**

Dentists use positive findings from the health questionnaire to indicate whether special precautions may be necessary when providing dental treatment for a particular patient. Several actions can be taken to ensure gathering good information about the patient's health.

1. Include a short statement at the beginning of the health questionnaire, stressing the importance of providing accurate information.
2. Written and oral instructions to the patient should indicate that any information provided about general health is necessary and important for treatment purposes and will remain confidential.
3. Ensure that all members of the dental team understand that all patient information is personal and confidential.
4. Make sure new patients arrive early enough to have time to complete the health questionnaire and other forms.
5. Consider mailing the health questionnaire and forms to the patient before the first appointment. A day or two before the appointment, the office staff should call and remind the patient to bring in the forms.
6. Consider having forms in other languages.

The practitioner should take particular note of any past hospitalizations, including outpatient surgery. Important examples include treatment for cancer, cardiovascular surgery, or placement of prosthetic joints or other prostheses. When medical or surgical procedures are part of the patient's history, the dentist will want to know whether such complications as excessive pain, bleeding, infection, poor healing, or adverse reactions to drugs occurred during the treatment. A history of such events should suggest the possibility that similar occurrences may occur in association with dental treatment. The dentist should always ask the patient if any medications have changed because of new surgical or medical treatments.

When a potentially life-limiting disease, such as cancer or severe congestive heart failure, has been diagnosed, the patient's long-term prognosis should be determined, because that information may influence decisions regarding which treatment options are most appropriate. For instance, the patient who is being treated for pancreatic cancer may wish to have missing teeth replaced to better chew food or to improve esthetics. Although dental implants may be an ideal long-term solution, a less expensive and more immediate solution, such as a provisional removable partial denture, may be more appropriate. It is important to note, however, that the dentist has a professional responsibility to share all reasonable treatment options with any patient, regardless of age, physical condition, or financial status.

### Current Health Information

In addition to identifying past health problems, the dentist needs to investigate findings related to current health

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conditions. The systemic health problems of most ambulatory patients relate directly or indirectly to chronic conditions, such as heart or lung disease, diabetes, hypertension, endocrine disorders, anemia, arthritis, or psychological disorders. Other problems, more episodic in nature, may not be associated with a chronic disease. Examples include seizure disorders, fainting, and seasonal allergies. Certain habits, such as tobacco use, excessive alcohol consumption, or substance abuse, can influence both systemic and oral health.

An important source of information about the patient's current health is an evaluation of the prescription or over-the-counter drugs he or she reports taking on a regular basis. All medications should be carefully documented and monitored, including prescription drugs, over-the-counter products, health and nutritional supplements, and herbal medicines. When all the patient's medications have been identified, the dentist should determine the indications for each, consulting a drug reference book or online resource, if necessary. This information should corroborate findings from the health questionnaire and provide some insight into the severity of a particular disease. Occasionally, the patient may be taking medications for conditions not originally identified on the health questionnaire. For example, an elderly patient may report taking furosemide (Lasix) and digoxin (Lanoxin) for a blood pressure problem. The astute dentist will recognize that these drugs also are commonly used to treat congestive heart failure, a much more serious condition.

In addition to recognizing or determining the indications for each of the patient's medications, the dentist must be aware of possible side effects. Of particular concern will be those side effects that adversely affect oral health or could cause problems for the patient while receiving dental treatment. For example, aspirin or anticoagulant drugs may promote excessive bleeding during periodontal or oral surgical procedures. Many medications reduce the volume of saliva produced, predisposing the patient to increased risk of caries, periodontal disease, and mucosal diseases.

After examining the health questionnaire and medication list, the dentist interviews the patient. How severe are the reported health problems? Does the patient see a physician or other heath professional regularly? Is the patient taking the prescribed medications as directed, and are they effective in treating the conditions they were prescribed for? When this information has been gathered, the dentist needs to evaluate whether the patent's systemic problems present a risk to providing dental care or could adversely affect the prognosis for the proposed dental treatment. The American Society of Anesthesiologists (ASA) has adopted a widely used classification system for estimating patient risk status (Table 7-1). The dentist may require an ASA category III or IV patient to seek medical consultation before treatment. For example, a patient who cannot climb a flight of stairs without resting and complains of occasional chest pain on exertion may be referred to a physician to evaluate for ischemic heart disease.

Patients should be asked about allergies or reactions to drugs or other substances. The dentist will be most interested in avoiding reactions to materials commonly used in dentistry. These include allergies or reactions to drugs such as penicillin, erythromycin, aspirin, nonsteroidal antiinflammatory drugs (NSAIDs), codeine, and other narcotics. Some patients are sensitive to latex products and others to certain metals in dental restorations. Patients may report problems with local and topical anesthetics or flavorings used in dentistry. The dentist needs to discern whether the patient has a true allergy, has experienced a side effect or toxic reaction, or simply does not care for the product. If it is determined that the patient has a true allergy, a medical alert label or warning message should be prominently displayed in the record. Frequently seen medical alert warnings in dentistry include allergies to latex and certain antibiotics such as penicillin or erythromycin, bleeding and blood pressure problems, and the need for antibiotic premedication.

**TABLE 7-1 American Society of Anesthesiologists (ASA) Physical Status Classification With Examples**

| Category | Definition | Examples |
|---|---|---|
| ASA I | A normal healthy patient with no evidence of systemic disease | |
| ASA II | A patient with mild systemic disease or a significant health risk factor. The patient is able to walk up a flight of stairs or two level city blocks without difficulty | Well-controlled diabetes, controlled hypertension, history of asthma, mild obesity, pregnancy, smoker, extreme anxiety or fear toward dentistry |
| ASA III | A patient with moderate to severe systemic disease that limits activity but is not incapacitating; the patient can walk up one flight of stairs or two level city blocks, but stops at times because of distress | Stable angina, postmyocardial infarction, poorly controlled hypertension, symptomatic respiratory disease, massive obesity |
| ASA IV | A patient with severe systemic disease that is life threatening; the patient is unable to walk up a flight of stairs or two level city blocks; patient is in distress at rest | Unstable angina, liver failure, severe congestive heart failure, or end-stage renal disease |

## Findings from Physical Evaluation

### Vital Signs

The value and significance of obtaining a patient's vital signs for patients is discussed in Chapter 1. One of the most commonly detected vital sign abnormalities is high blood pressure,

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or hypertension. Blood pressure measurements should be taken at every appointment for patients who have a history of hypertension, even if they are treated with medication. Most patients with hypertension can receive dental treatment but may also need a referral to the healthcare provider for evaluation and treatment (Table 7-2). Systemic phase treatment for patients with hypertension includes reducing anxiety and stress, and careful attention to rapid changes in chair position. Moderate amounts of local anesthesia with epinephrine may be used in hypertensive patients.

### Visual Inspection and Oral Examination

Evaluation of the patient's general appearance may suggest the presence of one or more systemic diseases. Abnormalities in appearance alone are usually not sufficient to support a definitive diagnosis, but they may corroborate other findings from the health history. Because the dental profession encourages regular maintenance visits, and many patients comply with this standard, the dentist has the opportunity to evaluate the patient at regular intervals and, as a result, may sometimes be the first healthcare provider to identify a systemic problem (Figure 7-1). Signs of such problems might be increased weight caused by water retention resulting from cardiopulmonary problems, or changes in skin color and fingernail beds. Changes in gait or posture may indicate neurologic or musculoskeletal problems, such as stroke or osteoarthritis.

Examination of the head and neck region may reveal other findings indicative of systemic disease. Skin color may vary from red and ruddy, suggestive of alcohol abuse, to a pale yellow seen with liver damage associated with hepatitis. Malodors from the mouth may be a sign of excessive alcohol consumption or, when a fruity smell is detected, poorly controlled diabetes. The clinician should pay close attention to the condition of the eyes and other facial structures. For example, thinning hair and eyebrows accompanied by dry skin may be a sign of a thyroid disorder. The dentist should also rule out systemic disease as a cause of abnormalities detected during palpation and examination of the head, neck, and oral cavity (Table 7-3). The dentist may choose to refer the patient for a medical consultation or laboratory test when abnormal findings are detected during the physical examination.

## EVALUATING RELATIONSHIP BETWEEN SYSTEMIC HEALTH AND DENTAL TREATMENT

When the need for systemic treatment for a general health condition has been identified, the dentist must weigh the risk of aggravating health problems by providing treatment for dental disease against the risk of delaying treatment. For example, the patient with frequent chest pain, suggestive of unstable angina, may best be referred to the physician for evaluation and treatment before a potentially stressful dental treatment, such as the extraction of several teeth. On the other hand, a new patient who has a blood pressure measurement of 150/95 mm Hg may also need to be referred to a physician to be evaluated for hypertension, but the dentist will probably feel comfortable providing such immediate services as an examination or prophylaxis.

For the patient with serious health problems, the dentist must consider several questions. How critical would a particular treatment be to the overall oral health of the patient? For example, removing an asymptomatic, impacted third molar even in a healthy 60-year-old woman may not be indicated. Additional questions to consider when evaluating the patient with serious health problems include the following:

- Is the patient in pain?
- Does the patient want comprehensive care, or is he or she interested only in having a specific procedure done?
- Are there other dental problems that need immediate attention?
- Does the patient have a physician? Is he or she willing to seek medical evaluation if it is warranted? How severe are the individual's health problems?
- What would be the ramifications of providing no care at this time?

The clinician is most cautious about providing services that would be particularly stressful for the patient. To be sure, much of the stress may be due to the patient's level of anxiety, but some procedures, such as extractions and periodontal surgery, are inherently invasive and more challenging for patients to tolerate. Any outpatient treatment requiring long appointment times or during which excessive bleeding might occur should be provided only to relatively healthy patients,

**TABLE 7-2 Dental Management and Follow-Up Recommendations Based on Blood Pressure**

| Blood Pressure (mm Hg) | Dental Treatment Recommendations | Follow-Up Recommendations |
|---|---|---|
| ≤120/80 | Any required | No physician referral necessary |
| ≥120/80 but <140/90 | Any required | Encourage patient to see physician |
| ≥140/90 but <160/100 | Any required | Encourage patient to see physician |
| ≥160/100 but <180/110 | Any required; consider intraoperative monitoring of blood pressure for upper-level stage 2 hypertension | Refer patient to physician promptly (within 1 month) |
| ≥180/110 | Defer elective treatment | Refer to physician as soon as possible; if patient is symptomatic, refer immediately |

From Little JW, Falace DA, Miller CS, et al: *Dental management of the medically compromised patient,* ed 8, St. Louis, 2013, Mosby.

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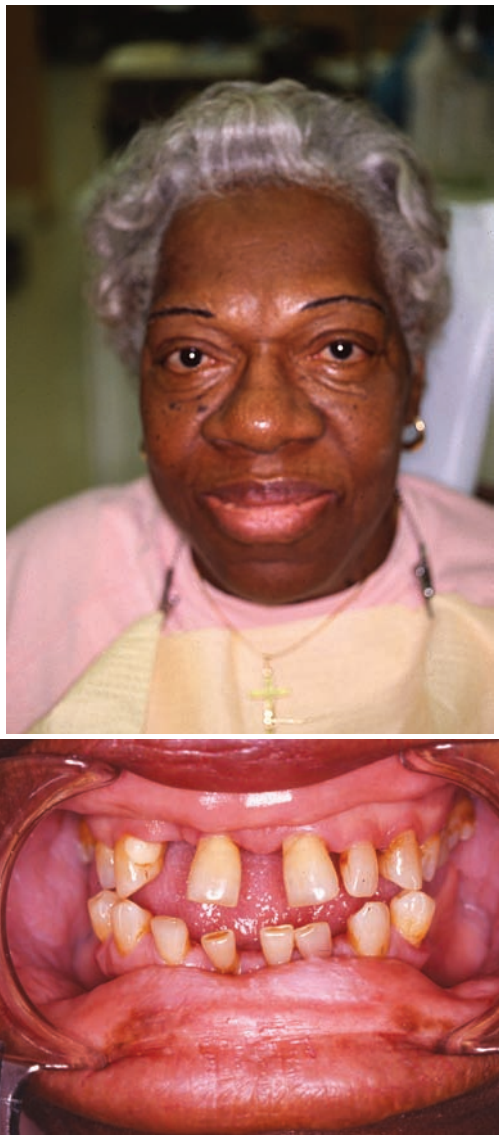

**FIG 7-1** When viewed alone, this patient's full lips and thick nose do not suggest a systemic problem. The patient came to the dentist complaining of the growing spaces between her teeth and an inability to wear her removable partial dentures. She also reported that her hands seemed larger and her rings and gloves no longer fit. The dentist suspected a systemic problem and referred the patient to a physician. The patient was diagnosed with acromegaly, a condition in adults in which excessive growth hormone is produced. A benign tumor on her pituitary gland was discovered and removed.

those in ASA categories I and II. Patients in ASA category III or IV who are in pain as a result of dental or periodontal conditions may best be managed with analgesics and possibly antibiotic medication, and consultation with or referral to a physician. Table 7-4 lists the risk of systemic complications associated with some common dental procedures.

## SYSTEMIC PROCEDURES

Most of the therapies discussed throughout this book pertain specifically to treatment of the teeth and surrounding structures. Systemic therapy, in contrast, focuses on the entire patient, with the goal of ensuring that dental care is delivered safely and comfortably. Some systemic procedures address the patient's physical concerns directly, such as postponing care and consulting a physician, prescribing drugs for pain and infection, and making the patient comfortable in the dental chair. Other techniques are instituted to effect behavioral changes—for example, instruction in smoking cessation or diet modification. Some techniques serve to reduce patient stress and anxiety. In addition, the dentist provides an important service by reviewing and updating the patient's health history on a regular basis. Although none of these therapies is technically difficult to provide, the challenge for dental practitioners is recognizing when, why, and how to provide them in support of the patient's systemic health and overall well-being. The dentist must assess the patient before, during, and after treatment to determine whether any of these therapies is indicated and reassess the patient at future appointments.

**TABLE 7-3 Examples of Oral Signs of Systemic Conditions**

| Finding | Possible Problem |
|---|---|
| Erosion of the teeth, especially anteriors | Gastroesophageal reflux disease, bulimia |
| Oral yeast infection | Decreased immunity associated with poorly controlled diabetes, AIDS, chemotherapy, or severely debilitated patients |
| Reduced saliva production, caries | Medication side effect, autoimmune disease such as Sjögren's syndrome, dehydration, bulimia |
| Gingival hyperplasia | Local reaction to cancer chemotherapy, seizure control drugs, or some cardiac medications |

**TABLE 7-4 Risk Categories for Selected Dental Procedures**

| Dental Procedures | Risk of Systemic Complications |
|---|---|
| Oral examination, radiographs, study models | Little to none |
| Local anesthesia, simple restorative treatment, prophylaxis, asymptomatic endodontic therapy, simple extractions, orthodontic treatment | Low |
| Symptomatic endodontic therapy, multiple extractions, single implant placement, deep scaling, and root planing | Medium |
| Extensive surgical procedures, multiple implant placement, general anesthesia | High |

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## Postponing or Limiting Treatment

Deciding whether it is in the best interests of the patient to limit or postpone dental care is always a difficult decision. The determination is usually made after evaluating a patient's physical and psychological condition with respect to the dental treatment to be provided. Sometimes the decision is straightforward. Consider, for example, the patient scheduled for periodontal surgery whose blood pressure registers at 170/110 mm Hg. Such a finding would be a clear indication for postponing the procedure so that the patient can seek medical consultation. Other situations for which it may be advisable to delay treatment include those involving the patient who is not feeling well, is extremely anxious, or has a health condition that requires immediate medical attention.

Managing the patient with significant systemic problems or abnormal vital signs and an acute dental problem, such as severe pain associated with an irreversible pulpitis, presents particular difficulties. It may be necessary to provide limited therapy, such as initiating root canal therapy or prescribing an antibiotic, and analgesic drugs for pain control. The dentist can also use a long-acting local anesthetic, such as bupivacaine HCl (Marcaine), to provide immediate relief while conducting a more detailed examination, contacting a physician by phone, or reevaluating the patient's vital signs.

## Consultation With a Physician

All dentists should feel comfortable contacting other health professionals to discuss a patient's condition. Three common reasons for contacting a patient's physician can be described. First, a physician may be contacted to request physical evaluation and treatment for the patient when signs of systemic disease are initially discovered in the dental office. In this situation, a written consult is most useful, particularly if the patient does not have a regular physician currently (see *In Clinical Practice: Writing a Medical Consultation Letter* box). For example, a patient might be referred for treatment of hypertension, with a letter that contains the most recent blood pressure measurements and a request to evaluate and treat.

Second, the dentist may wish to request additional information about or clarification of the patient's current physical condition. This might include confirming systemic diagnoses, such as the patient's cardiac condition after a heart attack, obtaining laboratory values (blood tests), or reviewing current medication regimens. As discussed in the *In Clinical Practice: Consulting a Physician by Telephone* box, contact by phone is typical. Any new information should be documented in the patient's record.

### IN CLINICAL PRACTICE

**Writing a Medical Consultation Letter**

A medical consultation letter to another healthcare provider must contain the following five items:

1. Patient identifying information. At a minimum, the full patient name and birthdate should be listed in the consultation letter. Some dentists include a release of information statement for the patient to sign.
2. The patient's history and/or the findings that indicated the consultation letter; the patient's medication history with dosages may also be included.
3. The proposed dental treatment, including some indication of how physically stressful the treatment may be; a listing of drugs (anesthetics/analgesics) proposed to be used during and after the treatment also may be included. Avoid unnecessary detail and technical terminology when describing proposed treatment. "Mesial occlusal composite resin on a lower left premolar and removal of impacted third molar" might be better stated as "one dental filling and surgical removal of a tooth."
4. A specific request for information or action. Examples include requests for physical evaluation, blood test results, or an opinion as to whether the patient should be premedicated.
5. The dentist's name, address, telephone and facsimile phone numbers.

Remember that the dental treatment of the patient is your responsibility. You should not expect the healthcare provider to accept that responsibility or dictate treatment. You are asking the provider, in light of his or her knowledge and understanding of the patient's condition, to assist you in making an appropriate decision about what level of treatment the patient can tolerate. The following is an example of such a letter to a physician:

October 13, 2016

From: Stephen J Stefanac, DDS, MS
To: John Smith, MD
RE: Rebecca Roe (DOB: March 28,1954)

Dear Doctor Smith:

When Rebecca Roe presented for a new patient examination, blood pressure measurements from her right arm while sitting were 160/95, 162/93, and 160/96 mm Hg. The only medication she reports taking is metformin for type 2 diabetes.

Ms. Roe will require deep cleaning of her teeth, four fillings, and a crown. All procedures can be accomplished with minimal stress using local anesthetic containing 2% lidocaine and 1:100,000 epinephrine.

Please evaluate and treat Ms. Roe's hypertension and inform me when her blood pressure is normal. If there are any other health considerations I should be aware of, please let me know. Should you require any additional information, please do not hesitate to contact me.

Sincerely,

Stephen J Stefanac, DDS, MS
1011 N, University St,
Ann Arbor, MI 48109-1078 USA
734.555.1212 734.555.1213 fax

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## IN CLINICAL PRACTICE

**Consulting a Physician by Telephone**

Often, the most expeditious method for consulting with a physician or other healthcare provider, especially when the patient has both significant health problems and urgent dental needs, is a telephone call. Because patients may receive care from a number of physicians, the dentist must first confirm who is the best physician to call. Is it the primary care physician or a specialist? It may be necessary to fax ahead a form signed by the patient permitting the physician to discuss his or her health information.

Ideally, the dentist should place the call, although some practitioners delegate straightforward consultations to other staff in the office. During the call, the patient's record should be available for reference, including identifying information, such as date of birth and home address. Writing specific questions out beforehand helps ensure that all necessary information is obtained.

When the receptionist in the physician's office answers the phone, the dentist should clearly state the patient's name and the general purpose of the call, and request to speak with the physician. In situations involving simple requests, laboratory values, or test results, it may be appropriate to speak with a nurse or the physician's assistant.

When the physician is on the line, the dentist should again confirm the patient's name and birthday and state the reason for the telephone call. All significant systemic diagnoses and any medications the patient may be taking should be verified. Although unnecessary detail concerning the proposed dental treatment should be avoided, the physician should be informed about anticipated levels of stress, blood loss, and possible postoperative problems. Any drugs that will be used before, during, and after treatment should be discussed. With questions to the physician that are clear and to the point, the dentist should gain sufficient information to reshape plans for treatment appropriately. Copies of any laboratory results in the physician's record for the patient may be requested and can be sent by mail or facsimile for incorporation into the patient's dental record. All other new information should be documented in the patient record immediately after the telephone call.

Finally, the dentist may need input from the physician to help determine whether providing dental treatment for the patient would be a prudent course of action. For example, consider the patient with many health concerns, who is under treatment by several medical specialists. Unless one physician is coordinating care, the dentist may need to discuss the situation with several physicians, gathering information and opinions to help determine what course should be taken. This does not involve asking permission to provide dental care, but is rather a collegial discussion of the proposed treatment plan and the risks and benefits it brings to the patient. The desired outcome of such conversations is a mutual decision as to what treatment can and should be provided, and how the care can be delivered so as to minimize patient health risks.

Several problems can occur when consulting a physician. If there is no answer to a written consultation request, the dentist will want to confirm, usually by telephone, that the physician did indeed receive it. The dentist may first wish to determine whether a correct mailing address was used or, if the request was to be hand-carried by the patient, confirm that the patient actually visited the physician. Occasionally, a physician will return a written request with an unclear response or one that the dentist may not agree with. When this occurs, the dentist will want to contact the physician by phone for additional clarification or further discussion of the patient's health problems.

## Stress Management

Many patients find visiting the dentist to be an anxiety-provoking experience. A detailed discussion of the manifestations, implications and management of anxiety is presented in Chapter 14. Anxiety frequently manifests itself as **stress,** a disturbance in the individual's normal homeostasis resulting from events that may be physical, mental, or emotional in nature. Helping the patient cope with stress represents one of the most beneficial systemic treatments a dentist can provide. This will be particularly important for patients with such systemic problems as cardiac disease, diabetes, and adrenocortical insufficiency.

Stressful events have a physiologic effect on the body, primarily because of the release of a class of substances called *catecholamines,* which include epinephrine and norepinephrine. These chemicals tend to speed up the body's metabolism, in particular making the heart work harder by increasing heart rate and creating an increased need for more oxygen in the cardiac muscle. Imagine, for a moment, how an anxious but physically healthy patient is affected by stress. The stressful experience often begins with a loss of sleep for one or more days before the dental appointment. The stress builds during the day as the patient worries about seeing the dentist and continues as he or she sits in the reception area, anticipating the dreaded appointment. Once in the dental chair, the patient may experience an increase in blood pressure and heart rate and may breathe rapidly, or even excessively, a condition referred to as **hyperventilation.** Such a patient will have a heightened awareness to pain that may persist even with sufficient amounts of local anesthetic. Under these circumstances, the appointment will be an unpleasant experience for both the patient and the dentist.

Patients whose health is severely compromised may experience even more severe reactions to stress than those described for a healthy patient. Patients with poor blood flow to the heart muscle may have chest pain or **angina.** Individuals with congestive heart failure can retain fluid in the lungs, developing **acute pulmonary edema.** Patients with asthma may have problems breathing. During a stressful event, the insulin-dependent diabetic patient may have altered glucose metabolism and develop symptoms from low blood sugar levels. Patients who have been taking corticosteroid medication for extended periods may be unable to tolerate high levels of stress, suffering an **adrenocortical crisis.**

Managing stress for the patient with severe systemic conditions involves several procedures, summarized in Box 7-2.

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**BOX 7-2 Managing Stress for the Patient With Serious Health Problems**

1. Review the health history and interview the patient regarding the individual's level of stress.
2. Discuss the treatment plan, options for pain management, and possible postoperative complications.
3. Consider prescribing drugs to reduce anxiety and improve sleep before appointments.
4. Schedule short appointments. If longer appointments are required, give the patient time for breaks.
5. Minimize the time the patient spends waiting for the appointment to begin.
6. Consider using nitrous oxide or conscious sedation.
7. Obtain good local anesthesia.
8. Plan for postoperative pain and complications; prescribe analgesics and antibiotic medication if necessary.
9. Contact the patient at home after treatment; be available should complications or questions arise after hours.

As always, the clinician begins with a careful review of the health history, followed by a sympathetic discussion of the patient's level of anxiety. The patient should be encouraged to freely express any fears, including describing any past unpleasant experiences in the dental chair. Discussing the details of the treatment plan so that the patient is familiar with the planned procedures and can ask questions about them may help alleviate the anxiety. For some patients, it may be advantageous to prescribe a preappointment sedative medication to improve sleep and help reduce anxiety.

For patients whose health is severely compromised, additional measures to control stress may be necessary. Shorter appointments when the patient is feeling his or her physical and psychological best can be arranged. The patient should not have to wait long to be seen after arriving for the appointment. The dentist may wish to consider using relaxation techniques or medications to help reduce anxiety and stress. These include hypnosis, guided imagery, nitrous oxide analgesia, oral antianxiety drugs, and intravenous sedation. It will be critical to control the patient's pain with adequate amounts of local anesthetic. At the conclusion of treatment, possible postoperative problems, especially the potential for pain and infection, should be explained to the patient. For some compromised individuals, it may be appropriate to prescribe analgesic medications and antibiotics to prevent infection. Finally, the dentist should assure the patient that he or she can be contacted by phone after the appointment if the patient has questions or postoperative complications. Some dentists regularly make early evening phone calls to patients who have had stressful procedures performed earlier in the day.

## Prescribing or Altering Patient Medication

Several medication options are available for the treatment of both systemic and dental problems. The medications most commonly prescribed by general dentists are antibiotics and medications used to control pain and anxiety. Less frequently, dentists may recommend corticosteroid drugs to control inflammation or need to administer oxygen and epinephrine in the event of a patient emergency.

### Antibiotics

Antibiotic drugs may be prescribed to treat or to prevent infection. The usual sources of oral infection stem from problems with the teeth and periodontal tissues—for example, apical or periodontal abscesses. These conditions are best treated by eliminating the cause of the problem by performing endodontic therapy, extracting the offending tooth, or debriding an area with periodontal inflammation. When the infection has spread beyond the original source, causing extensive swelling or lymphadenitis, or when signs of systemic infection appear, such as an elevated temperature, fever, and malaise, antibiotic drugs may be indicated.

A particular concern for the dentist is to prevent the occurrence of heart infections. Some patients have cardiac conditions that put them at risk for the development of **infective endocarditis** several weeks after receiving dental treatment. To prevent this infection, the dentist prescribes a single oral dose of antibiotic medication to be taken by the patient an hour before the procedure. Boxes 7-3 and 7-4 list the dental procedures and cardiac abnormalities for which the American Heart Association has recommended antibiotic prophylaxis. Table 7-5 lists the various oral antibiotic regimens currently available. A discussion of the issues associated with administering antibiotics for the prevention of prosthetic joint infection is presented in Chapter 17.

### Pain Medications

As discussed earlier, controlling pain is a crucial objective when managing stress. A wide variety of medications can be used to help control pain. Such nonprescription analgesic drugs as aspirin, ibuprofen, and acetaminophen can be effective. Prescription medications include narcotic and nonnarcotic pain relievers, many with both analgesic and

**BOX 7-3 Dental Procedures for Which Endocarditis Prophylaxis Is Recommended for Patients**

All dental procedures that involve manipulation of gingival tissue or the periapical region or perforation of the oral mucosa.

The following procedures and events do not require prophylaxis: routine anesthetic injections through noninfected tissue, taking dental radiographs, placement of removable prosthodontics or orthodontic appliances, adjustment of orthodontic appliances, placement of orthodontic brackets, shedding of deciduous teeth, bleeding from trauma to the lips or oral mucosa.

From Wilson W, Taubert KA, Gewitz M et al: Prevention of infective endocarditis: guidelines from the American Heart Association: a guideline from the American Heart Association Rheumatic Fever, Endocarditis and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group, *J Am Dent Assoc* 138(6):739-745, 747-760, 2007.

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**BOX 7-4 Cardiac Conditions Associated With the Highest Risk of Adverse Outcomes From Endocarditis for Which Prophylaxis With Dental Procedures Is Reasonable**

Prosthetic cardiac valve or prosthetic material used for cardiac valve repair
Previous episode of bacterial endocarditis
Congenital heart disease (CHD)
- Unrepaired cyanotic CHD, including palliative shunts and conduits
- Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure
- Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibits endothelialization)

Cardiac transplantation recipients who develop cardiac valvulopathy

From Wilson W, Taubert KA, Gewitz M et al: Prevention of infective endocarditis: guidelines from the American Heart Association: a guideline from the American Heart Association Rheumatic Fever, Endocarditis and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group, *J Am Dent Assoc* 138(6):739-745, 747-760, 2007.

**TABLE 7-5 Adult Oral Antibiotic Regimens for the Prevention of Bacterial Endocarditis**

| Situation | Agent | Regimen: Single dose 30-60 min before procedure |
|---|---|---|
| Not allergic to penicillin | Amoxicillin | 2 g |
| Allergic to penicillin | Cephalexin* | 2 g |
| | **Or** | |
| | Clindamycin | 600 mg |
| | **Or** | |
| | Azithromycin or clarithromycin | 500 mg |

*Cephalosporins should not be used in individuals with a history of anaphylaxis, angioedema, or urticaria after taking penicillin.
From Wilson W, Taubert KA, Gewitz M et al: Prevention of infective endocarditis: guidelines from the American Heart Association: a guideline from the American Heart Association Rheumatic Fever, Endocarditis and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group, *J Am Dent Assoc* 138(6):739-745, 747-760, 2007.

antiinflammatory properties. Some patients with serious health problems cannot tolerate or should not be given certain types of analgesic medications, often because they will interact with other drugs the patient is taking. For example, the patient who takes the blood thinning (anticoagulant) medication warfarin sodium (Coumadin) must avoid aspirin and some other medications. Some narcotics depress respiratory function, and therefore should be very cautiously used in patients with pulmonary diseases, such as emphysema. Antianxiety and sedative drugs are frequently used to manage stress in the patient with compromised health and are discussed in more detail in Chapter 14. Consultation with the patient's physician may be necessary to resolve these questions and, in some instances, may facilitate a temporary alteration in the patient's medication regimen to accommodate dental treatment requirements. For example, the diabetic patient may adjust the insulin dose taken before a lengthy appointment, or the dose of an anticoagulant drug may be reduced before a surgical procedure.

## Positioning Patient in Dental Chair

Some patients may be unable to tolerate being placed in certain positions in the dental chair. Conditions such as congestive heart failure or emphysema can be aggravated when the patient is reclined for even a short period. Before beginning treatment, the practitioner should query the patient about what reclining angle is comfortable. Patients with arthritis or back problems appreciate being offered a pillow or folded towel to use for additional neck and back support. Women in the last trimester of pregnancy often feel more comfortable turned slightly to the side in the chair. During treatment, patients with serious health problems should be asked how they are doing at regular intervals and should be allowed to take a break occasionally and sit up. The patient who feels cold in the dental chair will appreciate being offered a blanket for warmth.

To prevent inducing faintness by a rapid change in position, raise the chair slowly after an extended dental procedure. Faintness after a change from a reclining to a sitting position or from sitting to standing, caused by **orthostatic hypotension,** may happen with any patient but is seen more frequently in individuals with poor circulatory reflexes from heart problems or as an effect of certain medications prescribed to treat high blood pressure. To prevent this problem, the chair should be raised in two to three increments, pausing for 10 to 20 seconds at each stop.

## Regularly Reviewing and Updating General Health History

The practitioner should review each patient's health history before beginning dental treatment. In busy dental offices, this routine can easily be overlooked, leading to common mistakes, such as using latex gloves with a latex-sensitive patient or prescribing the wrong type of antibiotic or other medication. Placing the health questionnaire in a conspicuous location at the start of each appointment (possibly paper-clipped to the outside of the patient's record) will serve as a reminder

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of this important task. Most electronic health records display prominent alerts regarding allergies, significant systemic conditions, or the need to premedicate or take other preparatory actions with the patient.

Every practitioner should have procedures in place for a regular review and updating of the health questionnaire, recording any changes in the patient's health. This procedure may need to be implemented at every appointment for patients with serious systemic conditions, whereas the dental hygienist can interview other patients during regular maintenance visits.

Questions that may rouse the patient's memory regarding changes in health status include

- Are you being treated by a physician for any new disease or condition? These are the conditions currently listed in your record.
- Has there been any change in the medications you are taking? Here is what I have listed in your record.
- Have you developed any new allergies or sensitivities to drugs?

For a more thorough review of changes, the patient should complete a new health questionnaire every 2 to 3 years or after a specified number of updates.

## HOW SYSTEMIC CONDITIONS CAN AFFECT TREATMENT PLANNING

Although it is beyond the scope of this textbook to provide a comprehensive discussion of all systemic health conditions that could affect the delivery of dental care, the following three examples describe situations that occur with some frequency in a dental office. The examples illustrate the fact that simple rules alone cannot always provide sufficient guidance on how to treat such patients. Every dentist has a professional duty to be aware of treatment modifications that may be required when managing patients with significant systemic conditions. The core of this knowledge is first gained in dental school and must be supplemented regularly by reading journal articles and textbooks, participating in continuing education programs, and consulting with other health professionals.

Both dentistry and medicine have entered an era of rapid change in the ways in which diseases are diagnosed and treated. Recently, some investigators have proposed that certain oral diseases may be predictive of or cause systemic disease (see the *What's the Evidence? Is There Evidence of a Link Between Periodontitis and Cardiovascular Disease?* box). Only by keeping abreast of new developments will the dentist be prepared to provide optimal care to his or her patients.

### Patients Taking Oral Anticoagulants

Although many general health problems can affect the delivery of dental care, the risk for excessive bleeding represents one of the more serious concerns. Such a risk is especially important to identify before procedures that have the potential for significant blood loss, such as oral, periodontal, or endodontic surgery; implant placement; or periodontal procedures, such as scaling and root planing. Several different conditions may predispose the patient to excessive bleeding. For example, because the liver produces many clotting factors, the dentist should be concerned when the patient has a history of chronic liver disease or has impaired liver function.

Anticoagulants are a more commonly encountered risk factor for excessive bleeding and include such drugs as aspirin, some NSAIDs, and oral anticoagulants. Warfarin sodium, a vitamin K antagonist, more commonly known by its trade name, Coumadin, is the most frequently prescribed oral anticoagulant, although other medications are now available for patients with certain cardiovascular conditions.[4] Anticoagulant medications interfere with the formation or efficacy of factors necessary for proper coagulation. Patients taking these drugs often report that they are on a "blood thinner." When a patient reports anticoagulant therapy, the dentist should always inquire about the reasons for the therapy. The list of indications for anticoagulant therapy has expanded over the past 10 years (Box 7-5).

#### Treatment Implications

Although it is possible to measure the patient's bleeding time in the dental office, a more accurate appraisal can be obtained by contacting the patient's physician for recent laboratory measurements or, if necessary, by ordering new blood studies. Patients taking the anticoagulant warfarin sodium (Coumadin) should have their prothrombin time measured on a regular basis. This is usually reported in units referred to as the **international normalized ratio (INR).** The INR for a patient with normal coagulation is 1. Most patients taking anticoagulants are maintained in the INR range of 2 to 3, except for those conditions (e.g., patients with mechanical prosthetic heart valves) that require higher INR values from 2.5 to 3.5. Some newer anticoagulant medications do not affect the INR values. It's important to review the literature

**BOX 7-5 Indications for Use of Anticoagulant Drugs**

**Prevention of**
- Deep vein thrombosis
- Pulmonary embolism
- Vascular thromboembolism
- Transient cerebral ischemic attacks
- Stroke
- Clotting disorders

**Accompanies Treatment for**
- Myocardial infarction
- Dilated cardiomyopathy
- Atrial fibrillation
- Paroxysmal supraventricular tachycardia
- Rheumatic heart disease
- Valvular disorders
- Prosthetic heart valves
- Coronary artery bypass surgery

Adapted from Hawes EM, Viera AJ: Anticoagulation: indications and risk classification schemes, *FP Essent* 422:11-17, 2014.

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## WHAT'S THE EVIDENCE?

### Is There Evidence of a Link Between Periodontitis and Cardiovascular Disease?

Many studies have shown an association between periodontal disease and coronary heart disease.[1-13] Periodontitis is a disease of chronic infection and inflammation and may have an effect on the atherosclerotic process.[14] Three mechanisms have been proposed as ways in which periodontitis may be linked to cardiovascular disease: (1) an effect of transient bacteremia from periodontitis, which spreads the infection, (2) an effect of circulating oral microbial toxins, which cause distant injury, and (3) an inflammation resulting from injury caused by oral microorganisms.[15] Regardless of the mechanism, periodontitis may increase an individual's susceptibility to systemic diseases. In individuals with periodontitis, the biofilm present in the mouth contains gram-negative bacteria that can cause a transient bacteremia as a result of the release of microbial toxins and inflammatory mediators. Kinane states that any of these processes can cause vascular changes or disorders.[14] Atherosclerosis results in a decreased capacity of blood vessels to carry blood. Atherosclerotic lesions may crack or rupture, clogging one or more coronary arteries and resulting in a myocardial infarction or stroke.[16]

Studies have found an association between periodontal attachment loss and the thickness of the carotid artery intima-media wall[17] and electrocardiographic abnormalities,[18] which are subclinical signs of atherosclerosis and cardiovascular disease. Several metaanalyses have concluded that there is an association between periodontitis and cardiovascular disease,[19-27] but a causal relationship has not been verified.[28-31] Although after accounting for several confounding factors, such as smoking, alcohol consumption, education level and socioeconomic status, an association between periodontitis and cardiovascular disease remains, the association is present, but weak[5,6,13,23-25,29-32] In addition, it has been concluded that there is, as yet, insufficient evidence to answer the question of whether periodontal therapy for individuals with chronic periodontitis can prevent the occurrence or recurrence of cardiovascular diseases.[20,29,33]

### References


1. Arbes SJ Jr, Slade GD, Beck JD: Association between extent of periodontal attachment loss and self-reported history of heart attack: an analysis of NHANES III data, *J Dent Res* 78(12):1777–1782, 1999.
2. Beck J, Garcia R, Heiss G, et al: Periodontal disease and cardiovascular disease, *J Periodontol* 67(Suppl 10):1123–1137, 1996.
3. DeStefano F, Anda RF, Kahn HS, et al: Dental disease and risk of coronary heart disease and mortality, *BMJ* 306(6879):688–691, 1993.
4. Howell TH, Ridker PM, Ajani UA, et al: Periodontal disease and risk of subsequent cardiovascular disease in U.S. male physicians, *J Am Coll Cardiol* 37(2):445–450, 2001.
5. Hujoel PP, Drangsholt M, Spiekerman C, et al: Periodontal disease and coronary heart disease risk, *J Am Med Assoc* 284:1406–1410, 2000.
6. Hujoel PP, Drangsholt M, Spiekerman C, et al: Pre-existing cardiovascular disease and periodontitis: a follow-up study, *J Dent Res* 81(3):186–191, 2002.
7. Hung HC, Willett W, Merchant A, et al: Oral health and peripheral arterial disease, *Circulation* 107(8):1152–1157, 2003.
8. Jansson L, Lavstedt S, Frithiof L, et al: Relationship between oral health and mortality in cardiovascular diseases, *J Clin Periodont* 28(8):762–768, 2001.
9. Joshipura KJ, Rimm EB, Douglass CW, et al: Poor oral health and coronary heart disease, *J Dent Res* 75(9):1631–1636, 1996.
10. Kweider M, Lowe GD, Murray GD, et al: Dental disease, fibrinogen and white cell count; links with myocardial infarction? *Scott Med J* 38(3):73–74, 1993.
11. Mattila KJ, Nieminen MS, Valtonen VV, et al: Association between dental health and acute myocardial infarction, *BMJ* 298(6676):779–781, 1989.
12. Mattila KJ, Valtonen VV, Nieminen M, et al: Dental infection and the risk of new coronary events: prospective study of patients with documented coronary artery disease, *Clin Infect Dis* 20(3):588–592, 1995.
13. Mattila KJ, Valle MS, Nieminen MS, et al: Dental infections and coronary atherosclerosis, *Atherosclerosis* 103(2):205–211, 1993.
14. Kinane DF, Lowe GD: How periodontal disease may contribute to cardiovascular disease, *Periodontology* 23:121–126, 2000.
15. Teng YT, Taylor GW, Scannapieco F, et al: Periodontal health and systemic disorders, *J Can Dent Assoc* 68(3):188–192, 2002.
16. Beck JD, Offenbacher S, Williams R, et al: Periodontitis: a risk factor for coronary heart disease? *Ann Periodont* 3(1):127–141, 1998.
17. Beck JD, Elter JR, Heiss G, et al: Relationship of periodontal disease to carotid artery intima-media wall thickness: the atherosclerosis risk in communities (ARIC) study, *Arterioscl Thromb Vascular Biol* 21(11):1816–1822, 2001.
18. Shimazaki Y, Saito T, Kiyohara Y, et al: Relationship between electrocardiographic abnormalities and periodontal disease: the Hisayama Study, *J Periodont* 75(6):791–797, 2004.
19. Bahekar AA, Singh S, Saha S, et al: The prevalence and incidence of coronary heart disease is significantly increased in periodontitis: a meta-analysis, *Am Heart J* 154:830–837, 2007.
20. Blaizot A, Vergnes JN, Nuwwareh S, et al: Periodontal diseases and cardiovascular events: meta-analysis of observational studies, *Inter Dent J* 59:197–209, 2009.
21. Friedewald VE, Komman KS, Beck JD, et al: The American journal of cardiology and journal of periodontology editors' consensus: periodontitis and atherosclerotic cardiovascular disease, *J Periodontol* 80:1021–1032, 2009.
22. Geismar K, Stoltze K, Sigurd B, et al: Periodontal disease and coronary heart disease, *J Periodontol* 77:1547–1554, 2006.
23. Humphrey LL, Fu R, Buckley DI, et al: Periodontal disease and coronary heart disease incidence: a systematic review and meta-analysis, *J Gen Intern Med* 23(12): 2079–2086, 2008.
24. Janket SJ, Baird AE, Chuang SK, Jones JA: Meta-analysis of periodontal disease and risk of coronary heart disease and stroke, *Oral Surg Oral Med Oral Pathol Oral Radiol Endo* 95(5):559–569, 2003.
25. Khader YS, Albashaireh ZS, Alomari MA: Periodontal diseases and the risk of coronary heart and cerebrovascular diseases: a meta-analysis, *J Periodonol* 75(8):1046–1053, 2004.
26. Mustapha IZ, Debrey S, Oladubu M, et al: Markers of systemic bacterial exposure in periodontal disease and cardiovascular disease risk: a systematic review and meta-analysis, *J Periodontol* 78:2289–2302, 2007.
27. Persson GR, Ohlsson O, Pettersson T, et al: Chronic periodontitis, a significant relationship with acute myocardial infarction, *Eur Heart J* 24:2108–2115, 2003.
28. Dietrich T, Garcia RA: Associations between periodontal disease and systemic disease: evaluation the strength of evidence, *J Periodont* 76:2175–2184, 2005.
29. Kuo LC, Polosn AM, Kang T: Association between periodontal diseases and systemic diseases: A review of the inter-relationships and interactions with diabetes, respiratory diseases, cardiovascular diseases and osteoporosis, *Public Health* 122:417–433, 2008.
30. Kebschull M, Demmer RT, Papapanou RN: Gum bug, leave my heart alone! Epidemiologic and mechanistic evidence linking periodontal infections and atherosclerosis, *J Dent Res* 89:879–902, 2010.
31. Seymour GJ, Ford PJ, Cullinan MP, et al: Infection or inflammation: the link between periodontal and cardiovascular diseases, *Future Cardiol* 102:5–9, 2009.
32. Sim SJ, Kim JY, Moon AI, et al: Periodontitis and the risk for nonfatal stroke in Korean adults, *J Periodontol* 79:1652–1658, 2008.
33. Li C, Lv Z, Shi Z, et al: Periodontal therapy for the management of cardiovascular disease in patients with chronic periodontitis. *Cochrane Database Syst Rev* (8):CD009197, 2014.


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about such medications and to contact the patient's physician if significant bleeding can be anticipated with a planned procedure.

When contacting the patient's physician, the dentist should also confirm the systemic diagnoses and discuss, in a general way, the proposed plan of treatment. It is the dentist's responsibility to evaluate and communicate succinctly to the physician any potential for excessive bleeding that the treatment may involve. Some dentists, physicians, and even patients believe it necessary to temporarily halt the patient's anticoagulant medication several days before treatment, but this is not necessary for most procedures.[5] Many procedures, such as simple restorative treatment, do not normally lead to bleeding. Simple extractions and periodontal scaling and root planing can usually be performed safely when the INR is lower than 3. The risk for postoperative bleeding after extraction can be reduced by incorporating local measures, such as a hemostatic dressing and careful suturing of the extraction site. Multiple extractions (e.g., three teeth at a time) can be planned to minimize bleeding. Scaling and root planing should be performed in an organized fashion, one tooth at a time, to evaluate the bleeding response. Applying pressure at the site for several minutes may reduce bleeding.

## Pregnant Patients

With more than 4 million births each year in the United States, the chances are strong that a general dentist will be evaluating a pregnant patient with regularity. When planning treatment for the pregnant patient, the dentist is, in essence, planning care for two individuals—the expectant mother and the developing fetus. A dilemma arises when appropriate care for one may not be in the best interest of the other. Although the decision to defer treatment until after the baby is born may sometimes seem most prudent, deferral may not be realistic in the presence of serious dental problems. The challenge to the dentist is to weigh the benefit of providing dental treatment against the potential for harm to the fetus.

The history-taking stage is particularly important with this patient both for developing rapport and for gathering information that will help determine how care should be delivered. Women of childbearing age should be asked regularly if they could be pregnant before exposing them to radiography or prescribing medications. For new patients who are pregnant, the health history must be reviewed for evidence of systemic diseases, such as diabetes or hypertension, which could complicate the pregnancy. Several physiologic changes may accompany pregnancy, and certain systemic diseases may develop or be aggravated by these changes (Box 7-6). The patient's blood pressure and pulse rate should be taken and recorded along with the expected date of delivery. The decision to contact the patient's physician or obstetrician may be indicated when conditions such as diabetes, hypertension, pulmonary or cardiac disease, or bleeding disorders are present.[6]

A 2011 experts' consensus statement concluded that providing dental care to the pregnant patient throughout all trimesters of pregnancy is safe and effective, and that dental care should not be withheld because of pregnancy. Although dental procedures can be safely performed during the last months of pregnancy, concern for the mother's comfort may limit the extent of treatment. When the patient is in the third trimester, short appointments, allowing the patient to periodically adjust her position, and avoiding putting her in an extreme supine position will help make the patient more comfortable during treatment. The 2011 consensus statement also concluded that routine preventive, periodontal, diagnostic, and restorative treatments during pregnancy do not increase adverse pregnancy outcomes.[6,7]

### BOX 7-6 Changes and Conditions Associated With Pregnancy

**Physiologic Changes**

- Weight gain
- Increased need to urinate
- Restricted breathing
- Increase in clotting factors

**Conditions That Occur With Increased Frequency**

- Anemia
- Postural hypotension
- Hypoglycemia
- Hyperglycemia
- Systolic ejection murmurs

### Radiographs

Although the use of ionizing radiation during pregnancy might appear to be a concern, current scientific evidence suggests that radiographic imaging is not contraindicated during pregnancy.[7] As with all patients, the clinician should take the minimum number of images needed for diagnosis and treatment and provide the patient with a protective thyroid collar and abdominal apron. The pregnant patient may refuse radiographs, but the clinician should remember that an accusation of providing substandard care could be made if restorative treatment, extractions, or endodontic therapy is done without making appropriate radiographs. It may be necessary, in such cases, to not treat the patient unless they agree to have radiographs taken.

### Medications

The prudent dentist minimizes the use of medications when treating the pregnant patient. At the same time, however, local anesthetics may be necessary to make treatment comfortable and reduce the patient's stress. No drug has been proven absolutely safe for the patient who is pregnant, but research suggests that when necessary, most local anesthetic agents with vasoconstrictors can be used safely.[6]

If an antibiotic is indicated, as in the presence of swelling or an elevated temperature accompanying an oral infection, then penicillins are the medications of choice. Clindamycin may be prescribed if the patient is allergic to penicillin. The tetracyclines should be avoided because of the potential for causing intrinsic staining of the child's developing teeth.

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If medication for pain control is necessary after treatment, acetaminophen is usually the drug of choice. The patient's obstetrician should be consulted before the use of nitrous oxide, intravenous sedation, or general anesthesia.[7]

### Managing Dental Emergencies During Pregnancy

The pregnant patient with dental pain should receive the necessary radiographs to permit a diagnosis. The decision to treat depends on the source of the problem, its severity, the patient's symptoms, and the stage of pregnancy. For example, the patient in the late third trimester with an occasional mild intermittent pain from four impacted third molars could be treated with conservative, nonsurgical measures. On the other hand, if the patient reports the inability to sleep because of an irreversible pulpitis, root canal therapy or an extraction would be indicated even during the first trimester. In either situation, the patient should be informed about the consequences of treatment or no treatment.

### Disease Control and Definitive Care

The most common oral problem experienced during pregnancy is gingival inflammation and hypertrophy, often referred to as **pregnancy gingivitis** (Figure 7-2). The condition may arise from hormonal changes leading to an increased blood flow to the gingival tissues, coupled with the presence of local irritants, such as plaque and calculus. The bleeding typically increases as the pregnancy progresses, usually beginning to subside in the eighth month. Many patients who have not previously received regular dental care will seek treatment when the condition becomes painful or if they are concerned about "bleeding gums." Often these patients will have entered pregnancy with poor oral hygiene and marginal gingivitis. The dentist or hygienist should debride affected areas to remove plaque and calculus. If necessary, local anesthetic can be used to make the patient more comfortable during this process. All pregnant patients should receive oral hygiene instruction.

**FIG 7-2** This 20-year-old woman complained of sore gums, was 3 months pregnant, and had pregnancy gingivitis. The patient had poor oral hygiene and the gingiva was inflamed, especially in the mandibular arch. With improved oral hygiene and periodontal treatment, the condition improved and eventually disappeared.

Other disease control procedures, such as restorations to control caries and endodontic therapy, can be provided during pregnancy. The clinician should be observant for signs of tooth erosion that can follow nausea and vomiting, usually during the first trimester. The patient and dentist may decide to postpone extensive definitive care, such as multiple crowns, fixed partial dentures, implants, and preprosthetic surgery, until after the baby is born.

## Diabetes

Diabetes is a relatively common disease that in 2012 affected approximately 29.1 million people in the United States, or 9.3% of the population. Of the 29.1 million people with diabetes, 8.1 million (27.8%) are undiagnosed. Type 1, previously referred to as *insulin-dependent diabetes*, accounts for 5% of all diagnosed cases of diabetes and is most frequently discovered in the midteens. Type 2 diabetes usually occurs later in life and accounts for 90% to 95% of all diagnosed cases. Signs and symptoms of diabetes can occur during the second and third trimester of pregnancy. Five to ten percent of affected women become type 2 diabetics after pregnancy.[8] In the United States, diabetes is associated with tooth loss in patients 50 years and older, with 18% of complete tooth loss being attributed to the disease.[9]

Identification of the diabetic patient in the dental practice usually occurs after reviewing the patient's responses on the health questionnaire. For the patient with undiagnosed disease, the dentist may suspect diabetes if the patient has symptoms of hyperglycemia. The diagnostic criteria for diagnosing diabetes mellitus and the symptoms of hyperglycemia are presented in Table 7-6.

For the patient with a diagnosis of diabetes, the dentist should make note of any medications the patient is taking and be aware of any side effects, because several oral hypoglycemic medications can have an effect on the oral cavity. The level of metabolic control attained by the patient should be assessed from both an overall and a same-day perspective. Most diabetics can accurately assess their level of control on

**TABLE 7-6 Diagnostic Criteria for Diabetes Mellitus**

| Test | Prediabetes | Overt Diabetes Mellitus |
|---|---|---|
| Hb $A_{1c}$ (glycolated hemoglobin) | 5.7%-6.4% | ≥6.5% |
| Fasting plasma glucose test | 100-125 mg/dL | ≥126 |
| Random (nonfasting) glucose with signs of hyperglycemia* | Not applicable | ≥200 |

*Increased thirst, headaches, frequent urination, fatigue, blurred vision.

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a long and short-term basis. At the beginning of each appointment, the dentist should ask the diabetic patient how he or she is feeling, when and what type of food was eaten before the appointment, and whether insulin or oral hypoglycemic medications have been taken as prescribed by the individual's physician.

All diabetic patients should make regular visits to the physician and have periodic monitoring of blood sugar levels. The insulin-dependent patient should be questioned about the usual levels of blood glucose maintained and the frequency of blood testing for glucose. Any reported emergency visits for hyperglycemia or hypoglycemia should be documented in the record. Last, when reviewing the health questionnaire with the patient, the practitioner should learn whether the patient suffers from any of the other conditions frequently seen in the diabetic patient, such as kidney, cardiovascular, or peripheral vascular and neurologic diseases.

### Treatment Implications

If the patient's diabetes is poorly controlled or the patient has many of the complications seen with diabetes, such as severe cardiovascular disease, it may be necessary to consult the patient's physician before beginning treatment. Well-controlled diabetics should be advised to eat normal meals before appointments and ideally should be scheduled mid-morning for treatment. The dentist should be alert for signs that the patient is becoming **hypoglycemic**. Early signs and symptoms of hypoglycemia include hunger, weakness, trembling, pallor, and a rapid heart rate **(tachycardia).** Because eating regular meals is an important part of glycemic control, especially for the insulin-dependent diabetic, the patient may need to adjust the insulin dosage if he or she will be unable to return to a regular eating schedule immediately after a dental procedure.

Several oral problems may be more common in the diabetic patient and should be taken into consideration when planning the disease control phase. Some diabetic patients may have a greater incidence of periodontal disease, dental caries, missing teeth, xerostomia, and fungal infections. In addition, they may be more likely to suffer such adverse outcomes after treatment as delayed healing or infection. Diabetic patients may need more frequent periodontal maintenance visits and should be encouraged to maintain a noncariogenic diet and a high level of oral hygiene.

## DOCUMENTATION OF SYSTEMIC CONCERNS

Like findings from other parts of the patient's examination, information regarding the systemic health of the patient must be documented clearly in the patient's physical or electronic record. Significant medical diagnoses and other health concerns should be gathered and summarized in one area of the record so that the dentist can easily review this information before each appointment. A running list of all medications taken by the patient should be updated regularly. Colored stickers and ink stamps can be applied to a prominent place on a physical record to flag those patients with potentially life-threatening conditions, such as allergies to latex or penicillin or the need for antibiotic premedication before treatment. Most electronic record systems have conspicuous medical alert notifications.

Although for most patients, attention to systemic concerns continues throughout the entire treatment, for some it may be useful to document a discrete systemic phase plan at the start of therapy. For example, if the patient has severe health problems (ASA III or IV), and the dentist must consider limiting the nature and scope of the treatment plan, a written systemic phase of care is warranted. Consider the following example of a plan for a lymphatic cancer patient, who is preparing for radiation and chemotherapy to treat tumors in the head and neck region:

Systemic phase:

1. Consult with physician:
   a. To determine patient's upcoming radiation and chemotherapy schedule.
   b. To discuss plans to remove all hopeless teeth now and consider replacement at the conclusion of chemotherapy.
2. Obtain a complete blood count before removing remaining teeth.
3. Provide palliative treatment for xerostomia and radiation mucositis during radiation therapy.

When a patient has significant dental and periodontal disease, it is often best to remove all the teeth before head and neck radiation, even when a few teeth may be salvageable. The systemic treatment plan presented supports this decision and clearly states what the dentist must do to deliver care safely and help the patient during radiation therapy. Many dentists and dental schools find it useful to document all types of systemic therapy at the beginning of the patient's treatment plan.

## CONCLUSION

Dentistry, as a profession, evolved significantly as a result of research into the causes of oral diseases, the development of new research-based therapies, and a stronger emphasis on preventing oral problems. The relationship between oral health and general health is now more widely recognized by both the dental and medical professions. It has become increasingly important for dentists to be knowledgeable about human physiology, pathology, and pharmacology, and about the effect of dental treatment on the general health of each patient. This broad knowledge base becomes even more significant as more patients who are elderly or have serious systemic illness seek our services. Only through careful inquiry and attention to each patient's general and oral health do dentists earn the privilege of the title *doctor.*

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## REVIEW QUESTIONS

- What are the objectives of the systemic phase?
- Why has systemic phase treatment become increasingly important in the practice of dentistry?
- What is the ASA classification for a patient with severe congestive heart failure who is incapable of walking one block without rest?
- Describe common problems, usually identified in the patient history, that suggest the need for a systemic phase of care.
- Describe common problems, usually identified in the physical evaluation of the patient, that suggest the need for a systemic phase of care.
- Under what circumstances would it be advisable to postpone treatment or limit treatment for a dental patient?
- Describe some situations in which it would be appropriate to prescribe medications for a patient.

## REFERENCES


1. Soderlund K: Chairside medical screening could save $102 million a year, *ADA News* 45(5):2, 2014.
2. Anders PL, Comeau RL, Hatton M, Neiders ME: The nature and frequency of medical emergencies among patients in a dental school setting, *J Dent Educ* 74(4):392–396, 2010.
3. Collange O, Bildstein A, Samin J, et al: Prevalence of medical emergencies in dental practice, *Resuscitation* 81(7):915–916, 2010.
4. Curtin C, Hayes JM, Hayes J: Dental implications of new oral anticoagulants for atrial fibrillation, *Dent Update* 41(6):526–528, 530–531, 2014.
5. van Diermen DE, van der Waal I, Hoogstraten J: Management recommendations for invasive dental treatment in patients using oral antithrombotic medication, including novel oral anticoagulants, *Oral Surg Oral Med Oral Pathol Oral Radiol* 116(6):709–716, 2013.
6. Oral Health Care During Pregnancy Expert Workgroup: *Oral health care during pregnancy: a national consensus statement.* Washington, D.C., 2012, National Maternal and Child Oral Health Resource Center.
7. Steinberg BJ, Hilton IV, Iida H, Samelson R: Oral health and dental care during pregnancy, *Dent Clin North Am* 57(2):195–210, 2013.
8. Centers for Disease Control and Prevention: *National diabetes statistic report,* 2014. http://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf. Accessed July 23, 2015.
9. Patel MH, Kumar JV, Moss ME: Diabetes and tooth loss: an analysis of data from the National Health and Nutrition Examination Survey, 2003-2004, *J Am Dent Assoc* 144(5):478–485, 2013.


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# 8

# Acute Phase of Treatment

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## OUTLINE

**Challenges**
**Rewards**
**Profile of the Patient Requesting Immediate Treatment**
- Comprehensive Care Patient
- Limited Care Patient

**Patient Evaluation**
- Patient History
- Clinical Examination
- Diagnostic Tests and Techniques
- Radiographic Examination

**Common Acute Problems and Diagnoses**
- Complaint of Pain
- Complaint of Swelling
- Esthetic Complaints
- Traumatic Injury

**Treatment Planning for Acute Needs**
- Defining the Range of Options
- Factors Influencing Treatment Decisions
- Choosing a Plan That Takes Long-Term Implications Into Account
- Acquiring Consent for Acute Care
- Using Medications to Treat Acute Problems

**Documenting Acute Care Treatment and Follow-Up**
**Conclusion**

The **acute phase** of care incorporates diagnostic and treatment procedures aimed at solving urgent oral problems. Acute care can involve a myriad of services, from controlling pain and swelling to just replacing a broken tooth on a denture. All types of patients may need acute care, including those under active treatment or on maintenance recall, new to a dental practice, or returning to a practice after a lengthy absence. Most people expect a dentist to be available to treat any immediate problems and are drawn to offices that provide such services. Good practice management and professional responsibility require that every dentist effectively and efficiently manage patients with immediate treatment needs without unnecessary disruption to the flow of the practice. The dentist is also responsible for managing his or her patients when they have acute problems outside of normal office hours.

The purpose of this chapter is to provide information about how to design, record, and execute the acute phase of a dental treatment plan. In the course of this discussion, the reader will become acquainted with the unique challenges of providing acute dental care. The profile of the acute patient's typical problems is described. Guidance is given for evaluating, diagnosing, treating, and providing follow-up care for such a patient. In addition, suggestions for documenting all aspects of acute care are presented.

The reader will encounter two important and related distinctions throughout this chapter. An **emergency problem** is one that incapacitates the patient and has the potential to become a life-threatening condition. In such cases, immediate attention is required. Examples include severe dental pain, swelling, systemic infection, or trauma to the face or jaws. In most instances, the dentist will see the patient with emergency needs on the same day that contact is made. In contrast, an **urgent problem** does not require immediate attention but is a problem that the dentist—or, more commonly, the patient—thinks should be attended to "now" or "soon" (Figure 8-1). Examples include mild to moderate pain without active infection, asymptomatic broken teeth, lost restorations, and other purely esthetic problems. Treatment of urgent problems may, theoretically, be postponed without causing the patient unnecessary pain or the risk of systemic illness. Often, these problems can be managed with **palliative care** (for example, by treating the pain, but not the underlying problem), until the patient can be conveniently worked into the office schedule.

Making the distinction between emergency and urgent problems is important to both the dentist and patient to ensure that no true emergency problem goes unattended. On another level, the experienced dental practitioner recognizes that this distinction may seem irrelevant to an anxious, distraught patient. From a practice management perspective, it is important that the office be prepared to accommodate patients with acute needs in a timely and attentive manner, regardless of whether a potentially serious health issue exists. Not infrequently, patients have questions about "new" findings in the oral cavity that they fear may be cancer, or they may develop esthetic problems that for reasons relating to personal appearance and self-esteem need immediate

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**FIG 8-1** Although not painful, the fracture of the right central incisor is an urgent problem that needs prompt attention.

attention. These concerns, although not true emergencies, do require the dentist's recognition, if only to reassure the patient and to reschedule for more definitive care.

## CHALLENGES

Treating patients with acute care needs can be challenging in many ways. Initially, the practitioner must determine whether the patient's complaint is a true emergency requiring immediate attention or an urgent problem that can be treated at a more convenient time. Usually, this discussion occurs over the telephone and may be resolved by an office staff member without the dentist's direct involvement. On the other hand, the dentist usually manages after-hours emergencies. Once the decision to see the patient has been made, sufficient time must be available in the dentist's schedule to adequately diagnose and treat the patient's problem. This can be difficult when the practitioner's day is tightly scheduled. Some busy practices reserve time in the dentist's schedule, or book segments of the schedule lightly, to accommodate occasional add-on appointments.

Arriving at a diagnosis and an acute care treatment plan can be time consuming. This problem is compounded significantly when the acute needs patient is new to the practice. In the absence of an existing health and dental history and an established relationship with the patient, the dentist must work without many of the usual clues or cues that would otherwise guide the process. The dentist needs to assess for the first time the patient's health history, perform a limited oral examination and diagnostic tests, obtain radiographs if necessary, decide on the appropriate treatment, and execute some level of care to alleviate symptoms. Difficult enough for the patient of record, this task can be extremely challenging when it involves an anxious and emotionally labile patient whom the dentist has not met.

During an initial emergency appointment, the amount of time available to develop rapport will probably be limited. If the patient is in significant pain or has been awake all night, he or she may not be thinking rationally. Some patients will be fearful or irritable or may not be respectful of staff members. As a result, communicating the nature of the problem and the treatment options to the patient may be difficult. The patient may have difficulty making a treatment decision or providing informed consent, especially for irreversible procedures, such as extractions or endodontic therapy.

Furthermore, it is common for some patients, especially those who have never been seen in the practice before, to expect to have an acute need managed immediately and simply. These individuals may have experienced a lifetime of episodic dental care, may not understand the nature of the problem, and may be unrealistic about the scope or complexity of the needed treatment. This can be frustrating for some practitioners, who may see such patients as demanding, intrusive, and unappreciative of the value of comprehensive dental care. Nevertheless, the dentist has the obligation, insofar as is possible, to educate the patient about his or her overall oral condition and to describe how the prospective emergency or urgent care treatment will fit into the context of the person's overall oral health. To help the patient understand and accept this vision, the dentist must be a good listener, take the time to explore all reasonable treatment options with the patient, and thoroughly discuss any barriers to treatment that the patient might perceive, especially with regard to time, financial cost, and pain. To accomplish this quickly, efficiently, and professionally—and to do so with a personalized and caring delivery—can be difficult for even the most experienced practitioner.

## REWARDS

Efficiently managing the patient with acute problems is essential to attracting new patients and serving the needs of patients already in the practice. Dentists who are prepared to treat emergency and urgent problems promptly will retain patient loyalty and see their practices grow. Relieving pain or restoring a broken tooth can also provide great personal satisfaction to the dentist. Often, patients with such problems will arrive fearful and unsure of what treatment will be required. A kind, empathetic approach to care and the prompt resolution of the dental problem may encourage some patients who originally presented for episodic treatment only to become comprehensive care patients.

## PROFILE OF THE PATIENT REQUESTING IMMEDIATE TREATMENT

### Comprehensive Care Patient

Patients expect that their regular dentist will see them promptly if they are in pain, break a tooth or prosthesis, or lose a temporary restoration. Such problems can sometimes be anticipated, or they may come as a surprise to both patient and provider. Even when the problem is anticipated, however, the timing for the event cannot be predicted with certainty.

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Patients who are new to the practice and request comprehensive care for many dental problems may require immediate treatment, often to control or prevent dental pain and infection. When planning treatment, it is possible to identify those urgent problems that, if untreated, are likely to become dental emergencies and to sequence them early in the treatment plan. For example, the patient whose tooth has significant decay and is experiencing prolonged sensitivity to heat may require immediate caries removal and a pulpectomy to avoid the possibility of increased pain and development of an apical infection. Other common urgent care procedures include repairing prostheses or replacing restorations, especially in esthetic locations or when a tooth is sensitive.

Acute care may also become unexpectedly necessary while a patient is undergoing regular active treatment. Many procedures in dentistry may have associated postoperative complications, such as pain, bleeding, or swelling. Experienced dentists are aware of the potential for complications associated with the procedures they perform and will discuss the chances for postoperative problems with the patient when treatment is rendered. If a problem arises, the dentist may only need to speak with the patient on the telephone; however, if the problem is more serious, the person may need to return for evaluation.

Patients on periodic recall may also develop urgent treatment needs. The problem may be related to prior treatment (e.g., pain from a tooth that had received a restoration near the pulp) or to a chronic condition, such as a deep periodontal pocket that has developed a periodontal abscess. Common complaints include sensitive or chipped teeth, lost or fractured restorations, broken prostheses, oral infections, and traumatic injuries. These issues require prompt attention to satisfy patient expectations.

Patients of record who have not been seen for some time require special consideration during an examination for acute care problems. The dentist should determine whether other dentists have provided treatment since the patient left the practice and whether he or she has been receiving maintenance care on regular basis. The patient's health questionnaire will need to be updated or redone.

## Limited Care Patient

Approximately two-thirds of the U.S. population have visited a dentist in the past year.[1] Included in this group are those individuals who receive at least an annual oral evaluation and maintenance procedures for the teeth and prostheses. For the remainder of the population, dental care is usually both episodic in nature and limited in scope. There are several reasons for this. Many individuals are afraid of receiving dental services, often because of unpleasant past experiences with a dentist and fears that treatment will be painful or costly, or both. Understanding the reasons for this anxiety and treating the fearful patient are discussed further in Chapter 14. For many individuals, a real or perceived lack of financial resources to pay for dental treatment represents a significant barrier. In the United States, low-income patients without dental insurance may seek dental care in a hospital emergency department.[2] For the elderly person or the individual with severe health problems, dental treatment may not be accessible or may be considered a low priority compared with more life-threatening concerns. For some persons, dental care and good oral health simply are low priorities (see Chapter 18). These patients may appear apathetic, be reluctant to commit to a comprehensive treatment approach, miss appointments, and ultimately disappear from the practice altogether. Last, some young persons may have had regular care in their youth, but have not yet taken responsibility for maintaining oral health as an adult. Often, for these individuals, making the time or even remembering to see a dentist regularly constitutes the biggest barrier to care.

Although the persons just described may not be regular visitors to a dental office, it is probable that they will need treatment *sometime* in their lives. Most often, a particular event has provoked the patient to action. For example, a molar tooth, sensitive to hot and cold for several months, has now become a constant throbbing problem. For others, especially those who believe they are in reasonably good dental health, the symptoms may be less acute but disturbing all the same. Common complaints include loose teeth, bleeding gums, sensitivity to heat or cold, fractured teeth or restorations, food impaction, and broken prosthodontic work. Fear of worsening pain or the anticipation of additional dental problems may also motivate these persons to seek dental treatment.

Culturally, the U.S. population places a high value on personal appearance. For many, self-esteem can be greatly affected—positively or negatively—by the appearance of the teeth and smile. As a result, many limited care patients seek dental services because of esthetic concerns. Often, encouraged by friends and family to see a dentist, the patient may believe that he or she needs to look better to improve social and business opportunities. For such patients, a dark or missing anterior tooth may be perceived as a more severe problem than the broken down or chronically infected posterior teeth also identified during examination (Figure 8-2).

**FIG 8-2** Dark tooth as a result of pulpal necrosis. (Courtesy Dr. Gerald Scott.)

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## PATIENT EVALUATION

Although the evaluation of the acute care patient requires the same components as an evaluation of a patient seeking comprehensive care—a patient history, physical and clinical examination, and radiographs or any other necessary special diagnostic tests—each component is handled differently with the acute care patient. Of necessity, the acute care evaluation will often be more abbreviated, although in some cases additional diagnostic procedures are performed. With any acute care patient, the findings, both positive and negative, take on a different and often increased level of importance because of the urgency of the situation.

### Patient History

Methods and techniques for obtaining a comprehensive patient history are described in Chapter 1. The content of the acute care patient's history will focus on issues that affect the diagnosis and management of the immediate problem or problems for which the patient has sought treatment. Acute care patients usually complete the same health history questionnaire as the comprehensive care patient, but a detailed investigation of positive findings, particularly in the dental history, may be more selective and associated with the chief concern. (See Chapter 1 for a discussion of the inquiry process used to review the health history information with the patient.) The clinician realizes that many new patients who are in pain at the first visit are also anxious and may not be thinking or communicating clearly. Many of the issues discussed in Chapter 14 relating to the evaluation and treatment planning for the anxious patient will also apply to the patient with acute care needs.

#### Chief Concern and History of the Concern

The term **chief concern** (also referred to as the **chief complaint**) designates the immediate reason the patient seeks treatment. Recording the concern in the patient's own words not only identifies the issue that needs attention, but also provides important information about the patient's *perception* of the problem. The way in which the patient phrases the concern may provide important insight into the patient's dental knowledge and awareness. As illustrated in the *In Clinical Practice: Value of Listening to the Patient's Concerns* box, the patient's words may also give the dentist a glimpse of the patient's unexpressed fears. As the starting point for investigating the patient's problem, articulation of the chief concern is critical to making an accurate diagnosis of an acute problem. A clear, concisely stated chief concern helps the patient and the dentist focus on the important issues and saves considerable time in the evaluation process. Even a vague or poorly focused chief concern, however, can trigger questions that will enable the dentist to begin the process of establishing possible diagnoses. (See Video 8-1 Interview of a Patient in Pain on Evolve.)

The history of the chief concern enriches the dentist's understanding of the primary problem and the way in which it arose (Box 8-1). More important, the history helps the dentist to develop a short list of possible diagnoses and discern what specific areas should be examined, what radiographic images should be taken, and what clinical tests should be performed to identify the problem's source.

The careful and astute practitioner can make a tentative diagnosis for the vast majority of acute care problems on the

**BOX 8-1 Typical Questions to Ask Acute Care Patients**

- What brings you in today?
- How long have you had the pain or problem (days, weeks, months)?
- Is it getting better, worse, or staying the same?
- On a scale of 1 to 10, how severe is the pain?
- What makes the pain worse (hot, cold, sweets, pressure)?
- How long does the pain last (seconds, minutes, hours)?
- Does the pain follow some pattern, such as worse at night or when lying flat?
- Have you been using any medication for the problem? Does the medication help?
- Do you have swelling or drainage?
- Have you been examined or treated elsewhere for this problem?

**IN CLINICAL PRACTICE**

**Value of Listening to the Patient's Concerns**

The following encounter provided one dentist with a valuable lesson about the importance of open communication and complete informed consent while managing the acute care patient.

A middle-aged man in apparent good health presented to the emergency service at a school of dentistry. The man was well dressed, articulate, and well educated. He was also very apprehensive. His chief concern was the "swelling in my jaw" adjacent to an upper molar. The history of the chief concern revealed that the man recently had seen his private dentist in his hometown, an hour's car drive away. His dentist had referred him to a local endodontist for root canal treatment. The root canal had been initiated, and the patient reported no postoperative discomfort. Based on the conversation and the patient's reported outcome, it appeared that the diagnosis had been correct and that all treatment had been performed according to the standard of care.

Further discussion revealed the patient's real concern. The swelling that had begun as a diffuse, poorly localized tenderness had now localized and was indurated with smooth, well-defined borders. From the clinician's perspective, this was attributable to a normal progression in the natural history of a dental abscess. But the patient was convinced he had oral cancer.

Apparently, neither the general dentist nor the endodontist had taken the time to fully inform the patient about the diagnosis, the nature of the treatment, the expected outcome, and possible sequelae. Had that been done, the patient could have been spared considerable time and unnecessary worry. A few minutes of open and candid conversation at an earlier stage might have given this patient some desperately needed information, allayed his unwarranted fears, and provided him with a more positive experience with the profession.

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basis of the chief concern as expressed by the patient and the related history. A dilemma may arise, however, if the patient is allowed to ramble, raising multiple complaints and symptoms. The dentist may become distracted and have difficulty arriving at the essential working diagnosis, and, more important, treatment for the primary problem may be delayed as a result. On occasion, however, the patient's seemingly unrelated concerns may provide important clues, helping the dentist to make a diagnosis and treatment recommendation more quickly and accurately. Discerning when these other issues may be important and when they are a distraction takes considerable experience, sensitivity, and skill.

### Health and Medication Histories

Although the health history for the acute care patient can be abbreviated, it cannot be overlooked. A prime cause for dental malpractice litigation has been the failure of dentists to gather and document an adequate health history for acute care patients (Box 8-2). As with the health history for the nonacute comprehensive care patient, the health history for the acute patient may be gathered through an oral interview, a health questionnaire, or a combination of both. For the patient of record who presents with an acute problem, an update of the existing health history usually is sufficient.

The dentist must investigate any positive patient responses and document significant additional findings in the patient's record. Some patients who do not visit the dentist regularly may not see a physician either. The dentist is responsible for determining that there are no systemic health limitations or contraindications to dental treatment before performing any invasive examination procedures or before performing treatment on the patient. If the dentist cannot make that determination, it may be necessary to consult with the patient's physician before proceeding.

### Past Dental History

It is not necessary to complete a comprehensive dental history for the acute care patient. On occasion, however, pertinent findings from a brief dental history may augment the information derived from the chief concern and its history and assist in making a diagnosis. More commonly, a few questions related to the patient's past dental treatment can provide the dentist with important insights into which previous treatments have been successful or unsuccessful and help determine what treatment options will be most appropriate in the present situation. For example, the patient who has had root canal therapy initiated on one or more teeth, but has never returned to have the treatment completed or the tooth restored, is unlikely to be a good candidate for heroic efforts to save a newly fractured or severely decayed tooth (Figure 8-3).

### Social History

In most instances, a formal social history is not recorded for an acute care patient. Some issues, however, particularly the patient's ability to pay for a particular procedure, may have a bearing on the treatment selection. For instance, a patient with limited income who uses all discretionary monies to cover the cost of prescription medications would probably not be a candidate for extensive endodontic, periodontal, and restorative therapy to save a tooth.

## Clinical Examination

Examination of the acute care patient must, of necessity, include a detailed assessment of the area of chief concern. This is not the only important part of the clinical evaluation, however, and the dentist should consider including at least the five components in the acute care examination (Box 8-3).

## Diagnostic Tests and Techniques

The rationale for and use of diagnostic tests and techniques is discussed in Chapter 1. Some of these techniques are used frequently with the acute care patient and have particular importance in that setting. Although, with some exceptions, the dentist may carry out these tests and techniques at the same time as the examination process previously described, they are discussed separately here for purposes of clarity.

**BOX 8-2 Minimal Questions Necessary for Inclusion in an Acute Care Health History Questionnaire**

- Have you had any recent hospitalizations, surgeries, or major medical problems?
- Are you being treated currently by your physician?
- Do you have any heart or lung problems?
- Do you have diabetes?
- Do you have any known allergies to drugs, foods, or other substances, such as latex?
- Do you have any bleeding problems?
- Have you had a joint replacement?
- What medications, including herbal and over-the-counter remedies, are you taking?
- (If female) Are you or could you be pregnant?
- Do you have any other health problems that you or your doctor are following?

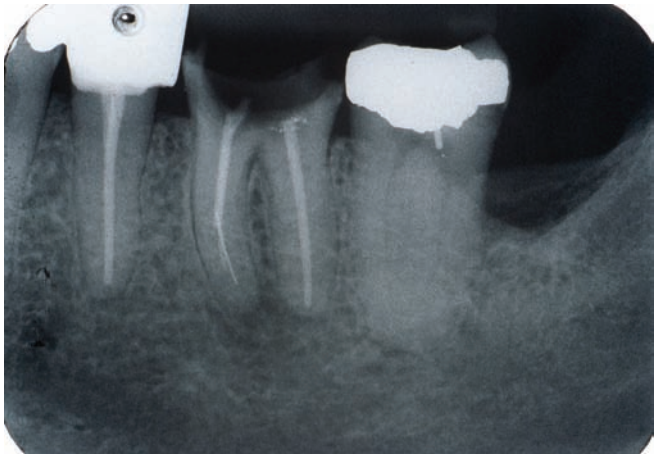

**FIG 8-3** It has been more than 3 years since this patient had endodontic treatment of the first molar, and the tooth still has not received a final restoration. It may now be unrestorable.

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## BOX 8-3 Components of the Clinical Examination of the Acute Care Patient

1. Overall Physical Health Status and Constitutional Signs
   As the dentist first approaches the patient, there should be a rapid overall assessment of the patient's general health. Is the patient ambulatory? Is the breathing labored? Does the patient have signs or symptoms of mild or severe systemic disease? An example of such signs would be swollen ankles suggesting congestive heart failure. Are there discernible signs of anxiety or stress? Does the patient appear healthy enough to withstand the rigors of treatment at this time?
2. Oral Cancer Screening
   It is part of the dentist's professional responsibility to perform an oral cancer screening for all new patients entering the practice, whether they are seeking comprehensive care or only limited care.
3. Vital Signs
   Any patient who is to receive acute care should have a preoperative blood pressure and pulse rate taken. The acute care patient is likely to be anxious about receiving dental treatment and may be poorly compliant with prescribed antihypertensive medications, and may report a diet and/or lifestyle not conducive to maintaining the blood pressure within an ideal range. As a result, this patient is more likely to have an elevated blood pressure at the dental visit. Such a finding raises questions: Can the patient be treated safely? Should a referral to a physician or the emergency department be made? These concerns cannot be allayed completely without taking preoperative vital signs. Should a medical emergency arise during treatment, it is essential to have recorded baseline vital signs to ensure proper treatment by emergency medical personnel. If the patient appears febrile or has signs of generalized infection, the temperature should be taken.
4. Area of Chief Concern
   This portion of the examination may demand the most skill and attention of the dentist. It may or may not require a significant amount of time. As noted earlier, a thorough review of the chief concern and its history often leads the dentist to a particular tooth or site, and one or two simple strategic tests lead immediately to a tentative or working diagnosis. In some cases, however, multiple examination techniques applied to several locations are required, and the diagnosis may remain elusive for even the most experienced practitioner. Tables 8-1 and 8-2 include treatment options for how some of the more common patient concerns can be evaluated and managed.
5. Contiguous Tissues
   Tissues adjacent to, or physiologically connected to, the area of the chief concern may also become involved. These contiguous tissues may have been examined as part of the oral cancer screening, but subtle changes may be overlooked unless a thorough examination is performed on sites that are commonly secondarily involved. Examples include inflamed lymph nodes (**lymphadenitis**), secondary to dental or periodontal infection, **trismus** of the jaw muscles secondary to a pericoronitis, or a dental abscess or cellulitis arising from necrotic pulp tissue. With trauma or dental infection, the opposing tooth may be symptomatic, and in rare cases, the pain may be referred to an adjacent or opposing tooth. When a periodontal origin is suspected for the patient's pain, it is often instructive to examine the periodontal health of the other teeth to help confirm or rule out the diagnosis.

The following list includes some of the evaluation methods most commonly implemented in diagnosing the acute care patient, along with a brief description of how each might be used:

- ***Inspection*** is the first and most commonly used technique in the dentist's arsenal. In many cases, carious lesions, fractures of teeth, defective restorations, periodontal disease, or soft tissue infections may be detected by visual inspection alone (Figure 8-4). When the problem is not readily apparent, exploration, transillumination, and the use of various dyes in conjunction with visual inspection may detect more subtle carious lesions, tooth defects, or fractures.
- ***Palpation*** is particularly useful for identifying subperiosteal swelling that may have arisen in conjunction with periapical inflammation or in delineating the borders and relative firmness of an abscess. It is often the sole means of detecting lymphadenopathy or lymphadenitis. With noninflammatory swelling, palpation can be a critical tool for ruling in or out cancer from the differential diagnosis.

## TABLE 8-1 Radiographic Image Selection for Common Acute Dental Problems

| Presenting Condition | Recommended Images |
|---|---|
| Isolated periodontal problem, pockets <5 mm | Periapical and conventional bite-wing radiographs |
| Isolated periodontal problem, pockets >5 mm | Periapical and vertical bite-wing radiographs |
| Symptomatic tooth, restorability in question | Periapical and bite-wing radiographs |
| Symptomatic tooth, restorability *not* in question | Periapical radiograph |
| Nonrestorable tooth | Panoramic or periapical radiograph shows the entire root and nearby anatomic structures, including the sinus floor and the mandibular canal |
| Eruption pain or pericoronitis | Panoramic or periapical radiograph |
| Possible jaw fracture | Panoramic radiograph (plus 3D imaging as indicated) |
| Blunt trauma to tooth or teeth | Periapical radiographs of traumatized tooth or teeth and any opposing teeth |
| Acute symptoms of temporomandibular dysfunction | Panoramic radiograph (plus other imaging modalities as needed) |

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**TABLE 8-2 Treatment Options and Recommendations for Selected Acute Phase Problems**

| Problem | Therapy Options (Short Term) | Treatment Implications (Long Term) |
|---|---|---|
| **Traumatic Injury** | | |
| Avulsed tooth | If < 30 min since injury, reinsert and stabilize (short term); if >30 min, root canal therapy, reinsert and splint as necessary | Monitor for changes (resorption) and possible need for root canal therapy, physiologic splint, extraction |
| Displaced tooth | Reposition tooth; radiograph and baseline pulp tests; splint as necessary | Monitor for changes (resorption) and possible need for root canal therapy, physiologic splint, extraction |
| Fractured jaw | If displaced, set fracture and stabilize; if not displaced, pulp test teeth and monitor | Follow carefully for bleeding, infection, root resorption, loss of vitality, malocclusion |
| Occlusal trauma | If resulting from clenching/bruxism, occlusal adjustment; if resulting from external trauma, radiograph, baseline pulp tests; consider short-term splinting | Consider fabricating occlusal guard or definitive splinting of the teeth |
| **Pain Associated With Individual Teeth** | | |
| Cracked tooth syndrome | Adhesive restoration; circumferential banding; provisional full-coverage restoration | Often requires cusp-protective cast restoration; may require endodontic therapy or extraction |
| Fractured tooth or restoration | Detailed analysis to determine underlying cause, place restoration | Definitive restoration |
| Irreversible pulpitis/acute apical periodontitis/apical abscess | Analgesics (symptomatic), extraction or root canal therapy (definitive) | Replacement of extracted tooth; definitive restoration of endodontically treated tooth |
| Pain after restoration placement | Check the occlusion, integrity of restoration; analgesics | May need endodontic therapy |
| Pain after endodontic therapy | Analgesics; antibiotics; occlusal adjustment; reinstrument if necessary | If tooth is fractured, may require extraction |
| Postextraction pain | Palliative therapy; antibiotics; antiinflammatory medication; if dry socket, apply dressing | Follow patient, confirm resolution |
| Reversible pulpitis secondary to caries, fractured restoration, or fractured tooth | Palliative treatment; temporary restoration | Requires definitive restoration |
| Hypersensitive noncarious cervical lesions | Dentifrice or topical treatment for tooth sensitivity | May require sealant or restoration* |
| **Periodontal and Other Soft Tissue Pain** | | |
| Pain after periodontal therapy | Analgesic; recheck for residue or debris | Follow patient; confirm resolution; if pain persists, look for other causes |
| Acute (marginal) periodontitis | Scaling and root planing; irrigate with chlorhexidine | Requires posttreatment evaluation and definitive periodontal therapy; if prognosis is hopeless, extract and discuss long-term treatment options |
| Acute gingivitis | Scaling, prophylaxis, oral hygiene instruction | Establish regular maintenance program |
| Periodontal abscess | Scaling and root planing; incision and drainage; irrigate with chlorhexidine | Definitive periodontal therapy or tooth extraction; consider effect of retention vs. extraction on the entire dentition |
| Periodontal/endodontic lesion | If endodontic in origin, provide root canal therapy and treat periodontal problems secondarily (periodontal treatment may not be necessary); if periodontal in origin, treat periodontal disease and do root canal therapy simultaneously | Definitive restoration after root canal therapy; long-term periodontal maintenance |
| Soft tissue injury associated with dental treatment | Obtain primary closure; analgesics and antibiotics as needed | Follow patient; communicate and confirm resolution of injury |

*Continued*

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**TABLE 8-2 Treatment Options and Recommendations for Selected Acute Phase Problems—cont'd**

| Problem | Therapy Options (Short Term) | Treatment Implications (Long Term) |
|---|---|---|
| Third molar pericoronitis | Palliative treatment; antibiotics; local irrigation with saline or chlorhexidine; consider extraction of the opposing third molar | Extraction of the offending tooth; consider extraction of all third molars |
| Ulcers/stomatitis | Palliative treatment with topical anesthetic and compounds that provide a protective covering of the lesions | Definitive therapy as needed to manage underlying systemic or oral disease; pharmacologic treatment |
| **Other** | | |
| Broken prosthesis | Repair prosthesis | Replace or remake prosthesis if needed |
| Pain associated with debonded, fractured, or missing provisional restoration | Re-cement, repair, remake provisional restoration | Definitive restoration |
| Pain associated with orthodontic therapy | Analgesics; cover sharp edges of brackets, bands, or wires | Reevaluation of orthodontic hardware |
| Swelling without pain (neoplasms, cysts, lymphadenopathy, sialadenopathy, mucocele) | Biopsy, aspiration, or other diagnostic tests as necessary; consult with radiologist, surgeon, or pathologist as needed | Definitive treatment of primary disease may be disfiguring, may require extensive reconstruction |
| Temporomandibular disorder | Palliative treatment: analgesics, muscle relaxants, splint therapy; applying ice or heat to the painful area, soft diet | Detailed analysis required to determine underlying cause; behavior modification, psychotherapy, pharmacotherapy, physical therapy, or surgical evaluation may be indicated |

*Veitz-Keenan A, et al: Treatments for hypersensitive noncarious cervical lesions: a Practitioners Engaged in Applied Research and Learning (PEARL) Network randomized clinical effectiveness study. *J Am Dent Assoc* 144(5):495-506, 2013.

**FIG 8-4** Patient with herpetic gingivitis of the palate, diagnosed by recent onset and the characteristic appearance.

Palpation can also be used to evaluate the muscles of mastication for pain and tenderness.

- ***Percussion*** is the primary technique used to determine the presence of periapical inflammation. This issue is crucial to both patient and provider, because positive findings often determine whether irreversible treatment is necessary, such as an extraction or root canal therapy. In the absence of pulpal involvement, it is important to rule out a periodontal source of pain to percussion.
- ***Periodontal probing*** is indispensable as a means of detecting periodontal disease and measuring attachment loss. In the presence of bleeding on probing, active infection can usually be assumed. Marked sensitivity on probing often confirms that the patient's concern is periodontal in origin and that the problem is not simply an incidental finding. An isolated narrow pocket that traverses to the apex of the tooth may indicate a primary endodontic lesion, a combined periodontal/endodontic lesion, or a sign of a vertical root fracture. In a patient with an otherwise healthy periodontal condition, an isolated deep pocket may indicate a vertical tooth fracture, which has a poor prognosis.
- ***Tooth mobility,*** although in itself not a clear diagnostic indicator, may, in conjunction with other tests and findings, confirm the presence and severity of occlusal trauma, periodontal disease, or a dental or periodontal abscess. The degree of mobility, especially compared with the other teeth, can be an important determinant in estimating the tooth's prognosis and usability as a future abutment for a prosthesis.
- ***Pulp vitality testing*** is essential to determining the state of health of the pulp in an offending tooth. Along with evaluation of the patient's symptoms, vitality testing is an important diagnostic indicator in determining whether root canal treatment is definitely indicated or may be indicated in the future. Methods for testing pulp vitality include an electric pulp tester (Figure 8-5) and application of cold and heat. In the absence of vitality tests, the dentist

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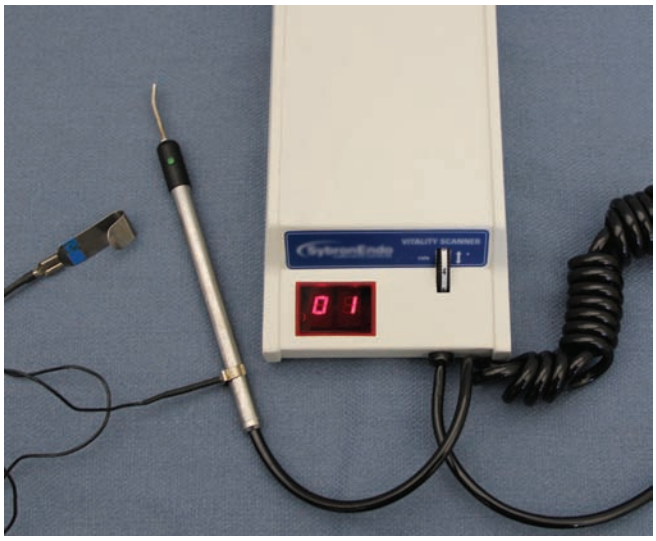

**FIG 8-5** An electric pulp tester used to evaluate pulp vitality.

cannot make sound treatment recommendations, and the patient cannot make informed choices about which treatment option will provide an optimal outcome. See Video 8-2 Tooth Vitality Testing on Evolve.

### Radiographic Examination

To meet the standard of care, a radiograph (or equivalent digital image) should be made of any tooth before extraction or root canal treatment. Table 8-1 includes guidelines that can be used to select images for some of the more common acute dental conditions. In managing the acute care patient, a single projection of the tooth or the area in question is often sufficient. Some isolated exceptions are noted in Table 8-1.

## COMMON ACUTE PROBLEMS AND DIAGNOSES

After evaluation of the chief concern, the dentist must define the problem or problems—usually, in terms of a diagnosis. In some cases, the diagnosis is definitive, but in many others it is a working or tentative diagnosis, to be confirmed later by additional testing or by observing the response to therapy.

The following section reviews selected problems that are likely to require acute care. Common conditions for which a patient may seek immediate attention are described, including key features that will assist the dentist in making a diagnosis. In instances in which a differential diagnosis is particularly problematic, advice on how to make those distinctions is provided. The issues discussed here are intentionally selective and exclude chronic complaints and milder concerns that usually do not require *immediate* attention. The reader should also be aware that the classification of acute problems by their origin and primary characteristic, although convenient, is artificial. Frequently, these problems do not exist in isolation. Patients may have multiple related or unrelated complaints. Over time, the complaint may change and what has been primarily a concern relating to pain may become a concern relating to swelling. Furthermore, at any given time, several clinical features for the same problem may be present.

### Complaint of Pain

Pain is the most common concern leading an individual to seek immediate care from the dentist. Pain has many possible sources. Here, they are classified as pulpal or periapical pain, periodontal pain, pain associated with tooth eruption, pain associated with previous dental treatment, or other types of oral, head, and neck pain.

#### Pain of Pulpal or Periapical Origin

An acute or symptomatic **reversible** pulpitis is a clinical diagnosis based on subjective and objective findings indicating that the inflammation should resolve and the pulp tissue return to normal.[3] This condition is characterized by intermittent, brief (few seconds) discomfort initiated by cold or air, without lingering or spontaneous pain. Usually, the discomfort has not resulted in loss of sleep and no analgesics have been tried (or are necessary). Pulp vitality tests are positive (vital), with no prolonged response on removal of the stimulus. **Percussion** and **palpation** tests are negative. Usually, no apical change is evident on the radiograph.

An acute or symptomatic **irreversible pulpitis** is a clinical diagnosis based on subjective and objective findings indicating that the vital inflamed pulp is incapable of healing. The patient may complain of lingering thermal pain, spontaneous pain (minutes or hours in duration) or referred pain. The tooth may be sensitive to cold, air, or heat. Analgesics often will have been tried and may or may not have been effective. The patient may report that the pain interferes with sleep. Pulp vitality tests often reveal no response or a heightened response and a lingering pain on stimulus removal. There may be a delayed response to cold. Palpation is negative, and percussion generally is negative as well. In multirooted teeth, some pulpal tissue may remain vital and responsive to vitality tests, whereas other areas demonstrate pulpal necrosis, develop apical periodontitis, and show a corresponding positive response to percussion.

An acute or symptomatic **apical periodontitis** results from necrotic or partially necrotic pulp tissue. The inflammation causing the symptoms is usually located in the apical periodontium (rather than in the tooth itself) and produces clinical symptoms including a painful response to biting and/or percussion or palpation. The pain is often described as a prolonged dull ache. Analgesic medication usually will have been tried with moderate success, depending on the patient's pain threshold, the dose taken, whether a therapeutic blood level has been maintained, and other factors. Often, the patient reports loss of sleep. The radiograph may reveal a widening of the periodontal ligament space at the apex of the tooth (Figure 8-6). Vitality tests are generally negative. Percussion is positive as the inflammatory process progresses from root canal to periapical tissue. Palpation is usually negative at this stage.

An apical periodontitis with abscess formation is called an **acute apical abscess**. An acute apical abscess is an inflammatory reaction to pulpal infection and necrosis characterized by

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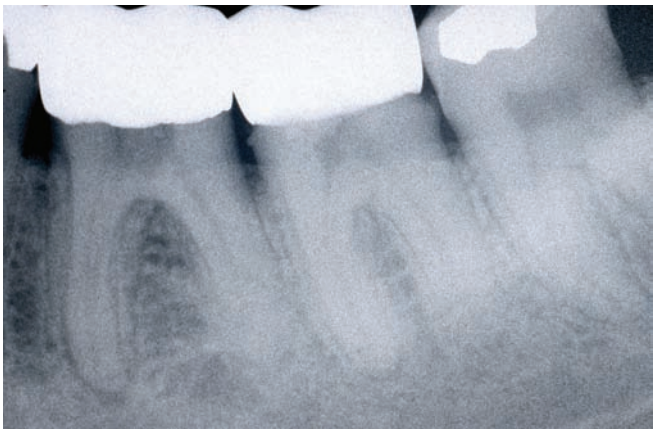

**FIG 8-6** Characteristic widening of the periodontal ligament seen with apical periodontitis on the mesial root of the first molar. (Courtesy Dr. Gerald Scott.)

**FIG 8-7** Toothsleuth instrument used to evaluate for cracked tooth syndrome. The apex of the instrument tip is placed on each cusp of the tooth sequentially and the patient is instructed to bite down. If biting down is painful, the tooth may be fractured.

rapid onset, spontaneous pain, tenderness of the tooth to pressure, pus formation, and swelling of associated tissues. An acute apical abscess has a profile similar to apical periodontitis, but subperiosteal or intraoral swelling is now present, and palpation sensitivity is significantly more pronounced. The radiograph demonstrates the same radiolucent periapical changes seen with an apical periodontitis or apical rarefying osteitis. A diffuse swelling with poorly defined borders occurring along with fever, malaise, or other constitutional symptoms suggests **cellulitis.** A localized, pointing abscess or "gum boil" clearly visible on the surface is referred to as a **parulis.** A tooth with a chronic or persistent abscess that drains purulent exudate is said to have a **sinus tract** (often less painful). If the source of infection cannot be identified, inserting a gutta-percha cone into the tract and then taking a radiograph may facilitate location of the problematic tooth.

Patients with a nondisplaced tooth fracture will often have a specific set of clinical findings and symptoms. A classic offender is a posterior tooth with a large existing restoration. The patient reports a sharp, sometimes lingering pain on biting specific foods. The pain may be aggravated by cold or air and, less commonly, by heat. Percussion and palpation are negative, as are radiographic findings. Careful clinical inspection of the dry tooth (which can be aided by dye solution and/or transillumination) often reveals a hairline fracture through a marginal ridge or adjacent to an existing restoration. In some cases, a horizontal fracture line may be visible surrounding one or more cusps on the tooth. A good clinical test is to put lateral pressure on each individual cusp, one at a time. This can be done with a mirror handle, a Burlew wheel, or a specific device designed for this purpose (Toothsleuth) (Figure 8-7). If the test recreates the symptoms, either when biting down or on release, a fracture is suspected. If the pain lingers, this is an additional indication of cracked tooth syndrome. Cracked teeth may mimic an irreversible pulpitis, especially when the patient clenches or bruxes. The fracture may also involve the pulp of the tooth.

Occasionally, a patient may have periodontal attachment loss to the extent that bacteria can enter the pulp space through lateral accessory canals. Conversely, a periapical lesion from a pulpal infection may drain by forming a pathway along the root to the gingival margin. In both situations, the condition is referred to as a **periodontal/endodontic lesion.** Patients often experience the acute symptoms of an irreversible pulpitis and must be managed with both periodontal and endodontic therapies.

## Pain Associated With Periodontal Tissues

Most periodontal problems are chronic in nature and rarely reach acute exacerbation. Some are acute, however, and may cause the patient to seek immediate care.

Patients with gingivitis may have tender gingival tissues in the absence of detectable periodontal pockets. The patient complains of "sore gums." Typically, this problem is characterized by notable inflammation with edema and hemorrhage on manipulation of the tissues, although these features may be absent in an immunocompromised host. Local factors, most notably calculus, are present and are the primary cause of the patient's discomfort.

Patients with chronic periodontitis may also become symptomatic. The patient typically describes itching or burning soft tissue with persistent pain. Mild temporary relief may be achieved using various rinses or by massaging the soft tissue. Although annoying and disruptive to activities of daily living, the pain is usually not intense and typically does not disrupt sleep. Common clinical findings include periodontal pockets with bleeding on probing. Subgingival deposits are almost invariably present. Probing the pockets recreates the primary complaint. Although the patient may have difficulty differentiating between pain of pulpal origin and periodontal pain, probing pockets will usually be discriminatory. Confirmation of pulp vitality also helps make the distinction.

A **periodontal abscess** has symptoms and features similar to the previously described apical periodontitis with abscess formation (Figure 8-8). In this case, however, the exudate more commonly drains through the periodontal pocket rather than through the facial or lingual bone and soft tissue. Exceptions occur, however, because calculus or other foreign debris may sometimes block egress of the pus from the pocket. Almost invariably, a significant foreign body will have been retained in the pocket, but now has been expelled. A

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**FIG 8-8** Periodontal abscess between the first and second molars.

classic example is the patient who experiences acute symptoms within a day of eating popcorn, with an entrapped popcorn hull as the culprit. A particularly large calculus deposit is another common source of irritation. Usually, bleeding and/or suppuration will occur on probing of the pocket where the periodontal abscess resides.

**Necrotizing ulcerative gingivitis (NUG)** is readily apparent to the patient because of significantly sore gums and halitosis. "Trench mouth," as it used to be called, typically occurs in the patient with poor oral hygiene who is also experiencing several of these conditions: stress, poor diet, sleep deprivation, being a smoker. Distinctive clinical features include significant gingival inflammation, bleeding, and "punched-out" papillae with a pseudomembrane (Figure 8-9). Suppuration may occur and the gingiva is exquisitely tender.

### Pain Associated With Tooth Eruption or Pericoronitis

As a normally erupting tooth makes its way into the oral cavity, some discomfort is not unusual. If the tissue over the erupting crown (the **operculum**) becomes traumatized by mastication or contact with the opposing tooth, however, the patient may experience considerable discomfort. Inflammation and swelling may occur, further aggravating the condition and making it even more likely that the operculum will be traumatized. **Pericoronitis** arises when the operculum becomes infected. At this point, the tenderness may extend to surrounding tissues (Figure 8-10). Particularly in the case of a third molar, trismus may develop. Suppuration may be present. A lymphadenitis on the affected side is not uncommon. If left untreated, constitutional symptoms, such as fever and malaise, may develop. Diagnosis is based on history and clinical findings. Presence and position of the erupting or impacted tooth should be confirmed by radiographic imaging.

### Pain Associated With Previous Dental Treatment

Patients may experience acute symptoms after dental treatment. After treatment such as deep caries excavation or an extraction or surgical procedure, acute sequelae may be expected and are predictable occurrences. In some cases, the discomfort may occur because the treatment was incompletely or improperly done. For example, when an initial and limited debridement is performed on a patient with significant pockets and subgingival deposits, the gingiva may shrink and become firm after the procedure, eliminating the existing pathway for exudate to egress from the periodontal pocket, resulting in a periodontal abscess.

**FIG 8-9** Patient with necrotizing ulcerative gingivitis (NUG). Note the loss of interdental papillae, especially around the mandibular incisors. (Courtesy Ms. Nancy Slach.)

**FIG 8-10** Inflamed tissue covering an impacted third molar. The operculum extends onto the second molar. (Courtesy Ms. Nancy Slach.)

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Some acute problems may occur months or years after initial treatment. The demise of the pulp and development of an apical infection years after placement of a deep restoration is a case in point. Another example is the development of a symptomatic lesion (such as a denture sore or ulcer or a denture stomatitis) in response to changes in the tissues under a prosthesis. In most of these situations, a thorough history and careful clinical examination will usually reveal the problem and its source.

When a patient fractures a restoration or prosthesis, he or she may express concern that the problem *will cause pain in the future.* Immediate treatment is usually not warranted, but the patient deserves an evaluation and a diagnosis that includes a professional opinion regarding the prognosis for the tooth, restoration, or prosthesis, and the likelihood of additional problems. Rendering such an opinion reassures the patient and has important risk management and practice management benefits as well.

## Other Sources of Oral Pain

A small percentage of patients whose chief complaint is pain have symptoms that are not related to the teeth or periodontium. This diverse group of problems may present diagnostic difficulties, especially if the patient has trouble localizing the pain. In many situations, the dentist develops a list of possibilities, which by a process of elimination leads to a differential diagnosis. This process can be challenging for the dentist, frustrating for the patient, and time consuming for both. The following paragraphs describe instances of such conditions, along with others that are easier to detect.

Three common types of ulcers may cause problems for patients: **herpetic ulcers, traumatic ulcers,** and **aphthous ulcers.** These are relatively easy to recognize clinically. Herpetic (herpes simplex virus [HSV]) ulcers are diagnosed on the basis of their characteristic history (prodromal symptoms), initiation in vesicular form, and predictable recurrence (Figure 8-11). Patients with **herpes zoster** may experience acute pain and prodromal itching before the outbreak of characteristic vesiculation and ulceration. Zoster also is expected to present as a unilateral process distributed in a specific dermatome. Traumatic ulcers are diagnosed by their history and location, usually in proximity to a recognizable source of trauma. **Aphthous ulcers** are usually found on movable tissue in the oral cavity and are typically diagnosed by their characteristic appearance (Figure 8-12). Oral ulcers are often seen in patients with immunocompromised conditions or as a reaction to some medications.

Patients with debilitated health or suffering from an autoimmune disorder may be prone to multiple and recurrent vesicles, bullae, erosions, or ulcers. When these lesions are generalized, they constitute a **stomatitis.** It may be appropriate to refer such patients to an oral medicine specialist, an oral and maxillofacial surgeon, or an internal medicine specialist to confirm the specific cause and recommend treatment.

Acute **temporomandibular disorders** (TMDs) appear in many forms. Acute arthritis usually manifests with pain on opening accompanied by marked crepitation in the temporomandibular joint (TMJ). A patient may exhibit an acute open lock—be unable to close the jaw and occlude the teeth—or a closed lock, which prevents normal opening of the mouth. Other common manifestations of acute TMD include painful pops or clicks, limited opening, deviation on opening, or painful spasm of one or more of the muscles of mastication.

Neurologic facial pain also can take different forms. **Trigeminal neuralgia** is an exquisitely severe, electric-like, lancinating pain that is related to the distribution of one or more divisions of the trigeminal nerve. A **neuritis** can be a deep, constant burning pain that runs the course of a nerve trunk. Trauma to a nerve can produce various symptoms ranging from increased sensation **(hyperesthesia);** to altered sensation **(paresthesia)** with burning, itching, or tingling; to complete loss of sensation **(anesthesia).** Patients with this kind of pain usually benefit from referral to a neurologist, an orofacial pain specialist, or an oral and maxillofacial surgeon who has particular expertise in nerve injuries or neurologic disorders.

**Acute sinusitis** may involve one or both of the maxillary sinuses. It is characterized by a constant "heavy" debilitating pain that changes intensity with changes in head position and may be accompanied by a foul odor and heavy discharge of mucus or pus from the affected sinus. The maxillary posterior

**FIG 8-11** Herpes simplex virus (HSV) lesion of the lower lip. (Courtesy Dr. Michael Finkelstein.)

**FIG 8-12** Aphthous ulcer on the buccal mucosa.

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teeth may be painful to chewing, and the occlusion may feel high to the patient. Palpation of the sinus wall is positive and the involved sinus cannot be transilluminated. Radiographic imaging may confirm congestion in the sinus.

## Complaint of Swelling

Swelling of dental origin is almost always caused by infection (Figure 8-13). The infection may arise in the periapical area as a result of a necrotic pulp tissue, it may be initiated in the periodontal pocket as a result of periodontal disease, or it may develop in the pericoronal tissues concurrent with an erupting or impacted tooth. In some situations, several sites may be involved, as with a periodontal infection that causes swelling and lymphadenitis of a cervical lymph node or a periapical abscess that drains into the maxillary sinus. Any of these situations is likely to bring the patient to the dental office seeking immediate care. A thorough history, clinical examination, pulp vitality testing, and selected imaging usually lead to a definitive diagnosis. Specific diagnoses for acute dental conditions in this group are the same as those listed under Complaint of Pain.

Possible sources for oral swelling not associated with the teeth or periodontium are many. These include cysts, benign and malignant tumors, infections, granulomatous diseases, and hyperplastic conditions secondary to medication use. In addition to the health and medication history, clues to diagnosing these lesions include their duration, the presence or absence of other symptoms, the shape, the texture, the integrity of the surface epithelium, the presence or absence of invasion into surrounding structures, and the presence or absence of lymphadenopathy. With lymphadenopathy, the shape, texture, borders, movability, and sensitivity of the affected lymph nodes can be useful in differentiating preexisting fibrosis or calcification from inflammation, lymphoma, or malignancy. Radiographic images may be helpful in the differential diagnosis of lesions in bone or in close proximity to bone (Figure 8-14). Computed tomography scans, magnetic resonance imaging, and/or a biopsy may be required to make a definitive diagnosis. The major salivary glands may swell from infection or blockage of duct.

**FIG 8-13** Facial swelling from a dental infection.

### ETHICS IN DENTISTRY

Dentists strive for excellence in patient care, but errors will occur in the practice of dentistry. Mistakes can occur, such as extracting the wrong tooth or a mechanical pulp exposure as a result of overpreparation of a tooth. Information about these events must be communicated to the patient. Dentists often receive conflicting advice about how to discuss errors with patients and are sometimes instructed to avoid apologizing because of the risk of future claims of liability.[1]

The patient's right to know about his or her treatment is highlighted by the American Dental Association (ADA) Code of Ethics, with the principle of veracity or truth telling. Underlying veracity is the principle of patient autonomy. To be autonomous, patients must be informed about both clinical status and the available options. Despite understanding the core ethical principles, dentists, like physicians and other health professionals, worry about litigation related to reporting errors in practice. Although the possibility of litigation cannot be eliminated, the law also upholds the patient's right to know. When professionals attempt to cover up mistakes or mislead patients, the legal consequences can be more severe than those caused by error alone (see Chiodo et al[2] for a review related to dentistry).

Most patients understand that clinical care is imperfect and errors occur. They report a desire to be informed about errors with a preference that clinicians tell them the truth about everything that has occurred. Most patients indicate a preference for compassion and apology, which is clearly different from physicians' beliefs that they should avoid apologizing because of concern about liability. Gallagher and colleagues[3] conclude, "Failure to provide patients with desired information about errors could impair clinical decision making, diminish patient trust, and increase the likelihood of a lawsuit."

When a dentist has a long-standing relationship with a patient, the discussion of error, although still difficult, may be aided by mutual respect and history. In some cases, disclosure of error may have the paradoxic effect of increasing trust between patient and dentist. In acute care settings, such as those in which patients are seen on a walk-in basis, the outcome of disclosure of error may be more uncertain but is nonetheless required.

**References**

1. Schwartz B: The need for apology in dentistry, *J Can Dent Assoc* 70(7):448–450, 2004.
2. Chiodo GT, Tolle SW, Chritchlow C: Disclosure of mistakes, *Gen Dent* 47(1):24–28, 1999.
3. Gallagher TH, Waterman AD, Ebers AG, et al: Patients' and physicians' attitudes regarding the disclosure of medical error, *JAMA* 289(8):1001–1007, 2003.

## Esthetic Complaints

Esthetic complaints are generally simple to diagnose because they are usually apparent to both dentist and patient. Such complaints often arise as a result of the fracture of a tooth, or fracture or loss of a restoration in an esthetic area. Other common causes include fractured porcelain on a crown or fixed partial denture and fracture or loss of a tooth from a removable prosthesis. Although these occurrences would not constitute an emergency (unless accompanied by an abscess

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**FIG 8-14** A lateral jaw radiograph of a patient with an ameloblastoma, which caused swelling of the jaw. (Courtesy Dr. Axel Ruprecht.)

or overt infection), they can constitute an urgent need if the patient's appearance or ability to speak is affected adversely.

The underlying cause of esthetic problems not due to overt trauma may be less apparent than the complaint itself. Was the tooth or restoration in hyperocclusion? Were lateral forces on the tooth excessive? Has there been loss of vertical dimension of occlusion? Was reduction in a crown preparation insufficient? Did the patient abuse the prosthesis in some way? If the underlying cause can be determined and mitigated, then the prognosis for a successful repair or replacement will be greatly improved.

## Traumatic Injury

When an individual experiences a significant traumatic event, as might be associated with a fall, for example, or playing sports, or a motor vehicle accident involving facial injuries, the dentist is likely to be consulted. Because such an event may simultaneously affect teeth, soft tissues, and bone, all three areas must be assessed. The dentist can also help prevent sport-related orofacial trauma by fabricating mouthguards for patients engaged in contact sports and by sponsoring mouthguard programs in the community.

Tooth injuries may range from the slight loosening of a single tooth (**partial luxation**) to fractures of enamel, dentin, and even into the pulp chamber. One or more teeth may be completely avulsed from the socket. Dental fractures may be **complete** (**displaced**) or **incomplete** (**nondisplaced**). Root fractures can occur independent of coronal fractures and are described in terms of location (apical, middle, or coronal third) and angulation (vertical or horizontal). As a result of the trauma, teeth may have been moved from their normal position—intruded or extruded or displaced facially, lingually, mesially, or distally. Making these descriptive distinctions is valuable as healthcare professionals communicate with each other concerning the nature and severity of the injury.

Classification of a dental injury can be important in the determination of the prognosis for a tooth and in shaping both short- and long-term treatment planning. The assessment of a traumatized tooth includes careful inspection for fractures, mobility testing (for traumatized teeth *and* opposing and surrounding teeth), pulp vitality testing (should be delayed in the case of a displaced or avulsed tooth), and selected radiographic or other imaging. Careful evaluation of the occlusion is critical in helping the dentist identify a displaced or extruded tooth requiring immediate treatment.

Soft tissue injuries typically include lacerations and contusions as the lips or cheeks are compressed between the teeth and the foreign object. If the lip or tongue is lacerated, significant bleeding may occur. Edema, induration, and swelling may occur during the healing process. If tissue becomes necrotic, it may slough and ulcerate. The dentist may be called on to diagnose and manage any or all of these conditions. All traumatized tissue must be carefully examined for the presence of foreign bodies or debris. Carefully debriding the site of any foreign material (gravel, glass, or even tooth fragments) is therapeutic and facilitates diagnosis. Selected imaging at a density appropriate for soft tissue can be helpful.

Jawbones may be crushed or fractured by the impact of a blow. Fractures may be partial or complete, displaced or nondisplaced. The initial diagnosis of a jaw fracture is based on the reported symptoms, findings from the examination, and appropriate imaging (Figure 8-15). A displaced fracture often results in the patient's inability to comfortably close the mouth and altered occlusion of the teeth. Trauma or infection may cause lack of sensation, or paresthesia, to oral and perioral structures. Especially in the compromised host, an infection of the bone, **osteomyelitis,** may occur at the site of fracture. When a jaw fracture is suspected or diagnosed, it is usually appropriate to refer the patient to an oral and maxillofacial surgeon for definitive evaluation, diagnosis, and treatment.

When evaluating a patient with a traumatic injury, dental personnel should screen for signs of domestic violence or child and elder abuse. Such injuries might include fractures of the jaws or other facial bones; fractured, avulsed, or subluxated teeth; lacerations; facial abrasions; or contusions. Careful questioning of the patient in the absence of the domestic partner or caregiver may be necessary, and referral to the appropriate agency to prevent further injury may be indicated.

Traumatic injuries may also arise at the time of, or as a result of, dental treatment. Examples include luxation or removal of the wrong tooth, loosening a crown or fracturing a restoration on another tooth during extraction, lacerating the cheek or lip during a restorative or surgical procedure, and injuring a nerve during administration of a nerve block or during surgery. Most of these problems are apparent to the patient and/or clinician at the time, but occasionally necessitate the patient's return to the office on an acute care basis. A careful history, examination of the operative site, and review of the patient record should be sufficient to enable a diagnosis of the problem. In some cases, for example, if paresthesia occurs, referral to an oral and maxillofacial surgeon for consultation, definitive diagnosis, and management may be warranted.

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**FIG 8-15** Panoramic radiograph of a fracture of the left condyle.

## TREATMENT PLANNING FOR ACUTE NEEDS

It would seem logical that treatment planning for a patient's acute needs would be simpler than dealing with the complexities of a comprehensive plan of care. Unfortunately, this is often not the case. Even though the options are usually more limited and the elements in the process are identical, acute phase decision making often must be achieved under adverse circumstances and a much more pressing time constraint.

When confronted with a patient with acute needs, the practitioner must go through several steps before arriving at an appropriate acute phase plan. Typically, these steps are collapsed into a single conversation with the patient in which treatment options are discussed and informed consent is acquired. For the purposes of this discussion and to articulate the elements in this process more clearly, the steps are presented separately.

### Defining the Range of Options

For the patient with an acute treatment need, a finite range of options is considered. For purposes of illustration, Table 8-2 includes a list of the more typical acute phase diagnoses and the most frequently used short-term therapies associated with each. Also included are possible long-term implications of those treatment options that both dentist and patient should keep in mind.

### Factors Influencing Treatment Decisions

Making a treatment planning decision for the acute needs patient is not simply a matter of selecting the best treatment from a standard menu. Numerous influences can affect planning acute phase treatment. Some of these (professional factors) must be determined and assessed by the dentist; some are solely under the control of the patient (patient factors and modifiers); and some are issues that need the perspectives of both patient and practitioner (combination factors).

**Professional factors** are those that define the limits of what is feasible and possible. At the outset, the dentist must establish parameters for what can be done under current circumstances that will be professionally reasonable and feasible. Important considerations include the patient's general health, the complexity of the dental treatment to be undertaken, the dentist's level of experience in and confidence with a proposed procedure, and the availability of specialists to provide consultation and/or treatment. Occasionally, a patient desperately seeks treatment that is not in his or her best interest—for example, the patient who wants to save "at all cost" a tooth that is not restorable. The dentist must define the limits for treatment and, in this particular situation, has the obligation to refuse the patient's request. It is the dentist's responsibility to identify and present treatment options that are reasonable and professionally appropriate.

**Patient factors and modifiers** (discussed in Chapter 4) are those patient circumstances or issues that have a direct bearing on the treatment choice selection. These include the patient's interests and priorities, the time and financial resources he or she is willing and able to expend on the treatment, the quality of oral self care, and the patient's ability to maintain the dental work. Additional patient factors include whether the patient has available the transportation and home support necessary to engage in the definitive therapy and follow-up under consideration.

It is important to keep in mind that the patient determines this set of issues. Some conversation between patient and dentist is required to delineate which issues are relevant and important for the situation. With the need to expedite treatment, it is easy for the dentist to hasten this conversation and

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make assumptions about the patient's motivation and desire (or lack thereof) for treatment. But these assumptions can be misleading and can lead the dentist to recommend inappropriate treatment options. For instance, a patient with a severely decayed but restorable molar may seem a candidate for extraction, especially if he or she has other oral problems or appears unable to afford the cost of root canal treatment and a definitive restoration. Removing the tooth may indeed be the most appropriate therapy, but each patient at least should be *offered* the ideal treatment if there is a reasonable prospect of success. If the patient rejects the ideal option, the dentist can then suggest other possible alternatives.

**Combination factors** are those about which both the dentist and patient have legitimate, although sometimes differing, interests and perspectives. Both perspectives can be critical to making the correct treatment decision. An excellent example can be drawn from the patient whose chief concern is an esthetic issue. A patient may present with a serious esthetic problem involving crowded and missing teeth, with the goal of improving his or her appearance before an imminent job interview. The dentist may mistakenly assume that replacing the missing teeth or masking or straightening the malposed teeth is the top priority, when in fact the patient is far more concerned with the dark color of the maxillary anterior teeth. This example illustrates the importance of ensuring that the dentist and patient clearly understand all options and goals before any acute or definitive treatment is begun.

## Choosing a Plan That Takes Long-Term Implications Into Account

Often overlooked when planning treatment for the patient with acute needs are the requirements of long-term follow-up. It is imperative that the patient be made aware of both the consequences of the acute phase treatment and any anticipated future treatment needs. This understanding must be achieved *before* a plan of care for acute treatment is finalized. All too often, the patient presents for an emergency tooth extraction without fully realizing the consequences. The patient must be informed of the risks and hazards to the dentition and overall health that may be associated with the loss of the tooth, including the possibilities of impaired function and movement of the surrounding teeth. The patient must also be made aware of the cost in time and money of future tooth replacement options. Similarly, a patient might insist on saving one tooth at a significant financial cost, when these resources would be better used to preserve other teeth that have a more optimal prognosis.

## Acquiring Consent for Acute Care

Informed consent for an acute care treatment plan requires all the same elements as consent for a comprehensive care plan. In both situations, the patient must be fully aware of (1) the diagnosis, (2) all reasonable treatment options (including the option of no treatment), (3) the risks and benefits of each option, (4) the nature of the recommended treatment, and (5) the costs of that treatment, both now and in the future. This is a significant amount of information, and the acute care patient, often in pain and in an anxious state, may have difficulty assimilating the information and making an informed treatment decision. This creates a genuine dilemma for the dentist. Although both the patient and dentist have a strong interest in relieving the patient's pain and satisfying the acute concern quickly, inability to establish fully informed consent may preclude expeditious treatment. It may be necessary to defer irreversible procedures until the patient feels comfortable with the options and can make a definitive decision. Providing short-term palliative care offers one approach to making that transition. The *In Clinical Practice: Decision Making for the Acute Care Patient* box discusses some of the issues associated with this situation.

### IN CLINICAL PRACTICE

**Decision Making for the Acute Care Patient**

"Extraction or a root canal treatment?" In the context of acute care, this simple treatment question is frequently asked by both patient and dentist. Acute pulpal and periapical disease, frequently involving irreversible pulpal pathologic conditions, is the most common problem leading patients to seek urgent dental treatment. In the short run, only two treatment options effectively eliminate the source of pain: initiation of root canal therapy or extraction.

Initially, the dentist must determine how critical the tooth is to the patient's overall oral health. What is the prognosis for the tooth? Is it restorable? In light of the patient's other dental needs, is it realistic to invest time and resources in trying to maintain the tooth? If so, what endodontic, orthodontic, periodontal, and/or restorative therapy also will be required or recommended?

At the same time, the patient must consider how much time, money, and energy he or she is willing to invest in saving the tooth. Even in the acute care situation, the dentist has the professional responsibility to be sure the patient fully understands the treatment options and their likely long-term consequences. The patient also needs to know what will be required in the way of follow-up care and be prepared to commit to that. If the patient is not well acquainted with possible dental treatment options, this may require considerable discussion.

In some situations, it is relatively easy to reach consensus and achieve fully informed consent. An example is the patient who has generalized severe periodontal disease, rampant caries, or a tooth with a poor restorative prognosis who wishes to have the affected tooth or teeth extracted. At the other end of the spectrum is the patient who exhibits excellent oral health, values and appreciates optimal treatment (including root canal therapy), and wishes to invest the time and financial resources necessary to save his or her teeth. In both cases, the treatment objectives are clear, and the dentist and patient can readily proceed with treatment.

For many patients, though, the decision is not so simple. The dentist may recognize that it is in the patient's best interest to save the tooth, but the patient may insist on having it extracted. Conversely, the patient may wish to save the tooth at

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all costs, with unrealistic expectations about the extent of treatment required or the prognosis. In many cases, various compelling patient and clinical reasons fall on both sides of the issue, with no clear choice indicated. When this occurs, it is critically important for the dentist to provide the patient with the maximum amount of information on which to base the decision. If the discussion overwhelms the patient so that he or she becomes immobilized and cannot make a decision, it may be helpful to include a family member, spouse, or friend of the patient in the decision-making process.

In summary, resolving acute problems often results in a difficult decision for the patient and dentist. It is possible, however, to approach the decision-making process in an efficient, sequential, and professional manner, even within the constraints and limitations of the acute care visit. The patient can be provided with sufficient information to make an informed and appropriate treatment decision that meets both short- and long-term needs. To accomplish this thoroughly, professionally, and compassionately, the dentist must develop a pattern for the process that includes various contingency plans that address issues as they arise and a communication technique that conveys unhurried and focused attention on the patient. With practice, this can become a seamless process in which the dentist and the patient are both well served.

### Using Medications to Treat Acute Problems

In general, the best treatment alternative is to manage the patient's acute problem with definitive care—for example, an extraction or pulp extirpation, rather than pharmacologically. In some situations, however, it is not only prudent but also preferable to prescribe medications rather than initiate treatment (see eTable 8-1). Examples include the following:

- The problem or offending tooth cannot be identified.
- The patient has a compromising systemic condition that precludes treatment at this time.
- The patient has an active infection, and there is significant risk that surgical intervention or extraction may lead to further pain or spread of the infection.
- The patient is unwilling or unable to provide consent to treatment.

In any of these situations, the dentist's duty does not end with the writing of the prescriptions for antibiotics and/or analgesics. It is the dentist's obligation to provide follow-up to ensure resolution of the problem. Patients should be appointed with the dentist or an appropriate specialist for definitive therapy. If the patient fails to keep the subsequent appointment, the responsibility for success or failure of the treatment becomes the patient's, and the dentist cannot be faulted.

An after-hours call from a patient with a toothache or other dental complaint to the practitioner at his or her residence is not an unusual occurrence. If the person is a patient of record and currently under the care of the dentist, it may be appropriate for the dentist to offer to return to the office to provide care or to call in a prescription to treat the symptoms. If the patient is new to the practice or had been in the practice but has since left or been dismissed, the dentist may recommend that the patient be seen in another setting, such as a hospital emergency room. When the patient is treated pharmacologically, especially after hours and over the phone, accurate and comprehensive documentation is essential. This includes many of the items presented in the next section.

## DOCUMENTING ACUTE CARE TREATMENT AND FOLLOW-UP

If the acute or potentially acute treatment necessary is recognized during the formulation of an overall plan of care, then it is included in the plan in the acute phase of care and is sequenced first. In this situation, a routine progress note in the patient record is sufficient to document the diagnosis and treatment recommendations.

An alternative situation arises when a patient presenting for acute care is either new to the practice or is a patient of record who now has an unanticipated problem. In either of these situations, the practitioner may document the event in a different manner from the usual progress note entry. Adapted from techniques used by our physician colleagues who routinely handle episodic care patients, this format has come to be known as a **SOAP note,** an acronym taken from the first initial in each of its four components. The SOAP note is a commonly used method of documenting the visit of an acute care patient in both medicine and dentistry. The components are as follows:

**S**ubjective—This information includes the chief concern or complaint and the history of that complaint (i.e., the history of the present illness) and is recorded in the patient's own words.

**O**bjective—This portion is garnered by the dentist and summarizes the clinical findings gathered during the examination process. Typically, this portion of the note includes visual findings, results of periodontal assessment, clinical tests (palpation, percussion, and vitality tests) and interpretation of radiographs.

**A**ssessment—In a word, this is the diagnosis. If insufficient information is available to arrive at a definitive diagnosis, the dentist records a preliminary or tentative diagnosis.

**P**lan—This includes the acute care plan for the patient and documentation of informed consent. Any options offered to the patient must be noted here. The patient's wishes and evidence that he or she understands the problem, options, and proposed plan are also included in the writeup.

In a dental practice, the SOAP note is usually preceded by a summary of significant positive or negative findings from the health history and review of systems and a recording of the vital signs on the date of the event, followed by an entry describing the treatment rendered (Figure 8-16).

Whether the patient has been active in the practice for many years, has a newly formulated plan of care, or has recently come to the office seeking only emergency care, he or she deserves to have the problem handled in a competent,

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## eTABLE 8-1 Oral Medications for Management of Acute Dental Pain in Adults[1-5]

| Drug Class/ Agent | Available | Maximum Daily Dose | Pharmacologic Properties | Usual Oral Adult Dosing | Comments |
|---|---|---|---|---|---|
| Acetaminophen (APAP) | 325, 500 mg tab<br>500 mg/15 mL liquid | 4000 mg | O: 11-20 min<br>Tp: 0.5-1 hr | 325-650 mg every 4-6 hrs | Do not exceed 1000 mg in a single dose. |
| **Nonsteroidal Anti-Inflammatory Drugs** | | | | | |
| Aspirin | 325, 500, 650 mg tab | 4000 mg | Tp: 0.8-2 hrs for film coated tabs | 325-650 mg every 4 hrs **OR** 1000 mg every 6 hrs | Absorption rate depends on formulation, pH of GI tract, presence of food, etc. Multiple dosing results in extended elimination half-life, increasing risk of toxicity and adverse reactions |
| | 325, 500, 975 mg delayed release/enteric coated (EC) tabs | | Tp: 4-14 hrs for delayed release/ EC tabs | | Significant lag time, decreased absorption are problems for use in acute pain. |
| Celecoxib (Celebrex) | 50, 100, 200, 400 mg cap | 400 mg | O: 60 min<br>Tp: 3 hrs* | 400 mg initially, then 200 mg BID | Cox-2 selective, no advantage in pain relief over other NSAIDs. Avoid in patients with cardiovascular or cerebrovascular disease. May use up to 600 mg on day 1. |
| Diflunisal (Dolobid) | 500 mg tab | 1500 mg | O: < 60 min<br>Tp: 2-3 hrs | 1000 mg initially; then 500 mg every 8-12 hrs | Loading dose provides faster onset of pain relief, comparable analgesic efficacy to acetaminophen 600 mg/ codeine 60 mg.[2] |
| Etodolac | 200, 300 mg cap, 400, 500 mg tab | 1200 mg | O: 30 min<br>Tp: 1.5-2 hrs* | 200-400 mg every 6-8 hrs | Duration of analgesic effect is 4-6 hrs. |
| Ibuprofen | 200 mg (OTC), 400, 600, 800 mg tab, 100 mg/5 mL suspension | 3200 mg | O: 30-60 min<br>Tp: 2 hr tab, 47 min susp.* | 400-800 mg every 6-8 hrs | Treatment of inflammation requires 3 days – 2 weeks before therapeutic effect. |
| Naproxen | 250, 375, 500 mg tab<br>125 mg/5 mL suspension | 1000 mg | O: 60 min<br>Tp: 2-4 hrs tab<br>1-4 hrs susp.* | 500 mg initially, then 250 mg every 6-8 hrs | May use up to 1250 mg on day 1. |
| Naproxen sodium | 220mg (OTC), 275, 550 mg tab | 1100 mg | O: 30 min<br>Tp: 1-2 hrs | 550 mg initially, then 275 mg every 6-8 hrs **OR** 550 mg every 12 hrs | May use up to 1375 mg on day 1. Sodium salt has faster onset. |
| **Opioids** | | | | | |
| Codeine/APAP | 15, 30, 60 mg/300 mg, 12 mg/120 mg per 5 mL solution | 4000 mg APAP | O: < 30 min<br>Tp: 1.5 hrs | 1-2 tablets every 3-4 hrs | Duration of analgesia is 3-4 hrs. More GI upset than hydrocodone. |
| Hydrocodone/ APAP | 2.5 mg, 5 mg/ 300-325 mg tab | 4000 mg APAP | O: 10-30 min<br>Tp: 1 hr<br>PE: <1-1.5 hrs | 1-2 tabs every 4-6 hrs | Duration of analgesia 3-4 hrs. |
| | 7.5, 10 mg/ 300-325 mg tab | 4000 mg APAP | | 1 tab every 4-6 hrs | Maximum single dose of hydrocodone in opioid naïve patients is 10 mg. |
| | 10 mg/300-325 mg per 15 mL solution | 4000 mg APAP | | 15 mL every 4-6 hrs | |
| Hydrocodone/ Ibuprofen | 2.5, 5, 7.5, 10mg/ 200 mg tab | 5 tabs/day | | 1 tab every 4-6 hours | Of use when acetaminophen is contraindicated expensive, inadequate ibuprofen concentration. |

*Continued*

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## eTABLE 8-1 Oral Medications for Management of Acute Dental Pain in Adults[1-5]

| Drug Class/ Agent | Available | Maximum Daily Dose | Pharmacologic Properties | Usual Oral Adult Dosing | Comments |
|---|---|---|---|---|---|
| Oxycodone/ APAP | 2.5, 5 mg/325 mg tab, 5 mg/300 mg tab | 4000 mg APAP | O: <30 min PA: 1.5 hrs | 1-2 tabs every 4-6 hrs | Duration of analgesia 3-4 hrs, more addiction liability than hydrocodone, more euphoria. |
| | 7.5, 10 mg/ 300-325 mg tab | 4000 mg APAP | O: 10-15 min PA: 0.5-1 hr | 1 tab every 4-6 hrs | Duration of analgesia 3-6 hrs. |
| | 5 mg/325 mg / 5mLsolution | 4000 mg APAP | | 5 mL every 6 hours | |
| Tramadol | 50 mg tab | 400 mg | O: 60 min PA 2-3 hrs | 1-2 tabs every 4-6 hrs | Duration of analgesia 6 hours. Not a first line agent due to drug interactions and adverse effects. |
| Tramadol/APAP | 37.5/325 mg tablet | 300 mg tramadol 2.6 g APAP | O: 60 min | 2 tabs every 4-6 hrs | Onset may be faster in combination product. Adverse effects limit usefulness. |

*Time to peak plasma level and/or peak analgesic effect is delayed by food.
O, (Onset), lag time between oral ingestion and the onset of analgesic effect; Tp, time to peak plasma concentration; PA, time to peak analgesic effect.
Courtesy Cindy Marek, B.S. Pharm, PharmD, FACA.

**General prescribing considerations for acute pain:**

- Agents should be prescribed "as needed for pain" with the maximum dosage per day written on prescription.
- Acetaminophen
  - Risk of acetaminophen-induced hepatotoxicity is increased in patients with pre-existing hepatic disease, alcohol ingestion or chronic malnutrition.
  - Question patient regarding all other OTC or prescription medications that may contain acetaminophen to avoid toxicity.
  - Inferior in pain relief to NSAIDs but has fewer serious GI and renal adverse effects.
- NSAIDs
  - Be aware of all prescription and OTC medications to avoid concomitant administration of NSAIDs and subsequent toxicity.
  - Other NSAIDs available in the United States: diclofenac, fenoprofen, flurbiprofen, indomethacin, ketoprofen, ketorolac, meclofenamate, mefenamic acid, meloxicam, nabumetone, oxaprozin, piroxicam, sulindac, and tolmetin.
- Opioids
  - Adverse effects
    - Nausea is most common adverse effect reported by dental patients, constipation is second most common.
    - Nausea from opioids is usually CNS mediated, so presence of food will not affect incidence or severity.
    - Dizziness, vertigo, sedation and vomiting are more common in ambulatory patients and some of these effects may be lessened if patient lies down.
  - Codeine is an inactive prodrug that must be metabolized to morphine by CYP2D6 isoenzyme.
    - Genetic variability in CYP2D6 means some patients will be hypo metabolizers while others will be hyper metabolizers.
- Tramadol
  - Significant adverse effects: 26% dizziness or vertigo, 24% nausea when used acutely, slow titration is recommended by manufacturer to lessen the severity of these effects, reducing usefulness as acute pain reliever
  - Older adults or frail patients are at high risk of falls and accidents

**References**


1. Nonsteroidal Anti-inflammatory Agents. [See individual agents] Facts & Comparisons eAnswers [database online]. St. Louis, MO, Wolters Kluwer Health Inc., 2014 (Accessed 9/14/2014).
2. Narcotic analgesics [see individual agents] Facts & Comparisons eAnswers [database online]. St. Louis, MO, Wolters Kluwer Health Inc., 2014 (Accessed 9/14/2014).
3. Acute Post Operative Pain. Lexi-Drugs, LexiComp. Wolters Kluwer Health, Inc., Hudson, OH. Available at: http://online.lexi.com (Accessed September 12, 2014).
4. [See individual drug monographs.] Lexi-Drugs, LexiComp. Wolters Kluwer Health, Inc., Hudson, OH. Available at: http://online.lexi.com (Accessed September 20, 2015).
5. NSAIDs Clinical Pharmacology. [See individual agents.] Elsiever gold standard, Gold Standard, Inc., Clinical Pharmacology [database online]. Available at: http://www.clinicalpharmacology.com (Accessed: September 20, 2015).


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***SOAP* Note**

*(Date of Acute Care Visit)*
Health status: No allergies, no medications and no contraindications to dental treatment; BP 136/80, Pulse rate: 76. Head, face, and neck examination within normal limits.

***S*** – "Toothache on the upper right for last 2 weeks–getting worse." Patient reports pain to cold and hot, duration 5-10 minutes, loss of sleep and requires ibuprofen 3-4 times per day.

***O*** – Grossly decayed #3, (+) response to percussion; palpation, swelling and periodontal examination is (−); #3 is non-vital to electric pulp testing (EPT), no apical change interpreted on the periapical radiograph.

***A*** – Caries, necrotic pulp, acute apical periodontitis–tooth is restorable.

***P*** – Discussed treatment options including endodontic therapy and crown vs. extraction with pros/cons and risks/benefits of each procedure. Patient prefers root canal therapy and understands that tooth may need a crown lengthening procedure.

Patient given a fee estimate of ____.

*(Treatment notes)*

**FIG 8-16** SOAP note.

courteous, and professional manner. Additionally, as noted earlier, the dentist's responsibility does not end at the conclusion of the office visit. The dentist may need to manage any complications that may arise from treatment. Specifically, at the conclusion of the visit, the patient should be given

- Postoperative instructions explaining what has been done and what (if any) oral self-care procedures the patient should carry out to protect and maintain oral health. Similarly, if the patient should avoid certain behaviors or habits (e.g., chewing on hard foods, smoking), these should be explained as well.
- Prescriptions for antibiotics, analgesics, or other medications as appropriate.
- Guidance on what to do if the original problem persists or worsens. This usually includes a phone number at which the treating dentist can be reached after office hours. If the patient is given a referral to another dentist, that office or clinic should be notified so that any pertinent records and radiographs can be made available.

Irreversible treatment of an acute condition based on a rushed evaluation and performed on an anxious patient who may not be thinking clearly makes for a volatile combination and has the potential to lead to litigation. The patient who perceives the dentist as unresponsive to problems or concerns arising from the acute or urgent care treatment may accuse the dentist of abandonment (see Chapter 6). Thorough documentation of the patient assessment, diagnosis, treatment plan, consent, treatment rendered, and postoperative conversation can reduce considerably the risk of litigation.

Aside from the risk management benefits, other important reasons for maintaining an open dialogue with the patient throughout the acute care treatment experience are as follows:

- Patients who are better informed tend to be less anxious and generally recover with fewer complications.
- Patients who have the opportunity to share their concerns and questions at the acute care visit are less likely to have questions later and are less likely to need to contact the dentist after office hours or return for unscheduled postoperative visits.
- Patients who know what to expect in the way of possible sequelae and pain are more prepared to tolerate the discomfort and are less concerned if it does arise.

By managing the acute care patient efficiently, compassionately, and professionally, the dentist creates the potential for a sustained referral base of new patients. Many acute care patients, even if they themselves do not return to the office, will recommend the practice and the dentist to their friends. Some, having successfully navigated the initial acute care visit, will become excellent patients in the practice. The acute care visit can be an opportunity to educate the patient about the benefits of contemporary oral healthcare and to demonstrate that dentistry does not have to be an impersonal, agonizing, or painful process. Some of the most appreciative and loyal comprehensive care patients in most any practice are those who began as acute care patients.

## CONCLUSION

Incorporating patients with acute needs into an already busy practice is a challenge. To do so with efficiency and compassion represents a genuine achievement. The professional responsibility of carrying out an appropriately detailed evaluation of the patient's general health and dental condition, deriving a diagnosis, developing an acute phase plan of care with complete informed consent, and delivering that care in a timely and professional manner is a necessary part of today's dental practice. When done well, benefits to the patient are inestimable, and the dentist receives significant personal and professional rewards.

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## REVIEW QUESTIONS

- What is the difference between an emergency problem and an urgent problem?
- In what ways does the acute care patient present a unique challenge to the dentist?
- How does the patient evaluation differ between the acute care patient and a comprehensive care patient?
- Describe the common acute problems seen in a dental practice. How is each diagnosed?
- How are acute phase treatment options determined and presented to the patient? How is consensus achieved? How is consent established?
- When is it appropriate to use medications to treat acute problems?
- How should acute care be documented?

## REFERENCES

1. Brophy-Marcus M: Many Americans say they forgo routine dental care, *USA Today,* March 10, 2009. http://usatoday30.usatoday.com/news/health/2009-03-10-dental-skip_N.htm/. Accessed January 13, 2015.
2. Allareddy V, et al: Hospital-based emergency department visits involving dental conditions: Profile and predictors of poor outcomes and resource utilization, *J Am Dent Assoc* 145(4): 331–337, 2014.
3. Glickman GN: AAE Consensus Conference on Diagnostic Terminology: background and perspectives, *J Endod* 35(12): 1619–1620, 2009.

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9

# Disease Control Phase of Treatment

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## OUTLINE

**Purpose of Disease Control Phase**
**Structuring Disease Control Phase**
**Common Disease Control Problems and Issues**
- Dental Caries
- Periodontal Diseases
- Pulpal Therapy and Management of Lesions and Defects Encroaching on Pulp
- Single Tooth Restoration in Disease Control Phase of Care
- Stabilization of Dental Malalignment, Malocclusion, or Occlusal Disharmony
- Disorders Associated with Temporomandibular Joints and/or Muscles of Mastication
- Use of Tobacco Products
- Other Forms of Oral Pathology
- Replacement of Missing Tooth or Teeth During Disease Control Phase

**Reassessment**
**Making the Transition to Definitive Phase of Care**

After a thorough examination and diagnostic workup of the patient, both the new and experienced practitioner may be tempted to finalize the treatment plan and move on to actual treatment. Certainly, there is merit in having a single, clear, well-sequenced restorative plan of care. A fundamental question to consider at this point, however, is whether the plan (exclusive of the systemic and acute phase elements discussed in Chapters 7 and 8) should be one continuous successive list, including all periodontal, restorative, orthodontic, endodontic, or surgical treatments required, or will the patient's oral health require a separate **disease control phase** of treatment to establish a stable foundation for future reconstruction?

## PURPOSE OF DISEASE CONTROL PHASE

Disease control is appropriate when, in the dentist's judgment, the questionable status of the patient's oral health suggests the need for further stabilization before making final decisions on treatment—that is, *treatment uncertainty.* Disease control is also warranted when an intentional reevaluation of the patient is necessary to ensure control of oral disease and infection—that is, *disease status uncertainty.* Finally, in problematic situations that could be characterized as *patient commitment uncertainty,* a disease control phase allows the dentist to preserve, for a time, the maximum number of treatment options while continuing to evaluate the patient's desires, resolve, commitment, compliance with oral hygiene recommendations, financial status, and comfort in the dental chair.

The purpose of the disease control phase is

1. to eradicate active disease and infection
2. to arrest occlusal, functional, and esthetic deterioration
3. to address, control, or eliminate causes and risk factors for future disease

The disease control phase allows the practitioner to determine the cause or causes of disease, assess risk factors, and estimate the prognosis for control of disease and various treatment options. The disease control phase also provides both the practitioner and patient with crucial information on which to base treatment recommendations and decisions. In general, when conditions warrant a disease control phase, nonacute and elective orthodontic, endodontic, periodontic, and oral and maxillofacial surgical procedures, as well as any definitive reconstruction, are postponed until the oral disease has been controlled.

A disease control phase is not necessary in the patient whose oral disease is minimal (e.g., patient's only active problem is a slight chronic localized marginal gingivitis) or who does not demonstrate significant risk factors for new disease. It also is not necessary for the patient whose oral disease will be eliminated *de facto* during definitive treatment. For example, consider the patient with generalized severe alveolar bone loss and clinical attachment loss whose treatment plan includes 14 extractions and the design, fabrication, and placement of complete maxillary and mandibular dentures.


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Because this treatment generally has a predictable outcome, with disease essentially eliminated by the definitive treatment itself, a disease control phase is usually unnecessary. On the other hand, the patient with seven variously sized carious lesions and multiple risk factors for new caries (and who will be retaining the teeth) *will* be likely to benefit from a separate disease control phase of treatment. In this case, it would be inappropriate for the dentist to provide crown restorations before the caries process has been controlled and caries risk factors neutralized or eliminated.

Minimally, the disease control phase should include plans for management of the following:

- Any active oral disease or infection, including but not limited to caries, periodontal disease, and pulpal pathology.
- Teeth requiring stabilization before definitive reconstruction.
- Risk factors that predispose the patient to the development of new or recurrent oral disease, such as smoking or a diet high in refined carbohydrates.

The plan for the disease control phase includes a posttreatment assessment. Although the concept of posttreatment assessment is discussed in detail in Chapter 11, the unique aspects of assessment after a disease control phase merit discussion here because of their importance and timing. Using quantifiable measures whenever possible, such an assessment provides an opportunity for the practitioner to confirm that disease and infection are under control. An example of this is the patient who demonstrates a measured reduction in the concentration of cariogenic bacteria at the conclusion of the disease control phase. The patient with chronic periodontitis who exhibits a reduction in the percentage of sites with bleeding on probing after scaling and root planing is another.

An assessment at the conclusion of the disease control phase allows both patient and dentist to make a realistic evaluation of feasible and practical treatment options. Previously considered options can be revisited, and the prognosis can be determined with more certainty. In addition, the patient will gain a clearer understanding of the level of financial resources, time, and energy he or she will need to invest in the process. With a track record already established by the patient, the dentist can make individualized treatment recommendations with a clearer sense of expected outcomes.

At the time of the assessment, *new* options for definitive treatment may also become apparent. Patients who, at the outset, only aspired to receive reparative treatment may now be prepared to consider other possibilities. Having successfully completed the disease control phase, the patient may have a new appreciation of self and the improvements that dental treatment can provide. For example, when there is less bleeding during brushing and flossing, and anterior teeth have been restored to an esthetically pleasing shape and color, the patient may be prepared to consider orthodontic tooth movement to correct anterior crowding. Before disease control therapy, the patient may not have considered and probably would not have wanted orthodontic therapy. Furthermore, the dentist may have been appropriately reluctant to even suggest orthodontic treatment to the patient before a successful outcome to the disease control phase had been assured.

## STRUCTURING DISEASE CONTROL PHASE

When the dentist has determined the need for a disease control phase, the next step is to formulate and sequence that plan. Many of the principles that apply to the development of the overall plan of care also have application to a plan for disease control. During this phase, however, those principles may take on a unique importance. In addition, other principles are specific to disease control.

As the dentist begins to shape the plan for this phase, there must be a consideration of all reasonable treatment options. In conversation with the patient, a winnowing process that leads to a single mutually agreeable approach to the disease control plan will be necessary. Once a general plan is agreed on, the dentist helps the patient to set achievable treatment goals and build realistic expectations for treatment outcomes. The dentist will need to establish clear, specific, and quantifiable standards for success (i.e., outcomes measures), such as setting a target plaque score and bleeding index. The dentist should specify, preferably in writing, the factors that will be evaluated at the posttreatment assessment that closes this phase of care. In addition, the dentist delineates the successive steps to be implemented both when the patient does and does not meet the standards for success. The dentist may also wish to briefly share various definitive phase options that may be appropriate to consider with the patient on completion of the disease control phase. Normally, this discussion should include the options that emerge (1) if the disease control therapy is successful, and (2) if disease control therapy is *not* successful. Such a discussion will prepare the patient for either eventuality.

Treatment during the disease control phase is sequenced by priority of patient need rather than by dental discipline. The accompanying *In Clinical Practice* box features keys to a successful disease control phase of treatment.

### IN CLINICAL PRACTICE

**Keys to Success of Disease Control Phase**

Although the disease control phase provides an ideal window of time and opportunity for both patient and practitioner to refine their individual assessments about the best overall course of treatment that window must be framed and defined clearly. Before engaging in a disease control phase plan of care, it is imperative that the patient understands the purpose, benefits, cost, and time period of the phase. Specific **goals** must be established and a *definite end point* must be set at which time an evaluation of the outcomes will occur. The dentist must project a clear plan of what the outcome will be—both if the goals are met, and if they are not. Despite its numerous

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advantages, the patient may perceive the disease control phase as a waste of time if it is not carefully developed and properly explained. Without tangible progress or positive reinforcement, the patient may become frustrated and give up. Such a patient may begin arriving late for appointments, delay paying bills, become noncompliant with treatment recommendations, or leave the practice, blaming the dentist for the apparent failure to improve his or her oral condition. All of these problems can be prevented if a clear understanding of the specific goals for the disease control plan is established between dentist and patient and if honest communication occurs throughout the process. When properly designed and executed, a disease control plan ensures that the patient has achieved and can maintain a healthy oral condition, and that definitive care, when provided, will have a high likelihood of success.

In addition to clear goals and ongoing communication with the patient, a key ingredient for the success of the disease control phase is the patient's commitment to the plan. With that commitment, the disease control phase becomes an effective tool with which the dentist can provide the best quality care. Without that commitment, the pace of care slows, dental problems continue to develop, and both patient and practitioner become frustrated. Even when early outcomes seem negative, positive value can be achieved. When handled properly, less than satisfactory outcomes can be seen by both dentist and patient as an opportunity to redirect therapy to a path more appropriate for the patient's abilities and circumstances. Sometimes the plan and effort will not succeed as hoped, but if both the patient and dentist share the perspective that the attempt has been made in good faith—and that it has effectively ruled out some treatment options—then the effort will have been worthwhile. The patient who recognizes that effort has been made in his or her best interests and at his or her behest will be likely to see the dentist's efforts as ultimately beneficial, even in light of short-term failure. Consequently, then, if handled effectively, even a negative outcome can strengthen, rather than diminish, the therapeutic relationship between the patient and dental team—as they work to define and accomplish the optimal plan of care.

General guidelines for sequencing elements of the treatment plan are discussed in Chapter 4. The following suggestions have particular relevance to the disease control phase.

- ***Address the patient's chief concern as early in the plan as possible,*** as long as such treatment does not conflict with the primary goals of the disease control phase. Although the psychological value to the patient of addressing the chief concern in a timely fashion is obvious, that approach may sometimes conflict with the demands and goals of disease control treatment. For example, the patient with rampant caries whose primary request is placement of a maxillary anterior fixed partial denture presents the clinician with a dilemma. Although it would not be professionally responsible to place a definitive fixed partial denture before the caries process is controlled, it may be possible to find a provisional solution that meets the patient's needs but does not compromise the standard of care.
- ***Sequence by priority—preferably treating the most severe and urgent needs first.*** Some notable exceptions will, of course, be necessary. For example, to minimize pain and reduce the need for root canal therapy, it is sometimes preferable to restore a moderately large carious lesion on a vital tooth before initiating root canal therapy with an asymptomatic necrotic pulp or extracting an asymptomatic tooth with a hopeless restorative prognosis (Figure 9-1).
- ***Sequence by quadrant/sextant.*** Once teeth with gross carious lesions or a questionable restorative prognosis have been extracted or stabilized using provisional (i.e., sedative or protective) restorations, it is most efficient and

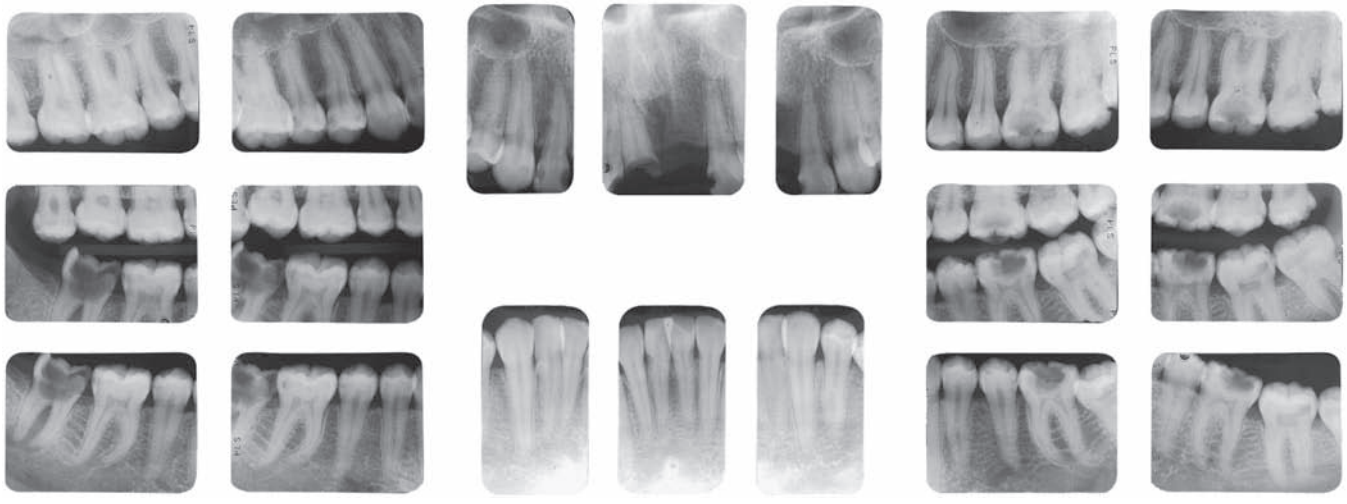

**FIG 9-1** Patient with numerous carious lesions of varying size. The asymptomatic and unrestorable lower right second molar and the asymptomatic and necrotic lower left first molar are not urgent needs. The management of the patient's esthetic problems, initiation of a caries control protocol, and restoration of the numerous moderately sized carious lesions should take precedence over the treatment of these two teeth. (Courtesy Dr. Chai-U-Dom, Chapel Hill, N.C.)

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productive to restore other carious lesions in the same area of the mouth at the same time. Placing direct-fill interim or definitive restorations on multiple teeth in the same quadrant or sextant greatly speeds completion of the disease control phase and may give the patient a much-needed psychological boost as rapid and dramatic progress is experienced.

- ***Integrate periodontal therapy into the disease control phase plan.*** Many practitioners routinely sequence scaling and root planing or an oral prophylaxis as the first item on the treatment plan. Although it may be easier and more convenient for the general dentist to have a hygienist or periodontist perform the initial periodontal therapy before restorations are attempted, it may not represent the ideal sequence (Figure 9-2). Often, a better approach is to provide both scaling and caries control restorations at the same visit while that quadrant is anesthetized. In general, treatment of deep caries lesions in vital teeth, symptomatic pulpal problems, and acute oral infections takes precedence over treatment for nonacute periodontitis.
- ***Keep definitive phase options open with minimalist treatment in the disease control phase.*** It is desirable, during the disease control phase, to look forward to what can be expected to be reasonable treatment options in the definitive phase treatment plan. Toward this end, a priority should be preservation of key teeth and other teeth that are salvageable, but about which there is uncertainty as to whether it will be feasible or desirable for the patient to expend the necessary resources to restore them definitively. Generally, however, only those procedures necessary to arrest the deterioration and prevent further infection should be undertaken in the disease control phase. In this context, moderate to long-term provisional restorations are preferred to definitive crowns. Pulp capping procedures (when clinically appropriate) are preferred to the initiation of endodontic therapy, and pulpotomy and pulpectomy procedures are preferred over definitive root canal treatment. Placement of a protective (sedative or temporary) restoration is commonly done in the disease control phase as an efficient and cost-effective means of restoring multiple large caries lesions in a patient who has an active caries problem. Even in the disease control phase, however, placement of a definitive direct fill restoration is often appropriate and has the benefits of greater longevity for the restoration and avoidance of the need to re-restore with a definitive restoration at a later date.

Specific circumstances and sound clinical judgment will create many exceptions to each of these general guidelines. Nevertheless, the overarching priority should be to retain key teeth, as well as other teeth that may have an uncertain prognosis, until completion of the disease control phase plan of treatment—at which time the salvageability of the teeth, and the patient's willingness to invest in more extensive and expensive procedures, can be accurately assessed. In other words, it is illogical and inefficient to invest extensive time and resources in an attempt to save teeth that are likely to eventually be lost. Importantly, this approach preserves the option, if the patient later chooses, of retaining the teeth and avoids the scenario of removing all questionable teeth and having the patient later regret that decision. An even worse outcome to be avoided is having the patient blame the dentist for "(needlessly) talking me into taking all my teeth out."

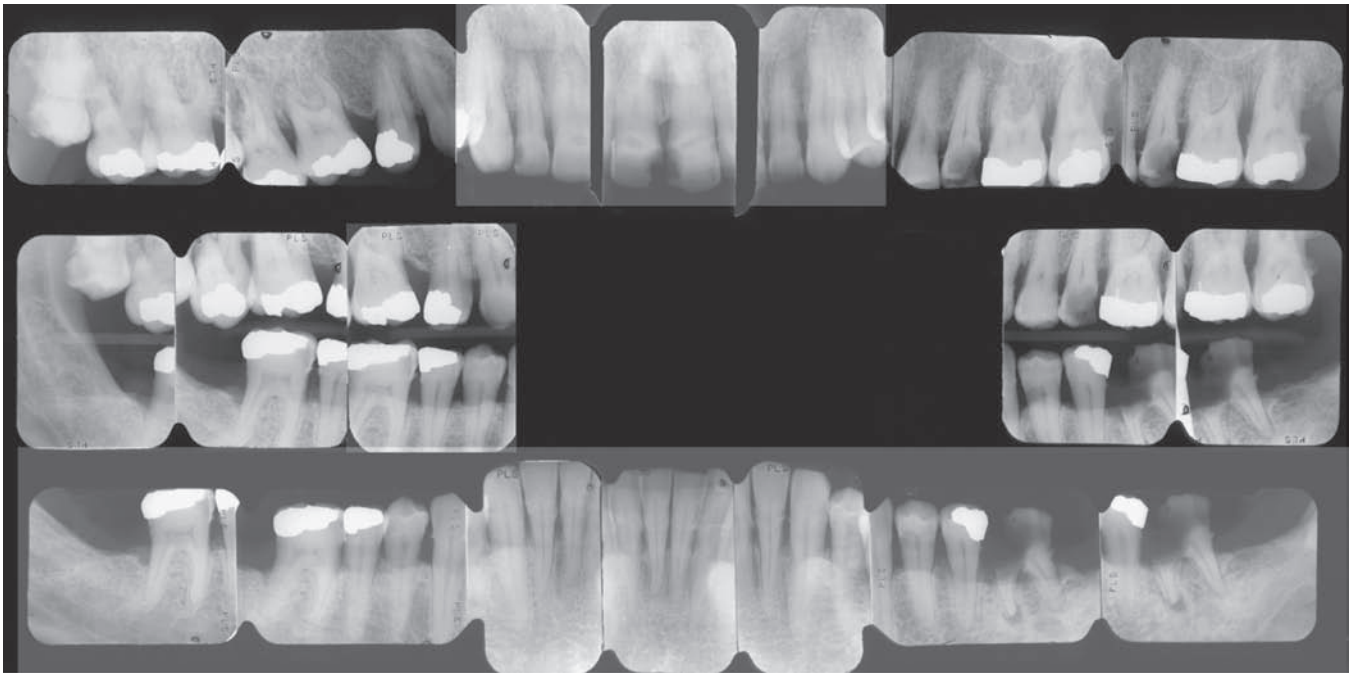

**FIG 9-2** Patient with active periodontal disease and active caries. In the absence of acute periodontal symptoms, management of the deep carious lesions should precede initial periodontal therapy. (Courtesy Dr. I. Aukhil, Chapel Hill, N.C.)

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The sequencing of the disease control plan is driven by many factors, including patient desires, symptoms, presence (or absence) of infection, and the other issues previously described in this section.

## COMMON DISEASE CONTROL PROBLEMS AND ISSUES

### Dental Caries

Worldwide, dental caries continues to be the single most prevalent oral health problem.[1] In North America and Western Europe, where caries incidence has declined in recent decades, there are still many individuals who are highly caries active and who are at elevated risk for new caries lesions. For those individuals, restorative procedures alone will not eliminate the disease, and they will need to be managed in a strategic, comprehensive, and personalized way.

A functional framework for the overall management of the patient with dental caries activity includes the following elements:

- Comprehensive caries diagnosis, including an evaluation of number of teeth involved, caries location by surface, and lesion activity (see Chapters 1 and 2).
- An assessment of caries risk level (see Chapter 3).
- A basic caries control protocol for all patients with active lesions or those who are at risk for developing new lesions.
- A supplemental intervention protocol or menu designed to address the specific needs of the patient who, at the outset, is recognized as needing additional measures beyond those in the basic caries control protocol, or those of the patient who, after the initial caries management efforts, remains caries active.
- Maintenance and reevaluation at appropriate intervals to identify new lesions and reevaluate the risk for future caries activity.

#### Caries Management: Working Definition

The term **caries management** (or caries control) is sometimes applied to placement of restorations in teeth that have active cavitated caries lesions. It also is sometimes used to characterize the use of sealants intended to prevent, arrest, and, in some cases, reverse noncavitated (i.e., incipient) lesions. The term has been applied to dietary and/or behavioral approaches, such as reducing frequency of consumption of fermentable carbohydrates between meals or increasing fluoride exposure, intended to prevent new caries lesions or the progression of existing ones. In this text, caries management means any and all efforts to prevent, arrest, remineralize, or restore caries lesions. A caries management protocol is a comprehensive organized plan designed to arrest or remineralize early caries lesions, eradicate overt caries lesions, and prevent the formation of new lesions in an individual who has a moderate or high rate of caries activity or is at increased risk for developing new caries lesions in the future.

#### Objectives and Scope of the Caries Management Protocol

The primary objective of the caries management protocol is to eradicate carious lesions and prevent new lesions from forming. To achieve this objective, it is essential to eliminate or effectively manage the causes of the disease process. A key aspect of this effort is restoration of the balance between the individual etiologic disease-driving agents—primarily dental plaque or oral biofilm—and the host and protective factors that the patient and dental team can bring to bear. Enamel covered by stagnant dental plaque cycles regularly through periods of demineralization and remineralization, and remains healthy as long as there is not a net loss in mineral content at the site over time (eFigure 9-1). When the amount of mineral content is sufficiently depleted over an extended period of time, a caries lesion begins to develop (eFigure 9-2). Among the important factors affecting this balance is the quality and quantity of plaque, the frequency of carbohydrate intake providing nutrients to the plaque bacteria and resulting in acid production, the volume and quality of saliva providing the essential minerals to replenish the demineralized enamel, and any fluoride, which dramatically affects the demineralization and remineralization events in favor of the host. Modifying these factors and increasing the resistance of the host are goals that require, in most cases, a coordinated effort between the patient and dental team. The patient's caries management plan should use the best evidence available, taking into account the patient-specific causes (risk factors), as well as the readiness of the patient to accept various forms of treatment and behavioral modification. Traditional caries management strategies, including fluorides, sealants, and restorative treatment, have demonstrated efficacy and constitute important components of the caries management program for most patients.

An important tenet of the caries management plan is the implementation of the minimum surgical or restorative intervention necessary to achieve the objective. Caries excavation can effectively remove the macroscopic caries defect, and conventional dental restorative procedures are required to replace destroyed tooth structure. These procedures alone are not enough to arrest caries activity in many caries-active patients, however, and in the absence of other (nonsurgical) therapy, new or recurrent caries lesions will continue to develop.

In most cases, behavioral changes, including diet, oral self-care, and fluoride use, are needed to achieve the objectives of the protocol. Such changes are often difficult to establish and maintain, however, and the dental team needs to be aware of these challenges and realistic about what interventions can be successful. Unfortunately, many caries management plans fail because they are too burdensome to fit into the patient's lifestyle, or because of the dental team's overly ambitious attempt to modify those habits of the patient that are considered to be outside the traditional "ideal" oral health behavior. Typically, an evidence-based and personalized preventive plan will have the greatest likelihood of success. Often, a useful strategy is to introduce changes in manageable, sequential

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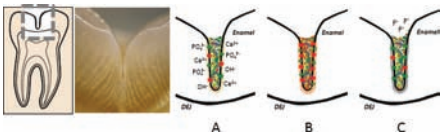
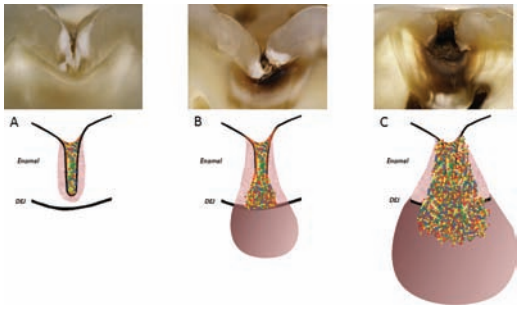



**eFIG 9-1** Illustration of the demineralization/remineralization process that occurs regularly on a molar fissure covered by stagnant dental plaque (i.e., biofilm). **A,** Most individuals will have some tooth surfaces covered by stagnant plaque; those areas experience constant dynamic chemical exchanges between crystals at the tooth surface and minerals in the plaque fluid. This exchange is driven by levels of saturation. **B,** When carbohydrates are available to the plaque, acids are produced reducing the saturation levels of the plaque fluid leading to mineral dissolution of the tooth structure (demineralization). **C,** In most situations, the period of unsaturation is temporary and it is followed by increasing levels of saturation (particularly in the presence of fluoride) to the point of supersaturation when minerals return to the tooth structure (remineralization). As long as the area gains as many minerals as it loses, the tooth surface will be in balance (equilibrium) and unaffected. (Copyright Dr. Carlos Gonzalez. All rights reserved.)




**eFIG 9-2** Illustration of the caries lesion formation. Caries lesions start to develop when the tooth surface regularly loses more minerals during the demineralization periods than those gained during the remineralization periods. **A,** If the conditions continue, the lesion continues to develop in the subsurface of the tooth structure affecting both the enamel and dentin. **B,** After the tooth structure has lost a significant amount of minerals, the mechanical properties of the enamel have been diminished to the point of being easily damaged by external forces creating a cavitation. After cavitation is formed, bacteria are able to colonize the cavitation easily and create a thicker dental plaque that frequently remains protected from external forces by the walls of the cavity. **C,** This thicker, protected plaque is able to dramatically augment the cariogenicity of the environment accelerating the development of the lesion and the direct bacterial infection of the dentin. (Copyright Dr. Carlos Gonzalez. All rights reserved.)

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steps—engaging the patient in the goal-setting process, and doing so at a pace that the patient determines. It is also helpful to encourage and reward the patient for positive changes as they are achieved at each step in the process. Chapter 18 includes an extensive discussion of how to engage and motivate such patients.

Regular assessments of the effectiveness of the caries management program will be essential. Progress can be tracked using one or more of the caries risk assessment and management forms described in Chapter 3.

## Caries Management Strategies

Today, many strategies are available to prevent dental caries in individual patients. Most patients will require a multifaceted approach that includes behavioral, chemotherapeutic, and both surgical and nonsurgical restorative therapy. Selection of the appropriate management regimen for each patient must be based on many factors, including the evidence supporting each methodology. Fluorides and pit and fissure sealants are two preventive approaches that have been used for decades to prevent dental caries and have been shown to be effective in multiple randomized clinical trials. These approaches are considered caries management strategies with the highest level of supporting evidence.

An appropriate caries management plan takes into account the patient's risk level (and the reasons for increased risk), the causes of the caries lesions, the patient's willingness to change deleterious behaviors, and his or her willingness to accept the different modes of therapy. The following sections delineate common caries management strategies and the rationale for each.

***Provide fluoride exposure.*** The benefits of fluoride use in reducing caries incidence and prevalence have been established conclusively over an extended period of time. Multiple reputable professional organizations have publically supported the use of fluorides in a variety of forms. For example, the American Dental Association and the U.S. Centers for Disease Control have strongly endorsed the addition of a limited amount of fluoride to community-based water supplies as a public health measure. They have also endorsed individual patient use of fluoridated dentifrices and other forms of topical fluoride as caries prevention strategies.

Although there may be some systemic and antibacterial effects, most of the evidence suggests that fluoride works primarily at the topical level, affecting the demineralization and remineralization events occurring between the tooth structure and biofilm fluid. The presence of small amounts of fluoride in the enamel crystals and surrounding fluid decreases the critical pH necessary for enamel dissolution, thereby effectively decreasing demineralization. In addition, the amount and speed of remineralization is enhanced.

Fluoride dentifrices, gels, varnishes, and rinses have all been shown to reduce caries incidence. Brushing the teeth with a fluoride-containing dentifrice is the most common oral hygiene practice around the world. Regular use of a (nonprescription) dentifrice with fluoride concentrations between 1000 and 1500 ppm has been shown to be highly effective in reducing caries levels. Dentifrices with higher fluoride levels, 5000 ppm, have also been shown to provide additional benefits, particularly reducing caries at the root surfaces. Fluoride rinses (0.05% NaF), used after brushing or between meals, have also been demonstrated to be effective in reducing caries in patients who are at increased risk. If the patient is using a prescription fluoride dentifrice and/or a fluoride gel as part of the daily regimen, using a fluoride rinse after brushing provides no additional benefit.

An increase in fluoride exposure can also be attained by the regular application of high-concentration fluoride products at the dental office. Professionally applied fluoride products include varnishes, gels, foams, and rinses. Fluoride varnish (typically 5% NaF) is becoming the standard for topical fluoride applications in the dental office because of its ease of use and short time required for application, safety, patient acceptance, and significant level of supporting evidence.

Chemotherapy, in the form of fluoride application, is preferred over restorative or surgical treatment in the management of reversible noncavitated ("white spot") lesions. When fluoride ions contact the exposed demineralized enamel surface, they are incorporated into the crystalline structure, forming fluorohydroxyapatite. A significant amount of the fluoride is also retained in teeth, soft tissue, plaque, and saliva as a reservoir to be released back later, when the saturation levels in plaque drop (e.g., after the consumption of sugars). In this process, fluoride serves to reduce demineralization and enhance remineralization. This reservoir can be replenished each time a fluoride exposure occurs, making it advantageous for the caries-active patient to have multiple exposures each day. This is most easily accomplished by asking the patient to rinse with a fluoride mouth rinse between meals, in addition to a twice-daily regimen of brushing with a fluoride dentifrice. It is logical to recommend the fluoride dentifrice application after breakfast and at bedtime, when there can be a maximum uptake of the fluoride and extended clearance time. Because fluoride retention and anticaries efficacy have been shown to be affected by the volume of water used to rinse after brushing,[2] the patient at caries risk should brush with a fluoridated dentifrice, expectorate the excess, and not rinse with water (or other beverage or fluoride-free rinses) for 30 minutes afterward.

Use of a two-part system of a fluoride dentifrice, along with the daily use of fluoride gel in a custom tray, has been shown to be effective in reducing caries in patients with severe dry mouth (e.g., radiation-induced xerostomia). The advantage of prescription level (5000 ppm) and some over-the-counter (1100 ppm) fluoride gels is that, unlike toothpastes, they include no detergents and abrasives. Gels, therefore, have the potential to increase fluoride bioavailability, as well as decrease irritation of the dry intraoral soft tissues in patients with dry mouth. The daily concurrent use of both toothpaste and gel can become burdensome for the patient (or personal care provider), however, and, as a result, many patients tend to become noncompliant over time. Some investigators have therefore recommended the

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use of a twice-daily, 2-minute brushing with a prescription dentifrice (5000 ppm) without rinsing after brushing (just expectoration) as an alternative to the two-part regimen, citing similar benefits in caries reduction and better patient compliance.[3]

For young patients at increased caries risk who are not regularly exposed to fluoridated water, prescription of fluoride supplements can be considered. Although the use of fluoride supplements has been associated with a reduction in caries incidence in permanent teeth, there is lack of strong evidence for its efficacy in deciduous teeth.[4] In general, the more frequent the fluoride exposures and the greater the concentration, the greater the benefit.[6] Providers and patients need always to be aware of the potential for toxicity, however, especially in children, if high-concentration fluorides are ingested indiscriminately.

***Plaque management.*** Before the 1970s, the prevailing theory on caries formation was the nonspecific plaque hypothesis. Consistent with this philosophy was the assumption that all dental plaque is deleterious for oral health and that, to halt caries development, it is essential to regularly mechanically remove all plaque from all exposed tooth surfaces at least daily. Regrettably, traditional mechanical removal methods, such as brushing and flossing *without fluoride,* do not seem to be efficacious in controlling active dental caries. A few decades ago, the specific plaque hypothesis was preeminent, positing that only a few pathogenic bacteria were the culprits in the oral diseases (e.g., *Streptococcus mutans* for dental caries). Active and passive vaccines to protect against *S. mutans* were developed and tested, demonstrating some efficacy, but in light of their potential side effects, the evidence was not sufficiently persuasive for regulators to approve its use.

Now that there is a clear understanding that dental caries development requires the presence of a stagnant acid-producing oral biofilm that functions to demineralize the tooth structure, an alternative hypothesis has developed, the ecological plaque hypothesis. In this model, the presence of disease—caries—is caused by an "ecological catastrophe" in the local dental plaque.[7] In other words, dental plaque may be nondetrimental, as long as it is in homeostasis with the host. Examples of potential factors that can create these "catastrophic" events are poor oral hygiene combined with an inappropriate diet or use of medications that significantly reduce salivary flow. Under this hypothesis, management of dental plaque is not focused on its complete elimination, but rather on bringing it back into balance with the host. Control of factors including plaque level, diet, and salivary flow is essential to creating this favorable plaque that would be in homeostasis. In many situations, a small amount of plaque may not contribute to demineralization and can enhance fluoride efficacy by serving as a fluoride reservoir.[3] Therefore, based on the evidence available today, the dental team should rely less heavily on mechanical plaque control as a central element in the caries management program; rather, the focus should be on targeted plaque removal, with the goal of bringing the biofilm back to homeostasis, to serve as an adjuvant to fluoride therapy, because fluoride efficacy improves with thinner levels of plaque.[8]

Although this may seem contrary to conventional wisdom and to flaunt the long-held mantra that all plaque is bad for oral health, there are two common circumstances in which whole-mouth mechanical plaque control is to be encouraged: the first is if the patient, in addition to being caries active, also has active periodontal disease (see *Periodontal Diseases,* later in this chapter). In the presence of gingivitis, the daily elimination of plaque remains a high priority. Also, the caries-active patient with heavy plaque deposits throughout the mouth will need traditional instruction in plaque removal and will need to be encouraged to engage in daily effective plaque removal. For these two groups, reduction in total plaque score remains an important treatment objective and can serve as a useful benchmark with which to assess the progress and success of the patient's caries management program.

***Limit fermentable carbohydrates.*** Bacterial fermentation of dietary carbohydrates produces the acids that cause localized tooth destruction (i.e., dental caries). Classic studies, such as the Vipeholm study[9] and the Hopewood House study,[10] have clearly demonstrated that dental caries do not develop easily in a diet with limited fermentable carbohydrate exposure and that the frequency and consistency of the carbohydrates are closely associated to their cariogenicity. More recently, numerous studies have shown that a biofilm ecological shift occurs when dental plaque is exposed regularly to fermentable carbohydrates. The regular production of acids by the biofilm creates an environment highly favorable for the development of aciduric bacteria, such as lactobacilli and mutans streptococci, which are also acidogenic and known to be closely associated with caries lesion development. Because of this, it seems logical to always recommend limiting refined carbohydrate intake by caries active and/or at-risk patients. As with other strategies that are patient dependent, however, compliance can be a significant problem. Dietary modification has generally been shown to be minimally effective in reducing caries prevalence, probably most often owing to the general lack of compliance commonly found in at-risk patients. Fortunately, because of the wide use of fluorides, the close association between consumption of dietary fermentable carbohydrate and dental caries has shifted, and today, most patients who are exposed to fluorides regularly and have reasonably effective oral hygiene routine can consume a limited amount of fermentable carbohydrates daily and still remain caries inactive. On the other hand, dietary counseling is definitely appropriate for patients with obviously deleterious behaviors, such as frequent sipping of sugared drinks or consumption of sugared cough drops. For these patients, dietary habits must be modified if caries activity is to be controlled. Of particular importance are reduction of between-meal exposures to refined carbohydrates and switching to other, noncariogenic sweeteners, such as sugar alcohols. The daily use of xylitol-based chewing gum has been shown to inhibit *S. mutans* and to be anticariogenic.[11] The recommendation is to consume

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between 5 and 10 grams of xylitol per day, divided into three or more consumption periods per day, ideally chewing after meals for approximately 20 minutes.

***Pit and fissure sealants.*** Pit and fissure sealants are placed in high-risk locations to provide a physical barrier to microorganisms and carbohydrates. A resin composite is the material most commonly used as a dental sealant. Specially designed glass ionomer cements can also be used as sealants. Sealants have been used in dentistry since the early 1970s to prevent caries formation at those anatomical locations. Because numerous clinical studies and systematic reviews have demonstrated that they are highly effective in preventing dental caries,[12] many reputable groups, including the American Dental Association, the American Academy of Pediatric Dentistry, the International Association of Dental Research, and the U.S. Centers for Disease Control, highly recommend their use. More recently, pit and fissure sealants have been recommended not only to prevent the initiation and formation of caries lesions but also to prevent progression of noncavitated lesions. Recent expert reviews of the literature have documented their effectiveness in accomplishing both processes.[13,14] The effectiveness of sealants depends on their long-term retention, and when a sealant has been lost or fractured, it should be replaced or repaired to guarantee its continuing effectiveness.

***Restorative treatment.*** As discussed later in this chapter, overt caries lesions are typically restored in the disease control phase with glass ionomer (GI), resin modified glass ionomer (RMGI) cement, composite, or amalgam. Lesions that closely approach the pulp are often managed with a partial caries excavation procedure (see Chapter 3 for the rationale and evidence, and the section *Pulpal Therapy and Management of Lesions and Defects Encroaching on Pulp*, later in this chapter for procedures). In general, GI or RMGI materials are favored when there are multiple large active caries lesions and it will be advantageous to restore several teeth in relatively few visits. When used in this context, protective (or provisional or temporary) restorations constitute what are frequently described as **caries control restorations**. This type of restoration has the advantage of stabilizing the oral environment by eradicating the locus of infection and changing the localized niche of the lesion sites in a minimal amount of chair time. Such restorations also provide the benefit of stabilizing the plaque:host balance. In cases with less urgency, and when the caries lesions are smaller, composite or amalgam restorations will serve well. Composites have the advantage of being more esthetically pleasing but should be restricted to sites where a dry operating field can be ensured. Amalgam is often recommended in sites where the patient and dentist prefer a definitive restoration, esthetics is not an issue, and isolation of the preparation is compromised. GI and RMGI restorations have the advantages of being relatively easy to place, bonding to dentin, maintaining a good marginal seal, and providing a modicum of esthetics. They also have the potential benefit of recharging and releasing fluoride—but their ability to prevent secondary caries has not yet been established (see *In Clinical Practice: Do Glass Ionomer Restorations Prevent Recurrent Caries?* box). Indirect restorations are generally contraindicated in the caries management protocol and in the disease control phase.

## IN CLINICAL PRACTICE

### Do Glass Ionomer Restorations Prevent Recurrent Caries?

Prevention of recurrent caries is a critical issue in managing the patient with high caries risk. Most patients will benefit from the advantages offered by a restorative material that, through the release of fluoride, will inhibit recurrent caries. Historically, silicate cements have had a proven track record in caries prevention, but they are no longer available. GI cements have been shown to be effective in inhibiting recurrent caries in vitro, but are they effective in vivo?

After an extensive review of the literature and screening of available reports, Randall and Wilson identified 28 appropriately controlled prospective studies.[15] The results were mixed and no clear conclusion could be drawn as to whether GI restorative materials inhibit secondary caries. To date, the evidence suggests that, although GIs, in general, perform no worse than other restorative materials; but no clinical caries-inhibiting benefit has been consistently demonstrated.[15,16] Prudent judgment suggests that where a GI restoration would otherwise be a satisfactory choice as an interim or definitive restoration, this material will be a good choice in the patient with active caries. The dentist should be cautious, however, in assuming that such a restoration will in fact inhibit caries. When used in a caries-active individual, it will be advisable to also provide the patient with frequent repeated fluoride exposure for potential recharging of the restorative material.

RMGIs are the restorative materials of choice for atraumatic restorative treatment (ART) technique on both primary and permanent teeth. ART involves use of hand instruments only to excavate and remove caries, followed by placement of an RMGI restoration (see the World Health Organization website http://www.paho.org/hq/index.php?option=com_content&view=article&id=7411:atraumatic-restorative-treatment&Itemid=39633&lang=en for a more detailed description of the ART technique). ART is most often performed on schoolchildren aged 6 to 15 years, who live in locations where conventional restorative dentistry is not feasible because of costs or geographic location. Although many reports on ART studies have not specifically tested the capacity of RMGIs to prevent recurrent decay, studies have shown that, in terms of acceptable longevity and retention rates, ART with RMGIs is a satisfactory method.[17-20]

***Caries susceptibility tests.*** A caries susceptibility test (CST) can be a useful adjunct in the diagnosis of the caries condition, the development of behavioral and pharmacologic management strategies for an active caries patient, and for monitoring the progress of the caries management program. See the *In Clinical Practice: Caries Susceptibility Tests* box.

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## IN CLINICAL PRACTICE

### Caries Susceptibility Tests

CSTs encompass a cluster of specific laboratory and/or chairside analyses of saliva that can help the dentist rule in or out some specific possible causes of caries activity in a patient. Although not proven to be a reliable predictor of caries risk, these tests represent the tools we have to date for ongoing monitoring of caries activity in the oral environment and are an important *quantitative* method available to the practitioner for evaluating an individual patient's current disease state.

Typical CSTs evaluate the following:

- Salivary flow—whole stimulated and unstimulated saliva calculated in milliliters per minute
- Buffering capacity—recorded in final pH
- Concentration of *s. mutans*
- Concentration of lactobacilli

These four tests can all be carried out with a single specimen of stimulated saliva. Typically, the patient chews a piece of paraffin wax and expectorates saliva into a collecting tube over a 5-minute period. A microbiology laboratory, set up to run the four specified tests as a block, can provide consistent, accurate, timely results for a reasonable fee. The clinician sends the sample directly to the laboratory, with results reported usually within a week. Alternatively, CSTs can be performed chairside using a variety of generic and commercially produced kits. (Figure 9-3).

Several of the notable benefits that can be derived from use of CSTs:

*Diagnosis:* CSTs serve as a diagnostic instrument to help identify specific causes of the disease—for example, hyposalivation.

*Baseline values:* CSTs provide baseline values for the number of cariogenic microbes in the patient's mouth and serve as a basis for comparison to judge whether the caries management program has been successful.

*Tracking mechanism:* CSTs provide a quantifiable method of assessing disease process progression and the efficacy of intervention methods used to date.

*Patient education/goal setting/and motivation:* CSTs serve as a tool for educating the patient about the causes and management of caries as a disease process, establishing goals for the patient and dental team, and motivating the patient to engage in the recommended behavioral changes.

**FIG 9-3** Examples of generic and proprietary supplies used for caries susceptibility testing.

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## Comprehensive Caries Management

***Basic caries control protocol.*** The basic caries control protocol, shown in Table 9-1, should be implemented for all patients who are caries active (three or more active lesions at the initial oral examination, or two or more new lesions at a periodic recall examination). Designed for simplicity and effectiveness, most of the products used in the protocol are readily available over the counter and involve techniques that are no more difficult to master than routine oral self-care procedures. Minimal chair time will be required for dentist and staff to explain the protocol and its use to the patient. A sample office handout for this purpose is shown in Figure 9-4.

**TABLE 9-1 Basic Caries Control Protocol**

| Item | Rationale |
|---|---|
| Caries susceptibility tests (CSTs) | See *In Clinical Practice: Caries Susceptibility Tests box* |
| Oral prophylaxis (professional) | Removes plaque and plaque-retentive accretions; makes tooth surfaces more receptive to uptake of professionally applied fluoride |
| Oral hygiene instructions* | Removal of mature plaque aids in fluoride uptake and tooth remineralization |
| Professional fluoride gel or varnish† application at each scaling or preventive (recall/maintenance) visit | Remineralizes tooth structure; potential antimicrobial effect; increases fluoride reservoir short-term; reduces caries incidence; most effective when given at more frequent time intervals (less than 6 mos) |
| Reduce frequency and duration of acid and sucrose (refined carbohydrate) exposure | Eliminates substrate for cariogenic bacteria; reduces acid-induced demineralization of tooth structure |
| Over-the-counter fluoride dentifrice and fluoride rinses (use daily) | Replenishes intraoral fluoride reservoirs, impedes demineralization of tooth structure; reduces caries incidence |
| Restore caries lesions with direct-fill provisional or definitive restorations‡ (Note: definitive indirect restorations are not recommended) | Eliminates the caries lesion; replaces destroyed tooth structure; improves cleansability |
| Sealants on susceptible pits and fissures (e.g., exposed pits and fissures in adolescents or in adults when other pits and fissures have needed restoration) | Eliminates site specific demineralization; prevents pit and fissure caries |

*Flossing has not been shown to reduce caries incidence. However, it is logical to encourage its use because of its many other proven benefits, including the reduction of plaque formation and gingivitis.
†In general, professionally applied fluoride varnish applications have been shown to be more effective than professionally applied fluoride gel treatments (Bader et al: A systematic review of selected caries prevention and management methods *Community Dent Oral Epidemiol* 29(6): 399-411, 2001, and Peterson et al: Professional fluoride varnish treatment for caries control: a systematic review of clinical trials *Acta Odontol Scand* 62(3): 170-176, 2004).
‡The merits of glass ionomer restorations as a means of inhibiting secondary caries are reviewed in *In Clinical Practice: Do Glass Ionomer Restorations Prevent Recurrent Caries?* in this chapter.

***Optional caries interventions.*** Likely candidates for additional intervention include patients with unusually active or rampant caries, or those who have specific identifiable factors suggesting high risk for caries development. Suggestions or guidelines for possible interventions and their indications are listed in Table 9-2.

***Management based on caries activity and caries risk.*** The appropriate strategy for management of the individual patient's dental caries activity will be driven by the patient's current disease activity and caries risk status. In the following discussion, the patient with dental caries is classified in one of three groups, and a management strategy is suggested for each classification.

**Patient with no active caries lesions and at low risk for future caries.** Patients who have cracked or fractured teeth, defective restorations, or other problems associated with previous caries activity do not need and are unlikely to benefit from a basic caries control protocol. Affected teeth should be restored with definitive restorations as appropriate. Selection of restorative materials and techniques for pulpally involved or potentially pulpally involved teeth is discussed later in this chapter. General restorative treatment planning options for individual teeth are discussed in Chapter 10. After restoration and in the continued absence of significant risk for new caries, these patients require only routine maintenance services, as discussed in Chapter 11.

**Patient with isolated caries lesions and at low risk for future caries, or patient with no caries lesions but at moderate or high risk for caries.** Patients who fit either of these criteria may be handled successfully in one of two ways. The individual can be placed on a basic caries control protocol and reevaluated at specified intervals (usually every 6 months). Alternatively, definitive restorations can be placed and the patient followed closely as part of a customized maintenance plan. Usually, both the patient and practitioner are comfortable with the latter approach because it is more decisive and completes the necessary restorative treatment more quickly. Some patients, however, have greater peace of mind with the comprehensive and structured approach of the first option and may wish to have the additional assurance that they are disease free and disease resistant before investing in such definitive restorations as crowns. In some instances, the dentist's clinical judgment may determine that the patient will benefit from the more comprehensive approach, even in the absence of compelling caries risk factors.

Regardless of which approach dentist and patient decide on, a careful reassessment at the conclusion of the interval is warranted. At that time, if no new lesions have developed and the risk potential does not appear to have increased, the patient can be reassured. If caries activity or risk has increased, the patient may need to be managed according to the protocol discussed in the following section.

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**Customized Dental Decay Prevention Plan**

From: <<Provider>>
UNC School of Dentistry

To: <<patient>>
Date: <<dd/mm/yyy>>

We are committed to helping you eliminate and control your dental cavities (caries). Fillings alone will not stop cavity formation. We need your help to stop the decay process and prevent new cavities from forming.

Based on several factors your caries risk assessment (CRA) is <<level>>

Based on those specific factors we are recommending the following:

- ☐ Brush and floss using methods discussed in clinic (for all patients, including low CRA)
- ☐ Brush at least twice a day (morning and bedtime) with a prescription fluoride toothpaste (example: Prevident 5000 Plus) with no or limited rinsing after expectoration (mostly for patients with exposed roots and low salivary flow)
- ☐ Use proxy brush as instructed (for patients with specific high risk plaque accumulation problems, particularly at margins of restorations and prosthesis; be able to select per patient based on perio architecture)
- ☐ Purchase and use an electric toothbrush (example: Sonicare or Oral B) (for patients at increased risk having problems removing plaque)
- ☐ Use gum or lozenges with xylitol (at least 3 times per day between meals, and for a total of 6-15 g per day)(to be considered for all patients as adjuvant therapy)
- ☐ Rinse for at least one minute with fluoridated 0.05% NaF mouth rinse (example: ACT) at <<specific for the patient>> intervals
- ☐ Rinse for at least one minute (morning and bedtime) with mouth rinse moisturizer (example: Biotene, Oasis)(for patients with dry mouth symptoms)
- ☐ Minimize the frequency of tooth contact with acids and sugars between meals (if snacking on cariogenic foods/drinks is frequent)
- ☐ Substitute non-acidic, high pH foods (e.g., cheeses) for between-meal snacks (if diet is highly cariogenic)
- ☐ Make appointment to have sealants places (if P&F are at high risk or present clinical signs of incipient lesions)
- ☐ Return to recall clinic every 3 months for a cleaning and fluoride varnish application (if high risk)
- ☐ Return to recall clinic every 6 months for a cleaning and fluoride varnish application (if moderate risk)
- ☐ Expect updated posterior bitewing radiographs every 6-12 months (if high risk)
- ☐ Expect updated posterior bitewing radiographs every 12-18 months (if moderate risk)

**FIG 9-4** Sample office handout for a caries-active patient.

## TABLE 9-2 Optional Caries Interventions

| Problem | Suggested Intervention |
|---|---|
| Decreased quantity or quality of saliva | Frequent oral hydration, use of salivary substitutes multiple times daily |
| Medication-induced xerostomia | In concert with patient's medical provider, prescribe alternative medication that is less xerostomic |
| Continued incidence of new caries activity despite previous intervention | Custom fluoride trays for daily home use |
| Patient at risk for additional root or smooth surface caries | Fluoride varnish application |
| Patient who would benefit from higher-level fluoride exposure, but is unwilling or unable to accept custom trays | Prescription dentifrice or gel with high-concentration fluoride |
| Any patient at risk for new caries who likes to chew gum | Ad lib use of xylitol chewing gum (good alternative for persons who crave between-meal high-sucrose snacks or drinks) |
| Patients with concurrent marginal periodontal disease and/or patients with *Streptococcus mutans* counts that remain high despite previous intervention | Chlorhexidine mouth rinses |

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**Patient with multiple active lesions or at high risk for new caries.**

***Determination of the patient-specific cause.*** Before proceeding with any nonemergency treatment, every effort must be made to determine the specific causes of the caries problem, beginning with a second-level review of the entire patient history. Does the patient have a systemic disease, such as Sjögren's syndrome that may cause xerostomia? Is he or she taking medications that may cause dry mouth? Has the patient had chemotherapy or radiation therapy for cancer that has affected salivary function? Does the patient have a deleterious habit, such as mouth breathing, which dries out the mouth and promotes caries development?

The patient's oral home care practices must be reviewed. How effective are the current plaque control measures? The history may suggest and evidence from the initial examination may confirm the effectiveness or ineffectiveness of the patient's oral self-care program. What type of fluoride exposure does the patient have and what is the frequency?

Lifestyle issues must be evaluated. Have there been recent stressful life-changing events that may have caused metabolic changes; altered daily patterns and routines, including oral self-care; or perhaps induced the patient to adopt a diet rich in "comfort foods"? Assessment of the patient's diet at the initial interview may have been cursory, but once the determination of high caries activity or high caries risk has been made, dietary issues require careful scrutiny. The patient should be asked specifically about sources of dietary acid and refined carbohydrates. What form? How much? With what frequency? Sometimes the cariogenic source is obvious (two liters of soda sipped each day), whereas other sources may seem more innocuous (a glass of buttermilk at bedtime). Other common culprits include sucrose-containing cough drops, breath mints, or lozenges. This aspect of the reevaluation deserves time and attention. If the practitioner suspects a dietary component to the caries problem, but is unable to elucidate the source of acid and sugar with the questioning process, a 5-day dietary history may be warranted to identify hidden problems.

After a careful review of the patient history and a detailed clinical examination, if doubt lingers concerning the patient-specific cause or causes of the active caries condition, additional testing is warranted to determine whether such factors as diminished salivary output, an abnormally acidic oral environment, or high numbers of specific pathogenic microbes are in evidence.

***Implementing the basic caries control protocol.*** This protocol offers several advantages for the patient with a high level of caries activity. In addition to providing an initial treatment to curtail caries activity, the protocol can serve as a useful program for increasing the patient's understanding of the nature of dental caries and introducing the concept that caries can be appropriately managed as a disease process. The basic caries control protocol (see Table 9-1) and the caries susceptibility tests, in particular, can be important in refining and confirming the cause of the caries. In addition, the protocol encourages the patient to engage in the management of his or her own condition and to assume a degree of ownership of the problem.

***Selecting from the optional caries interventions.*** When the cause or causes of the problem have been determined through an examination and a secondary analysis of the patient history and caries activity testing, selections that address the patient's particular needs can be made from the optional menu (see Table 9-2). The dentist may develop creative strategies specific to the problem that provide palatable alternatives to the patient. Even the most logical and strategic of therapies is useless if the patient cannot live with the recommendations on a daily basis, however. An example of such a well-intended but misguided approach would be to prescribe and fabricate custom fluoride trays for a patient who has a severe gag reflex or is nauseated by fluoride gels.

***Reassessment.*** During implementation of the caries management plan, multiple reevaluation opportunities arise as strategies are tried and modified, continued, or discarded. At a point clearly established by the dentist at the beginning of treatment, a comprehensive reevaluation of the disease control phase occurs and all aspects of the caries management plan are assessed. Development of an individualized posttreatment assessment is described later in this chapter, and a template for a comprehensive posttreatment assessment is shown in detail in Chapter 11.

This is a critical juncture for both patient and practitioner. If the caries management plan has been successful, then definitive treatment can proceed with a high level of confidence in the outcome. If caries management efforts have been unsuccessful, the options are usually limited and less attractive. For the patient who continues to exhibit active caries and/or continues to be at moderate or high risk for new lesions, the two logical options are (1) to recommend extraction of questionable teeth and proceed with interim or transitional (usually removable) prostheses, or (2) to enter into an extended disease control phase. For some patients, these two options may merge, and the distinction between them becomes blurred. In general, indirect restorations and fixed partial dentures on natural teeth are contraindicated as long as the patient remains at an elevated caries risk.

Although this situation can be frustrating for both the patient and dentist, a positive outcome may still emerge. The patient may be forced to make the hard decision to accept extraction of teeth, a decision that he or she would have preferred to avoid but that is now inevitable. In other cases, the dentist's refusal to provide definitive treatment may become the impetus to motivate the patient to engage more actively in the caries control practices necessary for halting the disease. If, at this point, the patient decides to terminate the therapeutic relationship, the dentist will at least have the satisfaction of having made a strong effort to manage the caries problem and of having avoided providing therapy that is likely to fail. This strategy is also wise from a legal risk reduction perspective.

## Periodontal Diseases

Periodontal diseases are not a singular entity, but rather comprise a group of inflammatory conditions affecting the supporting soft tissues around the teeth. Proper diagnosis is

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critical and, depending on the condition, varying modes of therapy are required, particularly if the patient has an aggressive form of the disease (Figure 9-5).

In the majority of cases, periodontal disease can be stabilized and controlled through appropriate treatment and maintenance. To minimize the likelihood of disease progression (i.e., clinical attachment loss and bone loss), patients afflicted by periodontal disease should expect to require some form of therapy as long as they retain their teeth. Management of periodontal disease is often a continuous process and may need to be addressed at every stage of the treatment plan.

The process must begin with a thorough assessment (see Chapter 1) and diagnosis (see Chapter 2) of the patient's periodontal condition. Before initiating treatment, the practitioner must understand the particular cause or causes of the disease in the individual patient and must have developed a periodontal risk assessment (see Chapter 3). This assessment includes the identification of various causes of disease and considerations relating to management of these factors. With the careful completion of risk assessment, the treatment plan for management of the patient's periodontal disease can be developed.

This section focuses on controlling or eliminating the mutable risk factors for, and causes of, periodontal disease, as well as arresting the disease progress. Definitive (i.e., surgical) management of periodontal disease and implant therapy are discussed in Chapter 10. Maintenance therapy for periodontitis is discussed in Chapter 11.

## Causes of Periodontal Disease

***Local factors—plaque, calculus, and pathogenic microbiota.*** The presence of bacterial plaque or biofilm is the primary cause of most periodontal diseases (Figure 9-6). Plaque is composed of bacteria organized around the teeth as a biofilm, which is a matrix enclosure providing the bacteria with protection, nutrients, and cooperative niches. Mineralized deposits around the teeth, **calculus,** also contribute to periodontal disease development in several ways:

- Calculus provides a rough surface to which plaque and bacteria can adhere.

**FIG 9-5** Clinical photos **(A)** and radiographs **(B)** showing aggressive periodontitis. Aggressive periodontitis is a relatively uncommon form of periodontitis affecting mostly adolescents and young adults. Rapid periodontal destruction is a hallmark feature, with first molars and incisors most frequently involved. These patients are otherwise systemically healthy. Familial aggregation is common; parents, siblings, and children of individuals with aggressive periodontitis should be clinically evaluated on a regular basis. In many cases, little plaque or calculus may be detected clinically. The microbial composition of the biofilm may contain elevated proportions of *Aggregatibacter actinomycetemcomitans* and/or *Porphyromonas gingivalis*. Referral to a periodontist is generally necessary for the management of their periodontal needs. (Courtesy Dr. Jonathan Reside and Dr. Antonio Moretti, Chapel Hill, N.C.)

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**FIG 9-6** Plaque and calculus are common local factors contributing to the development of periodontal diseases. (Courtesy Dr. Jonathan Reside and Dr. Antonio Moretti, Chapel Hill, N.C.)

- Calculus harbors bacterial toxins and byproducts that can increase tissue inflammation and encourage an immune response that promotes tissue destruction.
- Calculus makes effective mechanical plaque removal more challenging.
- Additionally, the presence of plaque and calculus can be unsightly and may discourage the patient's efforts to maintain good oral hygiene.

The initiation and progression of periodontal disease is a complex interaction of a susceptible host and virulent strains of specific pathogens. It is well known that specific pathogens contribute to the development and progression of periodontitis. Aggressive periodontitis is strongly associated with the gram-negative pathogen *Aggregatibacter actinomycetemcomitans*. Pathogens associated with chronic (formerly called adult) periodontitis include *Porphyromonas gingivalis, Prevotella intermedia, Tannerella forsythia,* and *Treponema denticola*. Mechanical removal of plaque biofilm and local irritants, such as calculus, remains the most effective mode of prevention and treatment for periodontal disease. The importance of removing plaque and calculus to inhibit or arrest the progression of periodontal disease cannot be overemphasized. Evidence suggests that if the local ecological niche (i.e., the tooth surface adjacent to the ulcerated pocket epithelium) is debrided of toxins and the biofilm is disrupted at regular intervals (by patient and clinician), disease progression can be arrested in the majority of cases.[21,22] An extensive body of literature has been developed describing the most effective methods for daily plaque removal procedures by the patient. Similarly, techniques and instrumentation for scaling and root planing, and oral prophylaxis procedures to make the teeth smooth and toxin free are thoroughly described in periodontology textbooks (see *Suggested Readings* at the conclusion of this chapter).

In some forms of periodontitis, mechanical removal of plaque and local factors may be insufficient to arrest or eradicate the disease, even on a temporary basis. *A. actinomycetemcomitans,* for example, may penetrate into the periodontal tissues and, as a result, may not be effectively eliminated by scaling and root planing alone. In such cases, antibiotic therapy used adjunctively with scaling and root planing or surgery can be helpful in controlling the disease.

***Heredity.*** Heredity can be both a risk factor for and a cause of periodontal disease. There is growing evidence that genetics are a factor in chronic periodontitis. Twin studies have demonstrated that genetic factors may account for approximately 50% of the population variance in chronic periodontitis.[23,24] Studies have also demonstrated strong inheritance patterns in genetic polymorphisms affecting the host response components in aggressive periodontitis.[25] In particular, previous research has clarified the role of interleukin-1 genetic polymorphisms in patients who exhibit increased risk for advanced periodontitis and concomitant tooth loss.[26,27] Research into the genetic factors associated with periodontitis is ongoing and comprehensive, and sophisticated assessments are being made to identify previously unexplored genetic inheritance patterns.[28] Commercial tests are available to assess individual genetic risks for periodontitis, and the

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implications of this data for disease management are currently being studied. Although it is not yet possible to alter genetic inheritance to correct a predisposition for periodontal disease, research on genetic therapy options continues.

The role of epigenetics in the development of periodontal disease also must be considered. Epigenetic changes are reversible genetic modifications resulting in an alteration of gene expression patterns and may lead to gene upregulation or silencing.[29] These changes may be induced by environmental stressors and may ultimately result in an altered inflammatory response. Several factors that may lead to epigenetic modifications (such as tobacco exposure and diabetes) may also contribute to periodontal disease in other ways.

It is important for the patient to understand that presence of the genetic or epigenetic factors described above does not make the occurrence or progression of periodontal disease unavoidable. The dental team must ensure that the patient understands that we now have safe and effective methods of treating periodontal disease. Patients who have seen their grandparents, parents, and siblings lose their teeth to the ravages of periodontitis need the reassurance that—*in most cases*—the disease *is* treatable and the eventual loss of teeth is not inevitable. Understanding these issues can have an important influence on the patient's acceptance of recommended therapy. Furthermore, the dentist's understanding of the patient's genetic predisposition for development of periodontal disease may help the practitioner to tailor management strategies and provide more effective treatment of that disease process.

***Systemic factors and immunoinflammatory response.*** Systemic disease and, in particular, diabetes mellitus, can contribute to the development and progression of periodontal diseases. In the poorly controlled diabetic, microvascular changes, altered circulation and leukocyte chemotaxis, impaired white cell function, and other ill effects of impaired immune response all contribute to periodontal disease and may negate efforts by the dental team and the patient to control it.[30]

Although, in general, the immunoinflammatory response plays a protective role for the host, it may also play a central role in the initiation and progression of periodontal disease. The patient's immune function may foster periodontal disease in two distinct ways. Any condition that diminishes function of the immune system has the potential to increase the severity, complexity, and seriousness of periodontal disease. Common causes for reduced immune system function include human immunodeficiency virus (HIV) infection, cancer chemotherapy, rheumatoid arthritis, systemic lupus erythematosus, and some blood dyscrasias, such as leukemia. Impaired immune function may predispose patients to periodontal disease or modify the presentation of the disease, for example, as in patients with cyclic neutropenia.[31-33]

Although the immunocompromising condition often cannot be eliminated, effective treatment of the periodontal disease can still be implemented. In such cases, current treatment approaches involve holding the periodontal disease in check until the immunocompromising condition is mitigated or controlled, at which time more aggressive periodontal therapy can be initiated. If the underlying cause cannot otherwise be controlled, it may be possible to augment the patient's immune function with pharmacologic agents.[34]

Paradoxically, although the immune system is essential for control of disease and infection, an overexuberant response to the pathogens at a local site may also cause severe destruction to periodontal tissues. Certain patients appear to exhibit a hyperinflammatory response to periodontal infections. Compared with normal controls, the inflammatory cells (monocytes) of such patients release increased amounts of catabolic cytokines and arachidonic acid metabolites in response to bacterial endotoxins.[35] These cytokines and prostaglandins in turn lead to increased tissue destruction and bone loss.

***Tobacco use.*** Tobacco use has serious deleterious effects on periodontal health, and individuals who smoke tend to have a higher risk for developing periodontal and periimplant diseases.[36,37] Tobacco affects the establishment of periodontitis, the progression of disease, and treatment outcomes. In particular, tobacco products have the potential to negatively affect the periodontal microbiota, collagen metabolism, immune system function, wound healing, and treatment outcomes.[36] On clinical examination, the appearance of the gingival tissue may not be consistent with the extent of disease. Patients who smoke typically have a more hyperkeratotic and fibrotic gingiva, which may mask an underlying inflammatory presence. Tissues typically do not appear erythematic, and bleeding on probing may be less compared to the responses of a nonsmoking patient with a similar periodontal disease presentation.[38] Smokeless tobacco can also affect the periodontium, causing a variety of lesions, including gingival recession.

Although the beneficial effects of smoking cessation on the periodontium have been firmly established, the risk for periodontal disease lingers for an extended period of time for former smokers, and reduced treatment outcomes may also be expected compared to nonsmokers.[39] Every effort should be made to provide education about the hazards of tobacco use and encourage cessation (see section *Smoking Cessation* later in this Chapter.)

***Other deleterious habits.*** Some individuals engage in self-destructive behaviors that damage the periodontal tissues at local sites (i.e., factitial injuries) or that may affect the entire periodontium.[40] In some instances, the patient may be unaware of the habit or its effect. The dentist should call these conditions to the patient's attention, identifying the consequences and encouraging changes in behavior to modify the self-injuring habits. Examples of such habits are listed in Table 9-3. Failure to identify and eliminate or modify these habits will result in continued progression of periodontal destruction, despite appropriate care.

***Defective restorations.*** Bulky, overcontured, or overhanging restorations or crowns; ill-fitting prostheses; or unhygienic orthodontic appliances may contribute to food and plaque entrapment, tissue irritation, and gingival inflammation.[41,42] If unaddressed, the result may be the development

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**TABLE 9-3 Habits That May Injure Periodontium**

| Source | Effect |
|---|---|
| Trauma from tools, instruments, needles held in the mouth | Localized stripping of the tissue |
| Placement of caustic medicaments | Tissue burn, slough, ulceration (e.g., aspirin) |
| Holding acidic foods (e.g., lemons) against the teeth for extended periods of time | Tissue irritation, dental erosion, dentinal sensitivity |
| Aggressive or obsessive tooth brushing | Gingival recession, cervical notching |

of bony defects, periodontal abscesses, or other forms of periodontal disease. When the periodontal problem stems from restorative treatment that is less than ideal, the dentist has an obligation to bring these issues to the patient's attention and must do so in an honest but nonjudgmental manner. The dentist needs to avoid casting blame on the previous provider, and the discussion needs to focus on the current condition, its relative importance, and the options in moving forward with treatment (see Chapter 6 for a more extensive discussion of this ethical issue).

Management of the defective restoration is paramount to ensure improvement in the health of the adjacent periodontal tissues. In appropriate cases, recontouring of the restoration may be completed to establish ideal anatomic contours. However, in cases in which recontouring is not possible, replacement of the restoration may become necessary.

***Occlusal trauma.*** Although occlusal trauma does not cause periodontal disease, it can result in increased tooth mobility and may accelerate localized alveolar bone loss, aggravate the progression of periodontal disease, delay healing, and hasten the loss of periodontally involved teeth.[43-45] Management of acute occlusal trauma is discussed in Chapter 8, and management of other forms of occlusal trauma is presented later in this chapter.

## Treatment of Active Periodontal Disease—Initial Therapy

The management of active periodontal disease in the disease control phase of treatment is often referred to as **initial periodontal therapy.** The key components of this process are described in the following sections.

***Systemic considerations.*** The management of systemic issues is discussed in detail in Chapter 7. Issues of specific concern in the patient with active periodontal disease include the following:

- Identification of and, if possible, mitigation of any diseases, treatments, or medication regimens that may affect periodontal disease pathogenesis, delay healing, or otherwise interfere with recommended periodontal therapy.
- Identification of individuals requiring antibiotic prophylaxis to minimize the risk of infective endocarditis (see Chapter 7) and/or infection associated with prosthetic joint replacements (see Chapter 17).
- Obtaining clearance, as appropriate, from the patient's physician for invasive dental treatment (i.e., confirming as necessary that the patient will be able to tolerate scaling and root planing without detriment to his or her health).

***Oral self-care instructions.*** Any patients at risk for periodontal disease and/or dental caries should be educated about the etiology of disease and provided with oral self-care instructions tailored to the particular condition. Oral hygiene instructions should emphasize the importance of mechanical plaque control. Tooth-brushing techniques should highlight proper positioning and movements of the toothbrush head relative to the teeth and gingiva. Instruction in techniques that emphasize plaque removal without damaging the hard or soft tissues should be provided. Certain types of powered toothbrushes have been shown to be slightly more effective in plaque removal and in generating patient compliance as compared with manual toothbrushes.[46] Interdental cleaning is paramount in achieving ideal plaque removal. A wide range of products is available to aid patients in effective plaque removal, including dental floss and floss holders, interproximal brushes, wooden toothpicks, wooden and plastic picks, and rubber tip stimulators. Flossing instructions should emphasize careful C-shaped flossing techniques, and additional devices, such as interproximal brushes, may be useful in individuals with wider interdental spaces. Additionally, irrigation devices are available to assist patients with oral hygiene.[47] Tongue debridement should be considered as part of routine oral hygiene to reduce tongue coating (bacterial colonization), while potentially reducing oral malodors.[48]

Patients with limited manual dexterity may require even greater assistance in tailoring specific oral hygiene regimens because of inherent challenges in holding and manipulating hygiene devices. For these patients, the use of manual and/or powered toothbrushes with larger handles, dental floss holders, and irrigation devices may be necessary. Visually impaired patients may benefit from guided hands-on and auditory hygiene instructions to ensure that they are effective in their oral self care technique.

An important benefit of brushing the teeth twice daily will be the result of the actions of the chemical properties of the dentifrice in preventing caries and/or periodontal disease. Dentifrices that include stannous fluoride, triclosan, or chlorhexidine have been shown to effectively reduce plaque accumulation and gingival inflammation.[49] Mouth rinses that include essential oils, cetylpyridinium chloride, or chlorhexidine have also been demonstrated to be effective in removing plaque and reducing gingivitis.[49]

Regardless of the technique used, it is critical that the patient be able to implement it effectively. Teaching and learning good oral self-care is a complex process and should not be taken lightly by the dental team or patient. The patient must not only be able to hear and understand the instruction, but also must be able to demonstrate the technique in the office and then repeat it at home. The learning process may be slow and laborious and can

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be frustrating to all parties but is definitely worth the effort, because the rewards are significant, and if the effort fails, the outcome can be devastating to the patient. Once the techniques are learned, the use of each prescribed oral home care aid should be reviewed and reinforced at subsequent visits. (See Video 9-1 Demonstration of Oral Hygiene Instruction on Evolve.)

***Extraction of hopeless teeth.*** In some instances, it will already have been determined that selected teeth are to be removed because of severe advanced periodontal disease, nonrestorability because of severe caries or fracture, or in preparation for placing prosthodontic appliances. Such extractions should be completed as part of initial therapy. Delay of inevitable extractions may give false hope and leave the patient deflated and discouraged when the teeth finally are lost. Exceptions to this approach may be advisable or necessary in some instances. It may be appropriate to maintain hopeless teeth temporarily until a replacement prosthesis has been prepared, to preserve appearance, if their retention prevents the imminent tipping or extrusion of other teeth, or if their removal would compromise the vertical dimension of occlusion.

***Elimination of iatrogenic restorations and open caries lesions contributing to periodontal disease.*** Management of caries lesions or defective restorations that interfere with effective plaque removal should be completed either before or in conjunction with scaling and root planing. In general, caries control should be carried out early in the sequence of treatment, and the placement of restorations, or the correction of overhanging restorations, should precede scaling and root planing for the following reasons:

- Scaling and root planing procedures are more effective after gross irregularities are removed and the open smooth surface carious lesions are sealed.
- The patient's oral self-care efforts will be more effective and the patient can witness the improvement in tissue health.
- Periodontal tissue healing may be enhanced.
- Caries or leaking restorations can be ruled in or out as the cause of pulpal symptoms or dentinal sensitivity.

***Managing other dental problems that contribute to periodontal disease.*** Conditions relating to tooth anatomy, position, and occlusion may also contribute to periodontal disease. Anatomic defects, such as root fluting or concavities, or exposed furcation areas, are typically managed in the definitive phase of care. Similarly, orthodontic correction of a root proximity problem normally is delayed until completion of the disease control phase. Marginal ridge discrepancies, open proximal contacts, and plunger cusps may be repairable with odontoplasty in the disease control phase, or if more severe, may need to be corrected with complex restorations during definitive treatment. Although comprehensive occlusal adjustment should not be performed before scaling and root planing, significant occlusal interferences causing acute occlusal trauma or trauma-related mobility should be eliminated through limited occlusal adjustment as part of the disease control phase.

***Scaling and root planing.*** Scaling and root planing constitute a central element in the periodontal component of the disease control phase. These procedures provide effective antimicrobial therapy by mechanically removing bacteria and disrupting their local ecologic niche. The primary purpose of scaling and root planing is to remove plaque and calculus from affected enamel and cementum, eliminating irregular and rough root surfaces in the process. Coupled with careful personal and professional oral hygiene procedures, such measures will help prevent subsequent plaque accumulation and disease progression. These improvements manifest clinically as reduced probing depths and lessened gingival inflammation (i.e., gingival redness and bleeding on probing).

Scaling and root planing can be a technically challenging procedure. Tenacious calculus, deep pockets, irregular root anatomy, and the inability of the operator to visualize the tip of the instrument during the procedure make this one of the most demanding tasks for the general dentist, hygienist, or periodontist. To be performed well requires patience, persistence, and skill. Patients often do not appreciate either the value or difficulty of a thorough scaling and root planing. Those with newly diagnosed untreated periodontitis may be accustomed to a quick rubber-cup prophylaxis and will be frustrated by the length of time required and the more likely occurrence of postoperative discomfort. Educating the patient about the value of the procedure represents an important component of this stage of care. A few clinical practicalities in support of these procedures serve the patient and practitioner well (see *In Clinical Practice: Improving the Efficacy of Scaling and Root Planing Procedures* box).

***Pharmacotherapy.*** For selected patients, prescribing topical antimicrobial rinses as an adjunct to disease control phase periodontal therapy may be appropriate. Chlorhexidine gluconate (CHX), a commonly used topical antiseptic, can be effective in reducing plaque, gingival inflammation, and bleeding. The following clinical indications for the use of CHX rinses in initial phase periodontal therapy have been identified:

- Acute conditions, such as acute necrotizing ulcerative gingivitis.
- Disabled patients who cannot manipulate handheld oral hygiene devices.
- Patients with immunocompromising conditions.
- Patients with severely debilitating systemic disease.
- Overt residual gingival inflammation and bleeding, which persists despite the dental team's and patient's best efforts at initial therapy.

Careful case selection is important when prescribing CHX rinses to patients during initial therapy. The excellent antiplaque and antimicrobial properties of CHX may mask deficiencies in patient's home care techniques, providing a false sense of security about mechanical plaque removal abilities and delaying necessary instructions to remedy these deficiencies. As long-term use is rarely indicated, the discontinuation of CHX in these cases will likely result

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## IN CLINICAL PRACTICE

**Improving the Efficacy of Scaling and Root Planing Procedures**

- If in doubt, use local anesthetic. In the absence of pain or discomfort, the patient is better able to tolerate the procedure and less likely to become stressed or fatigued. Similarly, if the patient is more comfortable, the procedure will be less fatiguing or frustrating for the clinician, and the outcome will be improved. Use of a vasoconstrictor can also establish a cleaner and drier visual field for the clinician, and more favorable access to the deposits. Judicious use of a local anesthetic therefore helps the dental team to deliver this treatment in the most safe, efficient, and effective means possible.
- It is better to perform complete scaling and root planing on a smaller area rather than to scale a larger area superficially, with the result that further scaling will be required at a later date. The second option may appeal to both patient and provider because it appears that more is accomplished in less time, but the appearance can be both deceiving and counterproductive. Superficial scaling may allow the gingiva to heal and return to a normal contour and texture, giving patient and clinician the false sense that the periodontal disease is under control and no additional periodontal therapy is required. In reality, the disease continues unabated at the depth of the pocket, and in some cases the healing of the superficial tissues allows for the formation of a periodontal abscess.
- If calculus, because of its location, mass, or tenacity, cannot be readily removed using normal means, including ultrasonic or sonic scalers, it will be advisable to discontinue the effort, delaying completion of removal until a flap can be reflected surgically. With the calculus exposed, debridement can be more efficient, effective, and thorough.

in a recurrence of plaque accumulation and gingival inflammation.

Although systemic antibiotic therapy is rarely needed in the management of chronic periodontal disease, it is often used as an adjunct to initial scaling and root planing in the management of aggressive or refractory periodontal diseases.[50] Antibiotic treatment helps eradicate invasive bacteria and also provides antimicrobial function for the patient with a compromised immune response. Its administration should be timed so that it coincides with mechanical plaque disruption through scaling and root planing to permit improved penetration and action within the plaque biofilm. The distinct disadvantage of this therapy, however, is that it also removes the normal populations of protective bacteria, which may allow repopulation with even more aggressive bacterial pathogens. If systemic antibiotics are to be used, it can be advantageous to culture plaque from the affected sites and perform antibiotic sensitivity tests to select the most effective antibiotic and the one with the least likelihood of killing desirable microbiota. Even with appropriate cultures, sensitivity testing, and optimal antibiotic selection, this therapy has potentially serious drawbacks, including the development of drug-resistant organisms, suprainfection, and sensitivity to the medication. The most commonly used systemic antibiotics are metronidazole, tetracycline, and amoxicillin. These agents may be used alone, serially, or in combination, depending on patient diagnosis, presentation, and culture data.

An additional indication for systemic antibiotic use is in the management of acute periodontal conditions, such as necrotizing periodontal diseases and periodontal abscesses (see Chapter 8).

### Periodontal Reevaluation

Often overlooked, periodontal reevaluation represents a critically important component of the disease control phase of periodontal therapy. See Box 9-1 for the elements of the periodontal reevaluation. The reevaluation is necessary to assess the effectiveness of periodontal therapy to date and to provide guidance for future treatment. With a thorough evaluation, the dentist can assess the efficacy of all aspects of the initial therapy, determine which elements have served their purpose and should be continued, and which have been ineffective and should be discontinued. If the situation calls for additional intervention, strategies can be selected with the advantage of seeing the outcomes of earlier approaches. This is also the ideal time to assess the patient's need for and willingness to accept periodontal surgery.

The periodontal reevaluation should be performed 4 to 8 weeks after the final scaling and root planing visit.[51] This time frame gives the patient ample opportunity to develop an effective oral hygiene routine and, if the therapy has been effective, allows sufficient time for resolution of inflammation. Furthermore, the time interval is brief enough that most patients will not yet have developed significant new calculus

### BOX 9-1 Periodontal Reevaluation Elements

- Reevaluation of patient's health status, recognition of any changes or significant continuing systemic conditions
- Reevaluation of patient's gingival condition, including description of tissue color, texture, contour, and form
- Probing depth and clinical attachment level measurements
- Notation of any sites where bleeding on probing occurs and calculation of bleeding index
- Calculation of plaque index
- Evaluation of teeth for mobility
  - Assessment of mucogingival status
  - Identification of occlusal factors that may affect periodontal condition
- An overall summary of patient's response to initial therapy
- Assessment of additional periodontal treatment needs, to include periodontal surgery
- Determination of interval for subsequent periodontal maintenance visits

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deposits. The evaluation also occurs early enough in the process that the patient will likely still be psychologically receptive to revisions in plans for therapy or recommended oral self-care techniques.

The practitioner should keep in mind several practical considerations that may facilitate planning the periodontal reevaluation visit. First, if the patient needs both an evaluation of initial periodontal therapy and an overall disease control phase posttreatment assessment (i.e., to include assessing control of other pathologic conditions), it is advantageous to do both simultaneously. Many features are common to both evaluations, and it is more efficient to combine them when possible. Second, any additional scaling and root planing or amended oral hygiene instructions often can be accomplished at this visit. Third, if the reevaluation suggests that periodontal surgery should be recommended, related issues can be discussed and informed consent for the surgery obtained before the patient leaves the office. If the patient agrees to surgery, the surgery appointment can be made before the patient is dismissed. Combining these efforts not only saves time, but also guides the patient more smoothly into the next phase of therapy. In short, consolidating activities at the periodontal reevaluation appointment benefits both patient care and practice management.

If the initial therapy has been successful, the patient's periodontal needs can now be managed through maintenance therapy (sometimes characterized as supportive periodontal therapy). If initial therapy has been unsuccessful, or if other periodontal needs remain, therapy can be provided during the definitive phase of care.

## Pulpal Therapy and Management of Lesions and Defects Encroaching on Pulp

The following section focuses on assessing and managing chronic pulpal or periapical pathology or those conditions that may cause pulpal pathology. (The diagnosis and management of acute pulpal and periapical conditions are discussed in Chapter 8.) The disease control phase of treatment is an ideal setting in which to provide initial restorative treatment for overt caries lesions, lost or defective restorations, displaced or nondisplaced fractures of teeth, or other tooth abnormalities that, if untreated, may result in loss of pulp vitality (Box 9-2). The disease control phase provides the opportunity for conservative procedures, such as **partial caries excavation** (PCE) that, if successful, will result in the formation of secondary dentin and maintain the vitality of the tooth. The pulpal and periapical response to such therapy can be followed after 3 to 6 months and through the disease control phase. A definitive diagnosis should be confirmed before initiating the definitive phase therapy. If the pulp is already irreversibly compromised, and the patient's plan of care includes a disease control phase, then this is the ideal time for definitive root canal therapy. The disease control phase is also the appropriate time to provisionally restore such teeth, often with foundation restorations (Figure 9-7), in anticipation of the definitive restoration that will follow.

**BOX 9-2 Common Causes of Loss of Pulp Vitality**

- Deep caries lesions (Figure 9-8)
- Fractured or leaking restorations
- Displaced fractures in close proximity to pulp (Figure 9-9)
- Nondisplaced tooth cracks or fractures
- Large restorations in close proximity to pulp (Figure 9-10)
- Tooth wear or notching via abfraction, abrasion, attrition, or erosion (Figures 9-11 and 9-12)
- Acute occlusal trauma or extreme chronic occlusal trauma
- Inadvertent exposure of pulp during tooth preparation

**FIG 9-7 A,** Before and **B,** after placement of amalgam foundation. (Courtesy Dr. Glenn Garland, Chapel Hill, N.C.)

**FIG 9-8** Deep caries lesion. (Courtesy Dr. Carlos Barrero, Chapel Hill, N.C.)

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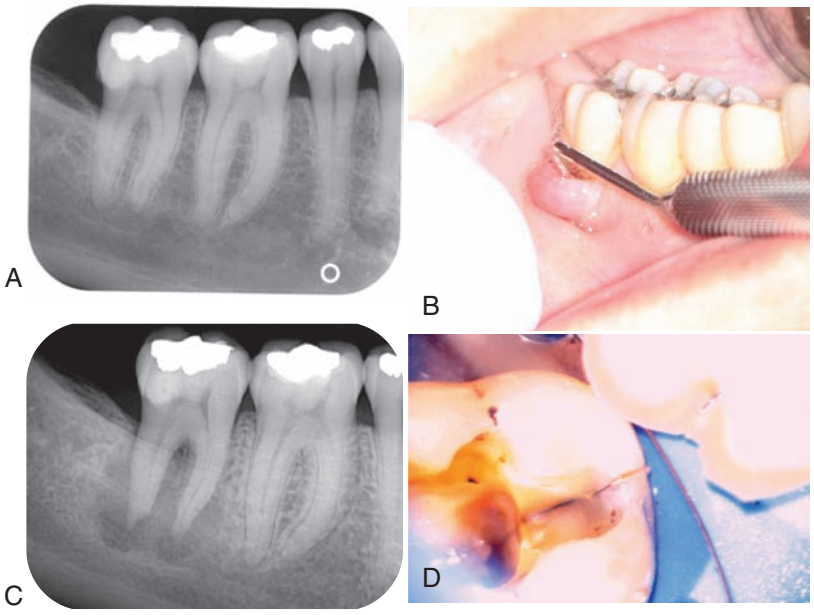


**FIG 9-9** Tooth crack. **A,** Mandibular second molar at initial visit. **B,** Second visit (11 months later), chronic apical abscess. **C,** Second visit, apical rarefying osteitis. **D,** Second visit, restoration removed and tooth crack exposed. (Courtesy Dr. Peter Tawil, Chapel Hill, N.C.)

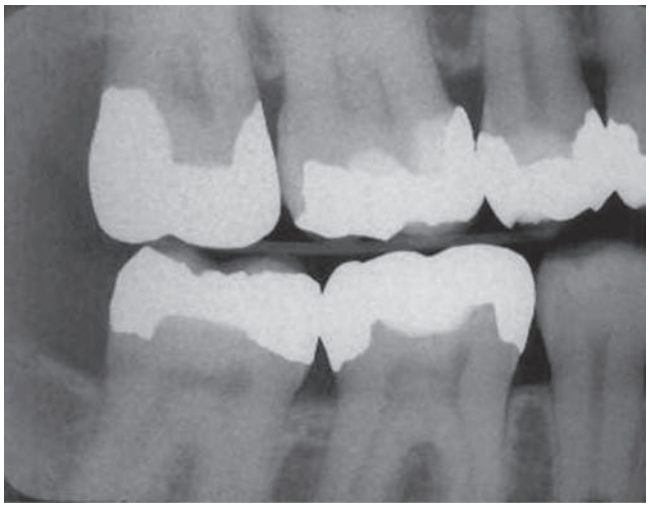

**FIG 9-10** Large metallic restorations. Note that the deep bases on the maxillary second premolar and first molar appear to be in close proximity to the pulp. (Courtesy Dr. J. Ludlow, Chapel Hill, N.C.)

**FIG 9-11** Cervical notching. (Courtesy Dr. Lee Boushell, Chapel Hill, N.C.)

If any of the conditions listed in Box 9-2 exist or if the dentist has concerns about the pulpal or periapical health of a tooth before restoration, an endodontic evaluation is in order. A specific tooth history and pulp vitality testing provide information for evaluating the health of the pulp. Appropriate evaluation of the periapical area includes visual inspection, palpation and percussion testing, and interpretation of a recent periapical radiograph. It is important to have a diagnosis of both the pulpal and periapical condition of such teeth *before* initiating restorative treatment.

The following sections address several approaches to managing and restoring teeth in various conditions of pulpal health during the disease control phase of treatment.

### Reversible Pulpitis or a Healthy Pulp When the Caries, Fracture, or Defect Is of Moderate Depth and Pulp Is Not Exposed

The typical approach to this situation is to use a desensitizer (5% glutaraldehyde + 35% hydroxyethyl methacrylate [HEMA]) followed by placement with a direct-fill restoration.[52] The

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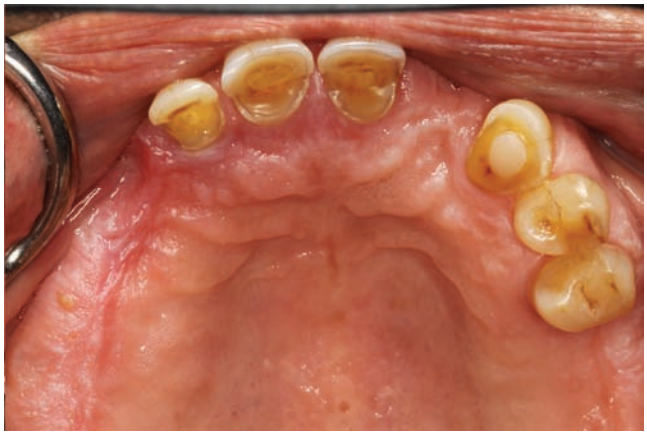

**FIG 9-12** Severe attrition. (Courtesy Dr. R. Patel, Chapel Hill, N.C.)

purpose of the desensitizer is to limit the flow of tubular fluid during the restorative procedure. Examples of commercially available desensitizers include GLUMA (Herareus Kulzer) and G-5 (Clinician's Choice).

A traditional base or liner under the restoration is usually not warranted unless less than 2 mm of dentin remains between the depth of the preparation and the pulp. If time does not permit placement of a conventional restoration, an adhesive material (GI cement or resin hybrid) can be placed as a "bandage" over the site. This expedient and atraumatic technique may provide an esthetic solution, and, by covering the exposed dentin, eliminate further insult to the tooth. In addition, this approach gives the practitioner time to confirm pulp health and the patient time to consider restoration alternatives before making an irreversible commitment. The obvious disadvantage to this approach is that it necessitates one or more additional visits for definitive restoration of the tooth.

### Reversible Pulpitis or a Healthy Pulp, and Healthy Periapical Area When the Caries, Fracture, or Defect Is in Close Proximity to Pulp

Two primary alternatives have been developed for this clinical situation. The first more traditional approach argues that total caries removal and the final form of the preparation should be undertaken. If the pulp is encountered in the process, then endodontic therapy or extraction is recommended. This approach argues that with a compromised pulp and a higher-than-normal likelihood of developing necrosis, the most expedient course of action is to force the issue and initiate root canal treatment or extraction. If root canal therapy is necessary, better to do it sooner rather than later because the root canals are less likely to become calcified, and the treatment outcome is more predictable. Classic research has shown that root canal therapy on a vital noninfected pulp has a long-term success of more than 95%.[53,54]

The second approach, held by advocates of a PCE procedure, promotes the idea that deep caries removal should cease when caries excavation has reached approximately 1 mm from the pulp. Those who subscribe to this mode of therapy recommend removal of all infected dentin from the periphery of the deep lesion and placement of a GI-based material in the deep recesses of the preparation, sealing the carious tissue. If deep transparent dentin allows the pinkish/red color ("blush") of the pulp to be visualized, then calcium hydroxide liner material is placed directly on that area of the pulpal/axial wall as an indirect pulp cap. It is recommended that the calcium hydroxide liner and adjacent deep peripheral dentin then be covered with a resin-modified GI base. The preparation is then restored with a direct-fill restorative material consistent with the overall approach of the current treatment plan. According to the second view, in most instances, the pulp will have a reasonable likelihood of survival, and because an indirect pulp cap has a generally favorable prognosis, it should be attempted. If successful, root canal treatment (or extraction) and a considerable expense to the patient can be avoided. If unsuccessful, root canal therapy can still be done, although with a somewhat diminished chance of success. Classic research has shown that root canal therapy on a necrotic infected pulp has a long-term success rate of around 85%.[53,54] (See Chapter 3 for the evidence-based rationale for this approach.)

The discerning practitioner will recognize that, in certain circumstances, one or the other of the two approaches clearly represents a better choice, whereas in other circumstances *either* approach could be selected, and that the decision is best made in conversation with the patient. Certain situations call for aggressive treatment, as for example when a "key tooth" is involved and the prognosis for the entire reconstruction depends on its successful retention. If it is important to avoid the necessity of root canal therapy *after* the tooth has been definitively restored, or if root canal treatment would improve the retention and longevity of the final restoration, it would be wise to treat aggressively and not attempt a PCE. If, on the other hand, the patient is unwilling or unable to accept root canal treatment should that become necessary, and if the tooth would otherwise be lost, then a more conservative approach, the PCE, should be attempted. In intermediate cases, in which there is a realistic choice between the two options, the patient should be engaged in the discussion and involved in the decision-making process.

The practical reality is that because this decision is being made in the context of the disease control phase, there is often uncertainty about the long-term prognosis for the tooth, as well as the lengths to which the patient is prepared to go to save it. In that state of uncertainty, the conservative treatment (PCE/indirect pulp cap) is usually preferable to root canal treatment on a tooth that may be extracted in the future.

### Reversible Pulpitis or a Healthy Pulp, and Healthy Periapical Area When the Pulp Is Exposed

In this situation, as with the previous one, there are competing perspectives. Some practitioners never place direct pulp caps. Many endodontists, having seen only the failures and dealing with the hazards of calcified canals, strongly oppose the technique. However, credible practitioners continue to support the technique in selected circumstances.[55] Direct pulp capping is not recommended in the presence of a large carious exposure because the microbial insult to the pulp is usually too great to

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be overcome. The presence of excessive bleeding (a "hyperemic" pulp) suggests that the pulp tissue has developed a substantial inflammatory response to the carious insult, whereas purulent exudate suggests a necrotic pulp. In both instances, pulp capping is contraindicated. The best candidates for direct pulp caps are small exposures (preferably mechanical) in teeth with healthy pulps and periapical areas that are scheduled to receive direct-fill intracoronal restorations. Before a pulp cap is placed, all treatment options and the possible consequences of each must be described to the patient, including the fact that a significant percentage of direct pulp caps can be expected to eventually lead to loss of pulp vitality.

Initially, the direct pulp cap should be considered as an interim solution by both patient and practitioner. If, on reevaluation (after 3 to 6 months), the tooth remains asymptomatic, with vital pulp tests and no clinical or radiographic evidence of apical pathology, then the expectation of long-term service can be given qualified endorsement. The dentist should continue to monitor the tooth indefinitely.

A direct pulp cap may be considered as an interim treatment option when there has been a direct exposure of the pulp and pulpal necrosis is imminent—but the patient either wishes to have the tooth extracted at a future date, or cannot decide whether to try to save or extract the tooth. For either situation, a clear time interval must be established, at the conclusion of which the patient must make a decision. Again, it is essential that the patient be informed that there is strong likelihood of further problems, especially pain or infection if the tooth is left unattended.

### Irreversible Pulpitis or Necrotic Pulp

In this situation, definitive pulpal therapy with root canal treatment or extraction is required. Pulp capping is contraindicated. If the tooth is to be retained, the initial treatment would be caries removal and a complete pulpectomy. A partial pulpectomy or pulpotomy should be considered only if the practitioner is unable to execute a complete pulpectomy (or extract the tooth) at that visit. The patient must understand that a pulpectomy is not a definitive form of treatment and that root canal treatment or extraction will be necessary.

### Patient Declines Treatment for an Asymptomatic Apical Periodontitis, Cyst, or Granuloma

When definitive pulp therapy is indicated but the patient is asymptomatic and exhibits no signs of active infection or progressive disease and declines endodontic treatment, the clinician is presented with a dilemma. If the patient is immunocompromised, allowing chronic apical infection to persist would, in most cases, be inappropriate and unacceptable. For the patient with a normal host response, the dentist may elect to reevaluate the condition at specified periods, as discussed in Chapter 11. If the lesion increases in size or is associated with signs of active infection, then intervention will be necessary. Some clinicians never allow chronic apical lesions to go untreated, and certainly this approach has merit. Even in cases in which root canal therapy might otherwise be deferred, common sense dictates that when a restoration is planned for the tooth, the root canal treatment should be performed first.

## Single Tooth Restoration in the Disease Control Phase of Care

A tooth that is to be restored as part of the disease control phase, but for which root canal therapy is not necessary or warranted, normally receives a direct-fill definitive restoration, as discussed in Chapter 10. If the tooth is found to require a crown in the definitive phase of care, a **core** or **foundation** is placed during the disease control phase using a direct-fill restorative material (see Figure 9-1). This treatment serves as both an interim restoration and the base on which the definitive restoration is to be placed. In rare cases, usually associated with a compelling esthetic concern for which a composite restoration will not suffice, or instances in which there is no other satisfactory way to provisionally restore the tooth, an indirect partial or full-coverage restoration may be warranted during the disease control phase.

Teeth receiving root canal therapy need special management. While root canal treatment is in progress, the tooth must have some form of provisional restoration (usually IRM, Cavit, or a GI) that isolates the canal from salivary contamination. Once the root canal treatment is complete, a more long-term provisional or definitive restoration is necessary. For posterior teeth, often a cusp-reinforcing (covering) direct-fill restoration is usually sufficient to stabilize and protect the tooth in the disease control phase. When an anterior tooth has had root canal treatment, but insufficient tooth structure remains to support a composite restoration, a provisional post and crown are typically constructed. Another interim solution is to fabricate the definitive post and core and follow up with a provisional or definitive full-coverage restoration. In any case, it is critical to maintain an effective seal between the oral cavity and the root canal filling material; especially in the case of posterior teeth, it will be very important to place a restoration that will protect the tooth from fracture.

## Stabilization of Dental Malalignment, Malocclusion, or Occlusal Disharmony

Most problems related to the malposition or malocclusion of teeth are addressed in the definitive phase of the treatment plan and are discussed in Chapter 10. It is usually inadvisable to provide orthodontic treatment before disease control therapy has been successfully completed. In some instances, however, occlusal or limited orthodontic therapy can or should be accomplished as part of a comprehensive disease control program. Examples are discussed in the following section.

### Root Proximity Problem that Precludes Restoration of a Carious Lesion or Fracture

In the presence of a large proximal carious lesion, adjacent teeth may drift together (Figure 9-13). To gain access for caries removal and place a matrix band and restoration with a physiologic contour, it may be necessary to orthodontically separate the teeth.

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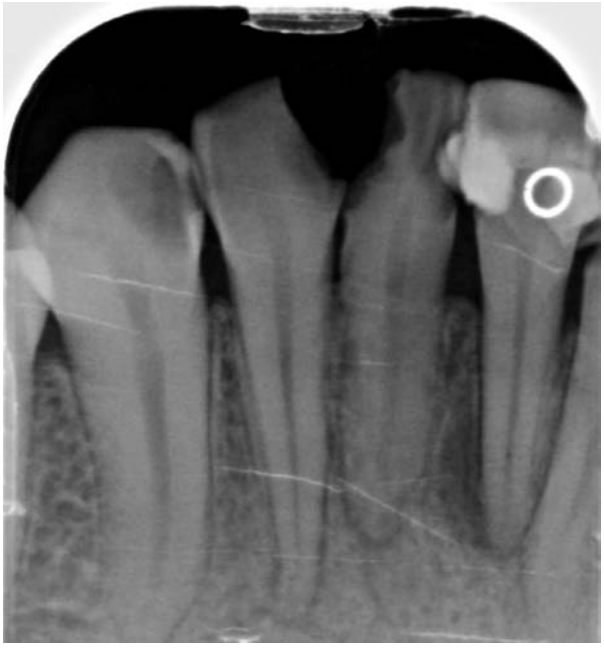

**FIG 9-13** Root proximity problem induced by caries-related space collapse. (Courtesy Dr. R. Quinonez, Chapel Hill, N.C.)

**FIG 9-14** Tooth malalignment as a contributing factor in periodontal disease. Tooth malalignment may complicate ideal plaque removal, encouraging the formation of calculus and potentially leading to periodontitis. Careful oral hygiene instructions must be provided to the patient so he/she can achieve adequate plaque control. Orthodontic treatment (i.e., tooth alignment) may be completed to help facilitate oral hygiene; however, patients must be cautioned about the risk for accelerated periodontal destruction if their oral hygiene is not adequate during orthodontic movement. (Courtesy Dr. Jonathan Reside and Dr. Antonio Moretti, Chapel Hill, N.C.)

### Plunger Cusp, Open Contact, and/or Marginal Ridge Discrepancy Contributing to Food Impaction and Periodontal Disease

Presence of a "plunger cusp" (a sharp, very prominent cusp that extends deep into the opposing tooth anatomy or proximal embrasure area) may encourage interproximal food impaction. This chronic condition may cause the soft tissue in the area to become red, bulbous, swollen, and tender. Significant bleeding on probing and deeper periodontal pockets may result. In this situation, a judicious recontouring (enameloplasty) of the offending cusp may be in order. If the problem is caused by an open contact that cannot be remedied by adjusting the opposing occlusion, then consideration should be given to altering the proximal surface on one or both of the adjacent teeth through placement of a restoration or restorations. An orthodontic solution may also be considered. Small marginal ridge discrepancies can be corrected by recontouring the "high" tooth or restoration. Larger discrepancies may require orthodontic correction or placement of a restoration.

### Severe Crowding

In some patients, severe crowding or malposed teeth may preclude effective plaque removal and can become a cofactor in periodontal disease. When tooth malalignment is an unmitigated factor in persisting gingivitis or periodontitis (Figure 9-14), limited or comprehensive orthodontic therapy may be recommended or necessary. In the case of malposed lower anterior teeth, if one incisor is significantly displaced, it may be possible to solve the problem by removing that tooth. Optional limited orthodontics after the extraction can enhance the patient's ability to remove plaque and further improve tooth alignment and esthetics.

### Occlusal Trauma Affecting Multiple Teeth

Occlusal trauma can be classified as primary or secondary (see Chapter 2). A dentition undergoing primary occlusal trauma may exhibit isolated wear facets or more generalized severe attrition, in some cases exposing dentin. Abfractive lesions often accompany the development of wear facets and/or attrition. Erosion may accelerate tooth loss initiated by attrition or abfraction. More severe occlusal trauma may lead to increased tooth mobility with clinically detectable fremitus. The patient may report sensitivity associated with affected tooth surfaces. In the presence of symptoms, an occlusal adjustment may be indicated (see discussion of bruxism in Chapter 3). If comprehensive occlusal adjustment is indicated, it should generally be implemented at the conclusion of rather than during the disease control phase of treatment.

The most common clinical feature of secondary occlusal trauma is significant tooth mobility. Other common findings (in addition to those noted with primary occlusal trauma) include drifting and tipping of the teeth. The maxillary anterior teeth are particularly susceptible to labial flaring and often exhibit obvious fremitus when the teeth are occluded. In some cases, the symptoms may be relieved by a comprehensive occlusal adjustment, which should follow rather than precede initial periodontal therapy. However, isolated secondary occlusal trauma that is associated with a limited number of teeth should be corrected as soon the resultant fremitus has been detected. In severe cases in which the teeth have drifted or exhibit moderate to severe mobility, provisional splinting may be required. Less commonly, orthodontic therapy may also be required during the disease control phase of treatment.

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### Occlusal Trauma Affecting Isolated Teeth

The diagnosis and management of acute occlusal trauma is discussed in Chapter 8. Individual teeth with occlusal trauma may exhibit pulpal sensitivity, be clinically mobile (with palpable fremitus), and (because of coexisting occlusal interferences) cause aberrant excursive patterns in eccentric jaw movements. Secondary occlusal trauma may contribute to additional loss of clinical attachment. Gross discrepancies that interfere with smooth function in excursive jaw movements or that cause occlusal trauma normally should be eliminated as part of the disease control phase of therapy. Usually, this can be accomplished with selective occlusal adjustment to eliminate premature contacts or interferences to excursive and/or protrusive mandibular movements. In rare instances, orthodontic or restorative correction is required.

### Supraerupted Tooth Extending into an Opposing Edentulous Space

This condition can be problematic, because it may preclude future reconstruction with a normal occlusal plane, (Figure 9-15) and depending on the tooth position and location, there is an increased likelihood of symptomatic interference in protrusive movement and function. This problem is usually addressed in the definitive phase, after evaluating mounted study casts. It is mentioned here because if the clinician considers a conservative approach—occlusal reduction without root canal therapy or an indirect restoration—then it is often advantageous to begin the process during the disease control phase. Thus, the reduction can be achieved sequentially, with the goal of allowing for the gradual deposition of secondary dentin and maintenance of a healthy pulp. If root canal therapy or an indirect restoration becomes necessary, then upon successful completion of disease control treatment that therapy can be undertaken immediately. It should be noted that the conservative approach requires that consideration also be given to the stabilization of the tooth to prevent further supraeruption.

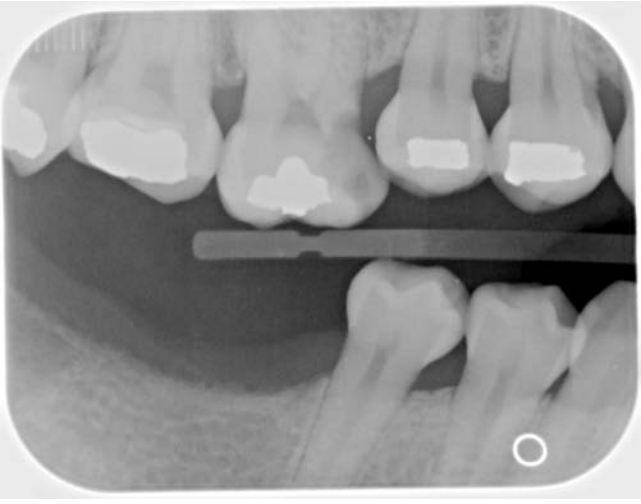

**FIG 9-15** Hypereruption. (Courtesy Dr. B. Proctor, Chapel Hill, N.C.)

### Impacted Tooth Other Than a Third Molar

Impacted teeth (usually maxillary canines or mandibular premolars) usually should be addressed in the disease control phase of care. If extraction is warranted because insufficient space exists for forced eruption, the procedure should be carried out earlier rather than later to avoid delaying definitive therapy. If forced eruption is a possibility, but the outcome is uncertain, the attempt should be made as early as possible, so that by the time the definitive phase is initiated, the outcome will be clear and subsequent therapy, if needed, can be delineated. Potential psychological and health benefits accrue to the patient when impactions are managed in the disease control phase. Delay simply prolongs the inevitable and may give the patient the false sense that treatment can be postponed indefinitely. Delay also increases the risk of resorption, periodontal disease, or carious invasion of adjacent teeth.

### Decreased Vertical Dimension of Occlusion

Management of decreased vertical dimension of occlusion can be complex and difficult. Certainly it is easier for the dentist to defer the decision as to whether it is necessary or desirable to open the bite until the disease control phase is complete. By delaying the decision, however, the dentist risks being placed in the awkward position of having to recommend extraction of teeth already restored, or re-restoration with definitive (often indirect) restorations at the new vertical dimension. For these reasons, it is important to consider the fundamental question of whether to open the bite and, if so, how that should be accomplished as part of the disease control phase.

If it is determined that reconstruction can be accomplished successfully at the existing vertical dimension, then every attempt to save teeth may be justified. If the vertical dimension will need to be opened and the patient cannot afford the required complete mouth reconstruction, then a denture or overdenture may be the only alternative. If the vertical dimension needs to be opened and the patient can afford comprehensive reconstruction, it may be prudent to refer the patient to a prosthodontist for the entire reconstruction.

## Disorders Associated with the Temporomandibular Joints and/or Muscles of Mastication

The management of acute pain or dysfunction of the temporomandibular joint(s) (TMJ) and/or muscles of mastication (commonly referred to as temporomandibular disorders, TMDs or TMJDs) is addressed in Chapter 8. Even in the absence of acute symptoms, some disorders of the temporomandibular joint complex and/or muscles of mastication may have a significant effect on the patient's ability to chew and talk and, as a result, should be included in the disease control phase of treatment. Four of the more common conditions are discussed here, with information on diagnosis, relevance to the patient's care, and treatment. Before attempting to diagnose or manage TMJD, however, the dentist should receive training in the diagnosis and management of TMJD

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and orofacial pain. In the absence of specific training, practitioners are advised to consult with, or refer the patient to, someone with that expertise. Often a specialist in oral medicine, hospital dentistry, oral and maxillofacial surgery, or oral and facial pain would be a good resource.

### Reducing Disc Displacement

Reducing disc displacement (RDD) refers to the displacement (usually anteriorly) of the articular disc of the TMJ when the posterior teeth are in occlusion. During mouth opening, the disc is reduced back into its proper location on the superior portion of the condyle. Both opening and closing movements may produce distinct, audible, and/or palpable clicks or pops (also known as reciprocal clicking). Mandibular range of motion is within normal limits. RDD is mostly painless and does not result in mandibular dysfunction. However, some patients may complain of difficulty opening, a sensation of jaw muscle tightness, soreness or discomfort, and painful clicking or pain during jaw movement. Patients may seek treatment for RDD because of pain, difficulty with normal jaw function during chewing or talking, or social embarrassment as a result of the audible click.

Treatment consists of self-care measures, including applying ice or heat to the painful area, massaging the jaw, restricting jaw functions to a painless range, soft diet, oral parafunction awareness, jaw exercises, and jaw muscle relaxation training, nonsteroidal antiinflammatory drugs (NSAIDs; if needed) for pain control, and occlusal splint therapy.

The latter can be beneficial in reducing both immediate and persistent symptoms of RDD.

### Nonreducing Disc Displacement

Nonreducing disc displacement (NDD) refers to the complete displacement or dislocation (again, usually anteriorly) of the articular disc of the TMJ in both the closed and open mouth positions, as well as during all excursive movements of the TMJ. NDD is also known as closed lock of the TMJ. Owing to the lack of reduction of the articular disc, TMJ popping or clicking is absent. Both active and passive mouth opening is restricted with a hard end-feel and ipsilateral deflection. Patients typically complain of severely restricted mouth opening accompanied by moderate to severe pain in the acute stage. The TMJ pain is often localized to the joint and may be perceived as an earache because of its proximity to the ear canal. Associated inflammation of the retrodiscal tissue (known as retrodiscitis) results in tenderness of the ear canal to palpation. Patients seek treatment for NDD because of pain and severe restriction in mandibular range of motion, thereby interfering with normal jaw function. A sudden onset of severely limited mouth opening, along with a prior history of TMJ clicking or popping, is the primary feature of NDD.

Treatment consists of self-care measures (as described above for ADD), prescribing NSAIDs for the control of pain and inflammation, and occlusal splint therapy. Orthodontic treatment and occlusal adjustments are contraindicated. Over time, although the articular disc remains displaced or dislocated, the retrodiscal tissue assumes a "pseudo-disc" formation, resulting in increased mouth opening. On resolution of the TMJ inflammation, physical therapy can assist with rehabilitation of the TMJ, especially in improving the mandibular range of motion.

### Degenerative Joint Disease

Degenerative joint disease (DJD) or osteoarthritis of the TMJ is the result of destruction of the articular surfaces of the condyle and/or glenoid fossa secondary to joint inflammation. The etiology of DJD is complex and can result from micro- or macro-trauma, ageing, or prior TMJ surgery. DJD can also be generalized, involving multiple joints in the body (known as polyarthritis), or may be associated with underlying medical conditions (such as rheumatoid arthritis and gout). Patients may complain of TMJ pain, preauricular swelling, restriction in mandibular range of motion, and joint crepitus (a crunching or grating sound on movement of the TMJ). The pain is usually spontaneous and may become worse on jaw movement. Capsulitis/synovitis of the TMJ may result in a transient acute malocclusion (disclusion of the ipsilateral posterior teeth and heavy occlusion of the contralateral anterior teeth), which self-corrects after resolution of the joint inflammation. DJD may also occur in the absence of jaw pain or mandibular dysfunction. Radiographic evidence of bony condylar changes, such as erosions and osteophytes, is present in DJD. Patients seek treatment for DJD because of pain and interference with normal jaw function.

Treatment consists of self-care measures (as described previously), NSAIDs for pain control and reduction of inflammation, and occlusal splint therapy. Systemic or intra-articular steroids and glucosamine may be helpful. In chronic and progressively debilitating cases, TMJ surgery (such as arthrocentesis, arthroscopy, and total joint replacement) may be indicated.

### Masticatory Myalgia

Masticatory myalgia is pain originating from the muscles of mastication as a result of muscle fatigue and overexertion. Myalgia frequently occurs as a result of parafunctional activities, such as clenching, often in response to stressful events. It differs from TMJ pain in several ways. Myogenous pain is often diffuse and cyclical (waxes and wanes over time) compared to TMJ pain, which is often very well localized with a distinct onset. When asked to indicate the location of pain, patients with TMJ pain typically point to a small area in front of the tragus of the ear, whereas the patient with muscle pain will place his or her hands over the entire side of the face. On clinical examination, myogenous pain can be provoked or aggravated by digital palpation of the muscles of mastication. Passive mandibular range of motion is usually restricted (because of pain), but active mandibular range of motion is usually within normal limits and associated with a soft end-feel. Taut muscle bands with hypersensitive or exquisitely painful areas (known as trigger points), which radiate pain in a characteristic pattern, are typical findings of myofascial pain. Patients seek treatment primarily to relieve the jaw or face pain and associated headaches.

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Self-care measures (as described previously), NSAIDs, and muscle relaxants are usually considered the first line of treatment, especially when the patient has acute symptoms. Steps to strategically reduce levels of masticatory muscle activity should be considered. Use of a well-designed occlusal splint (i.e., a splint that allows even centric stops for all teeth in maximum intercuspation and anterior guidance with immediate posterior disclusion on mandibular movement) is effective at eliminating posterior interference contributions to excessive masticatory muscle activity. In addition, occlusal splints provide protection of the dentition. Patients who experience the greatest discomfort on awakening should use the splint at night, whereas patients experiencing the greatest discomfort in the evening should use the splint during the day. Antidepressants and anticonvulsants may also be very effective for many of these patients. Finally, physical therapy, trigger point injections, and botulinum toxin (Botox) injections may also be indicated.

**FIG 9-16** Nicotine stomatitis associated with long-term smoking. (From Ibsen OAC, Phelan JA: *Oral pathology for the dental hygienist,* ed 6, St. Louis, 2014, Saunders.)

## Use of Tobacco Products

In the United States, tobacco use, although declining, is still pervasive, resulting in significant morbidity and mortality to both users and nonusers.[56] Worldwide, tobacco use continues to increase. Cigarette smoking is a major risk factor for heart disease, various forms of cancer, stroke, and chronic obstructive pulmonary disease. It is estimated that one in five deaths is related to smoking and that one in four smokers will die prematurely of a tobacco-related disease, losing on average 15 years of life.[57] Women who smoke are at risk for the same adverse effects as men, and, in addition, a pregnant woman who smokes puts her unborn child at risk for complications, such as premature birth and low birth weight. Tobacco smoking causes 30% of all cancer deaths in the United States.[56] Tobacco smoking has been cited as the leading preventable cause of mortality and morbidity worldwide.[58] The morbidity and mortality from cigarette smoking are related to the total years of smoking, the number of cigarettes per day, and the depth of inhalation. The use of nonfiltered cigarettes and mentholated cigarettes is also related to increased morbidity.[59]

Cigar and pipe smoking are associated with the same health concerns as cigarette smoking, including cardiac and pulmonary diseases, the risk of nicotine addiction, and the creation of indoor air pollution.[60] Cigar and pipe smoking are considered at least as great a risk factor for the development of oral cancer as cigarette smoking.[60,61] The pipe stem (smoke delivery end) delivers smoke that has both thermal effects and hot gasses produced during combustion. These act synergistically with the toxic components in tobacco smoke to enhance the risk of carcinogenesis in chronically exposed tissues, such as lips and soft palate. The habit of holding the lighted end of the cigarette inside the mouth, called "reverse smoking," is also associated with a significantly higher risk of oral cancer.[61,62] Oral effects of pipe smoking are shown in Figure 9-16.

Currently, there are as many as 46 million smokers in the United States[56] and millions of other individuals who are exposed to passive or secondhand smoke. Secondhand smoke from cigarettes, cigars, and pipes is known to pose health risks to nonsmokers.[63]

The oral use of smokeless tobacco (commonly called spit, chew, or snuff) is not a safe alternative to smoking.[63-65] Compelling scientific evidence documents the fact that smokeless tobacco is also dangerous and can lead to nicotine addiction and a number of noncancerous oral pathologic conditions demonstrated in Figure 9-17. Types of smokeless tobacco to be chewed are shredded loose-leaf, pressed brick or plug, or twist, made of dried ropelike strands. Snuff is a powdered or finely cut cured tobacco, which is available as a wet or dry product to be used topically in the mouth or nose. All forms contain nitrosamines and other potentially carcinogenic substances. The risk of developing oral cancer increases with long-term use of smokeless tobacco. Chapter 13 describes the toxic and pathogenic effects of key ingredients of tobacco products and explains the addictive potential for tobacco in its many forms.

### Smoking Cessation

In light of the current knowledge about the health effects of tobacco use, dental health providers (dentists and dental hygienists) have a professional and ethical obligation to engage in tobacco prevention and cessation counseling with patients who use tobacco products. Tobacco intervention is consistent with the goals of oral health promotion and preventive dentistry. When appropriate, tobacco use cessation should be an integral part of the dental treatment plan. (See Summary of Policy and Recommendations Regarding Tobacco [1964 – Present)] from the American Dental Association at www.ada.org/ADA Positions, Policies and Statements/Tobacco and Nicotine.)

For many patients with limited access to healthcare, the episodic visit to the dentist may be the primary point of contact with a healthcare provider. For these patients, and for those patients who are regularly seen for periodic dental visits, the dental office provides an ideal setting and opportunity

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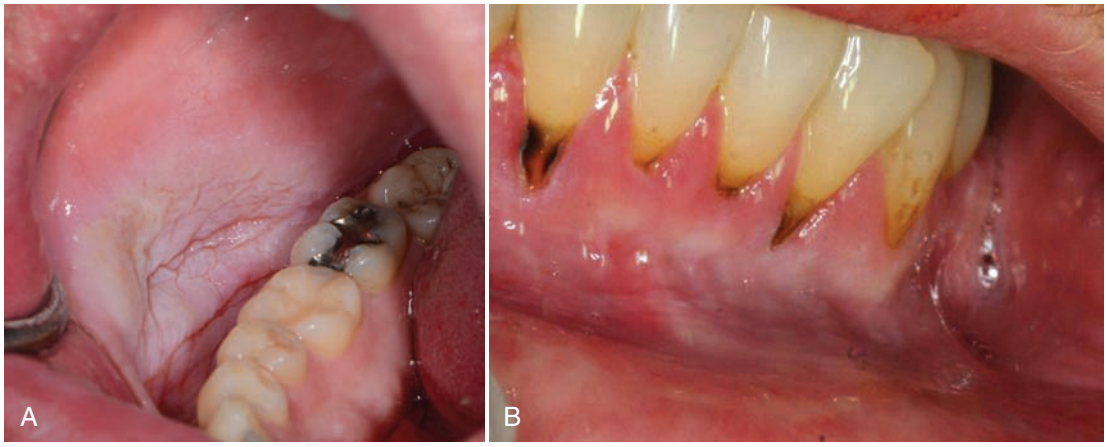


**FIG 9-17** Oral effects of smokeless tobacco. **A,** Tobacco pouch keratosis. **B,** Recession, mucogingival defects, tooth stain, and submucous fibrosis. (Courtesy Dr. Ricardo J. Padilla, Chapel Hill, N.C.)

to initiate, manage, and reinforce a patient's smoking cessation program. By seeing the patient at periodic maintenance visits, dental team members can also help manage a relapse of tobacco use, should it occur. Every member of the dental practice team can play a role in smoking cessation counseling. First, they should set a good example by being tobacco-free themselves. When addressing issues of patient tobacco use, dental team members should be discrete, diplomatic, and encouraging, but not condescending. All office members should be educated in the harmful oral and systemic effects of tobacco use and aware of current approaches and acceptable strategies for tobacco control.

***Information for the patient about effects of tobacco.*** Dental patients who use tobacco should be advised about the adverse effects that tobacco products may have on both systemic and oral health. Most patients are aware of the potentially life-threatening pulmonary and cardiac effects of smoking, but may not be cognizant of the direct and indirect effects of smoking on the oral cavity and the effect of smoking on oral health.[63] Tobacco-induced illnesses affecting the cardiovascular and respiratory systems may preclude certain kinds of elective surgical treatment because of the increased systemic risk of surgery and anesthesia. For the medically compromised patient who smokes, the detrimental effects can be synergistic and may further limit dental treatment options. Cellular, tissue, and immune system changes caused by smoking can have a negative effect on the outcome of any oral surgical procedures.[57,66] This is a particular concern with respect to implants. Because early long-term studies had shown that patients who smoke are more likely to develop peri-implantitis,[67] a few practitioners have declined to place implants requiring osseointegration in individuals who continue to smoke, and many will require that patients receiving implants refrain from smoking during the postinsertion healing period.

By altering the humoral and cellular immune system response, tobacco use increases the probability that periodontal disease will occur, and that it will occur sooner than it would have otherwise. Tobacco smokers are 2.5 to 3 times more likely to develop periodontal disease than are nonsmokers.[63,68] Smoking increases the risk of necrotizing gingivitis (NUG). A strong association has been found between smoking and tooth loss, as well as alveolar bone loss. There is also a direct relationship between periodontal disease severity and the number of cigarettes consumed daily, number of years of use, and age at initiation of smoking.[69] The smoker's susceptibility to other smoking-related diseases may be correlated with the severity of that smoker's periodontal disease.[68] Smoking can have a significant negative effect on any efforts to treat or prevent the recurrence of inflammatory periodontal diseases. Some evidence suggests that with cessation of smoking, periodontal tissues are more likely to regenerate and rehabilitate.[69-71]

Tobacco use has been associated with other oral conditions as diverse as oral mucosal leukoplakia, localized alveolar osteitis (dry socket),[66] and halitosis. The combustion products of smoked tobacco can stain the oral soft tissue, especially the tongue; tooth structure; dental prostheses; and composite resins. Use of smokeless tobacco is associated with buccal tooth abrasion and gingival recession in the areas of the mouth where the tobacco is held.[63] Some smokeless tobacco products contain sugar, which can significantly increase the risk of developing cervical caries.

Smokers should be informed of the ultimate negative outcome of their high-risk behavior—oral cancer. Tobacco cessation studies have shown that there is a greatly increased risk for a second primary oral cancer in patients who continue smoking after cancer treatment and that the 5-year survival rate is approximately twice as high for nonsmokers as for smokers.[62] Potentially life-threatening, oral cancer can seriously affect ability to eat, chew, talk, and function, as well as significantly altering the individual's appearance and self-image.

Box 9-3, to be shared with patients by the dental team, summarizes the major effects of tobacco products in the mouth. Open-source publications on the effects of tobacco and tobacco cessation techniques and programs are available from the National Cancer Institute at www.cancer.gov

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**BOX 9-3 Patient Pointers on Possible Oral Effects of Tobacco Products**

- Discoloration and coating of tongue
- Smoker's palate
- Bad breath
- Staining and wear of teeth and fillings
- Tooth decay
- Irritation and staining of gums
- Receding gums
- Bone loss around teeth
- Gum disease and pyorrhea
- Implant infection
- White or red premalignant lesions
- Oral cancer

**BOX 9-4 Five A's of Tobacco Intervention**

- ASK—Systematically identify all tobacco users at every visit.
- ADVISE—All tobacco users should be encouraged to quit. Advice should be clear, direct, and individualized for each patient.
- ASSESS—Determine the patient's willingness to initiate cessation.
- ASSIST—Aid the patient in quitting. Patients should be advised to remove tobacco products from their environments and to avoid situations that may compromise their efforts to stop using tobacco, such as socializing with active smokers or consumption of alcohol.
- ARRANGE—Schedule follow-up contact. Follow-up contact should occur soon after the quit date, preferably during the first week. A second follow-up contact is recommended within the first month. Schedule further follow-up contacts as needed. Acknowledge success.

Adapted from the National Cancer Institute's tobacco intervention program http://www.ahrq.gov/professionals/clinicians-providers/guidelines-recommendations/tobacco/5steps.html. (Accessed September 22, 2015).

(see Harms of Cigarette Smoking and Health Benefits of Quitting and Cessation Fact Sheet)[71a,71b] and Smokefree.gov. These are excellent resources for educating patients and are suitable for use in the dental office.

***Smoking cessation strategies.*** Smoking cessation can be accomplished through healthcare providers and healthcare systems; medications, including nicotine replacement therapy (NRT); individual and group counseling; and web-based or stand-alone and computer-based programs. For many smokers a combination of cessation strategies, including counseling and medications has been demonstrated to be most effective.[72] Smoking cessation programs show a predictable success rate of 40% with NRT or 20% without NRT.[59]

The first step in smoking cessation therapy is recognition that the patient is a user of tobacco products. This information can be gathered routinely, as part of the patient history. As a patient is identified as a tobacco user, he or she can then be asked about readiness to quit. A discussion with the dentist or dental hygienist focusing on the oral health risks and personal advantages of quitting tobacco use can be a useful method for motivating an individual to make the decision to quit.[73-75] An analysis of the tobacco history becomes the basis for smoking cessation counseling.[76] Tobacco cessation not only involves a behavioral change in breaking a habit, but also recognition of the need to overcome the physical dependence on nicotine. Successful changes in behavior focus on the advantages and disadvantages associated with the habit.[74,75] Established tobacco intervention protocols, such as the one advocated by the U.S. National Cancer Institute, can be easily implemented in the clinical setting, including the dental office. When using this model with patients, providers should apply the 5 As (Box 9-4).[68]

A systematic, step-by-step approach over four appointments and involving all members of the dental team, as described in the *In Clinical Practice: Smoking Cessation—Step-by-Step Instruction for the Dental Team* box, can be used to assist dental patients to successfully discontinue their smoking behavior.

## IN CLINICAL PRACTICE

**Smoking Cessation—Step-by-Step Instruction for the Dental Team**

As soon as the smoker expresses a willingness to quit the tobacco habit, the following four steps may be used in the preparation stage. Note: it is important to keep records during smoking cessation counseling regarding the patient's smoking status, given that the process often is not a straightforward one.

1. Appointment: Supply the patient with self-monitoring sheets to be completed at home.
   a. Instruct the patient to note each cigarette smoked on a self-monitoring sheet. Note in particular the time and the degree of importance (How much did I need it?) for each cigarette smoked and a possible alternative behavior.
   b. Set the next appointment for 7 to 10 days later.
2. Appointment: Assess self-monitoring sheets.
   a. Identify the less-important cigarettes smoked from the self-monitoring sheets.
      Request for the following appointment: Eliminate the less-important cigarettes as soon as possible.
   b. Determine the type of smoking behavior.
      Distinguish between the individual who "smokes at regular intervals throughout the day" and the individual who "only smokes at particular times."
   c. Alternatives to smoking.
      Request for the following appointment: Ask the patient to seek out his or her own activities to substitute for cigarettes.
   d. Set the next appointment for 7 to 10 days later.
3. Appointment: Evaluate behavior change and nicotine dependence.
   a. Less-important cigarettes successfully eliminated?
   b. Assess commitment to cigarette alternatives (changes in behavior).
   c. Determine nicotine dependency.*
   d. Set "stop smoking day" appointment.

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4. Appointment: Stop smoking day with an individualized plan to quit.
   a. Reconfirm cigarette alternatives.
   b. Make a recommendation for a nicotine replacement product based on past smoking behavior and assessed level of nicotine dependency.

**Follow-Up Appointments**

The dental team takes the opportunity to congratulate the ex-smoker on his or her success. If a patient is found to have resumed smoking, ask if he or she is ready to try again. Relapses are quite normal, and smokers often need four or more attempts to achieve long-term success.

*To evaluate the level of nicotine dependence, three questions should be asked: "Have you attempted to give up smoking in the past?" "How many cigarettes do you smoke daily?" and "How soon after waking up in the morning do you smoke your first cigarette?"[76] Patients who have made (unsuccessful) attempts to quit in the past, patients who smoke >1 pack of cigarettes per day, and patients who need a cigarette as soon as they are awake all have a higher level of dependency.

Nicotine replacement products have been developed that reduce or eliminate withdrawal symptoms and have been found to significantly increase success in efforts to stop smoking.[59] These agents provide individuals with help for the psychological and behavioral aspects of their nicotine addiction once the decision has been made to stop smoking. Physical symptoms, such as headache, digestion complaints, sleep disturbances, and increased appetite, are common during nicotine withdrawal, and, in addition, the intense craving for nicotine may cause the patient to resume smoking. Nicotine replacement products supply a specific measured dose of nicotine without exposing the patient to any associated tobacco carcinogens and toxins.

NRT products are available in both prescription (e.g. bupropion, varenicline) and non-prescriptions forms. Popular delivery systems include nicotine chewing gum such as Thrive, and nicotine patches such as Habitrol. The patch program typically takes 8 weeks to complete. Start with using the 21-mg patch for 4 weeks, then the 14-mg patch for 2 weeks, and finally the 7-mg patch for 2 weeks. There are also lozenges, sprays, and inhalers containing nicotine available for patient use. Evidence from a systematic review suggests that antidepressants such as bupropion and nortriptyline help in long-term smoking cessation and that adverse events with either drug are rarely sufficiently serious to require stopping use of the medication.[77] The products can be used in combination and, although no one of the delivery systems has been demonstrated to be superior, individual smokers may find that one product is more effective than another. The choice of nicotine replacement product should be based on the patient's smoking pattern and level of dependence.[73,76] See Table 9-4 for a comparison chart of nicotine replacement products.

**TABLE 9-4 Nicotine Replacement Therapy (NRT) Products*,†**

| Product | Advantage/Uses | Precautions/Adverse Effects |
|---|---|---|
| **Nicotine Gum** | | |
| Available: 2- and 4-mg strengths.<br>Maximum: 24 pieces per day.<br>Use 4-mg strength only for patients who take their first cigarette within 30 mins of waking or smoke > 25 cigarettes/day.<br>Dose: 2- or 4-mg gum every 1-2 hrs for 6 wks, then taper over next 6 wks.<br>If cravings are strong and frequent, may use second piece within an hour. | Available over the counter.<br>Use: Chew gum slowly until it tingles, then park between cheek and gum. When tingle is gone, begin chewing again until tingle returns. Repeat process until most of the sensation is gone (30 mins).<br>Using at least 9 pieces/day the first 6 wks is associated with higher chances of quitting.<br>Short acting makes dosing more flexible. | Adverse effects: Continuous use may cause nausea, hiccups or pyrosis.<br>Other effects: Gastrointestinal disturbances, jaw pain, orodental problems.<br>May worsen TMJ disorder.<br>No food/drink except water 15 mins before and while chewing.<br>May use with cigarettes.<br>Duration of use: 6 wks to 6 mos. |
| **Nicotine Lozenges** | | |
| Available: 2- and 4-mg strengths.<br>Maximum: 20 lozenges per day.<br>Dose (as with gum): 2- or 4-mg lozenge every 1-2 hrs for 6 wks, then taper over next 6 wks. | Available over the counter.<br>Use: Allow lozenge to slowly dissolve in mouth over 20-30 mins. Minimize swallowing. Do not chew or swallow lozenge. | Cautions similar to gum.<br>Do not use more than 1 lozenge at a time or more than 5 lozenges in 6 hrs.<br>Duration of use: 3 mos. |
| **Nicotine Nasal Spray** | | |
| Available: 0.5 mg per metered spray.<br>Maximum: 40 mg (80 sprays) per day.<br>Initial dose range 8-40 mg/day depending on level of addiction.<br>Dose: 1-2 sprays in each nostril every hour, taper over 4-6 wks. | Prescription only.<br>Use: To minimize side effects, do not swallow, or sniff or inhale through nose while using product. Tilt head back slightly when administering.<br>Fastest form of nicotine delivery, short acting allows for dosing flexibility. | Adverse effects: Nasal irritation and congestion, runny nose, changes in taste or smell (most adverse effects improve after 3 days).<br>May be more likely to induce dependence owing to fast onset, poor compliance.<br>Duration of use: 3-6 mos. |

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**TABLE 9-4 Nicotine Replacement Therapy (NRT) Products—cont'd**

| Product | Advantage/Uses | Precautions/Adverse Effects |
|---|---|---|
| **Nicotine Transdermal Patch—24 hrs** | | |
| Available: 7, 14, 21 mg per 24 hrs.<br>Maximum of 21 mg/day transdermally.<br>Start with highest dose if patient smokes >10 cigarettes/day.<br>Dose: Use daily for 6 wks, then taper by 7 mg/day every 2 wks. | Available over the counter.<br>Use: Apply new patch to nonhairy, clean, dry skin on upper body or upper outer arm and wear for 16-24 hrs. If cravings occur on awakening, wear for 24 hrs. If vivid dreams or sleep disturbances occur, remove patch at bedtime. | Adverse effects: Skin sensitivity and irritation may affect up to 54% of users; also dizziness, headache, nausea, unusual dreams, racing heartbeat.<br>Wash hands after applying or removing patch.<br>Disadvantage: Doesn't treat acute cravings.<br>Duration of use: 8-12 wks. |
| **Nicotine Oral Inhaler** | | |
| Available: 4 mg/metered spray in 10-mg cartridge.<br>Maximum of 64 mg/day (16 cartridges).<br>Dose: 6-16 cartridges/day for up to 12 wks, then taper dose over 6-12 wks. | Prescription only.<br>Use: Spray into the mouth, avoiding lips. Do not inhale while spraying. Do not swallow for several seconds after spraying.<br>Most successful patients in clinical trials used between 6 and 16 cartridges/day. Recommend at least 6 cartridges/day for the first 3-6 wks. | Adverse effects: Local irritation of mouth and throat, coughing, rhinitis.<br>Avoid in severe reactive airway disease.<br>Mimics hand-to-mouth action of smoking, moderate compliance.<br>Duration of use: Up to 6 mos. |

*A 2013 Cochrane review of pharmacologic interventions for smoking cessation ranked various nicotine replacement therapies as being equivalent and second only to varenicline in treatment efficacy.[2]

†**Precautions for all products:** Recent (<14 days) myocardial infarction, underlying cardiac arrhythmias, serious or worsening angina pectoris, adolescents (< 18 yrs), pregnancy, breastfeeding. Taper slowly off all products.

References:
Cahill K, Stevens S, Perera R, Lancaster T: Pharmacological interventions for smoking cessation: an overview and network meta-analysis. *Cochrane Database Syst Rev* 2013 May 31;5:CD009329.
Fiore MC, Jaen CR, Baker TB, et al: *Treating tobacco use and dependence: 2008 update - clinical practice guideline, U.S. Department of Health and Human Services*. May 2008. http://www.ahrq.gov/professionals/clinicians-providers/guidelines-recommendations/tobacco/index.html/ Accessed March 2, 2015.
GlaxoSmithKline Consumer Healthcare: *Nicorette (nicotine polacrilex gum) consumer labeling*. Moon Township, PA, 2014.
Nides M: Update on pharmacologic options for smoking cessation treatment, *Am J Med* 121(4 Suppl 1):S20-S31, 2008.
Palmer KJ, Buckley MM, Faulds D: Transdermal nicotine. A review of its pharmacodynamic and pharmacokinetic properties, and therapeutic efficacy as an aid to smoking cessation, *Drugs* 44:498-529, 1992.
Wolters Kluwer Health: *Nicotine; drug facts and comparisons; facts & comparisons*. 2014 Clinical Drug Information LLC. Available at: www.wolterskluwercdi.com. Accessed March 8, 2015.

## Other Forms of Oral Pathology

The disease control phase of the treatment plan is a logical place to deal with oral pathology in its many forms. Lesions that require a biopsy, consultation, or active therapy usually are addressed in the disease control phase. Benign lesions that should be monitored (e.g., fibromas or condensing osteitis) are best addressed in the maintenance phase of care. Soft tissue pathology may appear at any time during the course of the patient's treatment. For that reason, and because it may appear in myriad forms and need to be treated in widely divergent ways, the management of oral pathology has application to all phases of the treatment plan and is found in many chapters of this text. Oral manifestations of systemic disease, such as anemia-induced glossitis, are most often managed as a systemic element throughout all phases of care. Acute conditions, such as stomatitis, may be most appropriately handled as an acute phase of care. New lesions that may arise during the course of definitive therapy, such as abrasions caused by dentures or hyperkeratosis, are addressed as they occur.

Any comprehensive attempt to control oral disease should certainly include the management or eradication of any and all pathologic diseases and conditions. From a timing perspective, this also makes sense because overt oral pathology requiring treatment should receive priority in scheduling and should therefore precede the definitive phase of care.

Chapter 5 discusses in detail the recognition, diagnosis, and management of oral cancer. For more specific information on the diagnosis and management of the numerous oral pathologic conditions, the reader should consult one of the many currently available texts in oral pathology. *Suggested Readings* are listed at the end of this chapter.

## Replacement of a Missing Tooth or Teeth During the Disease Control Phase

Many patients do not wish to delay tooth replacements until the conclusion of the disease control phase of care. Although tooth replacement usually occurs during definitive phase therapy, it may be necessary and appropriate to place a provisional restoration or prostheses during the disease control phase to satisfy the patient's short-term esthetic or functional needs and maintain arch integrity (Figure 9-18).

Replacement of a missing single tooth in the anterior region most typically is accomplished by bonding in a denture

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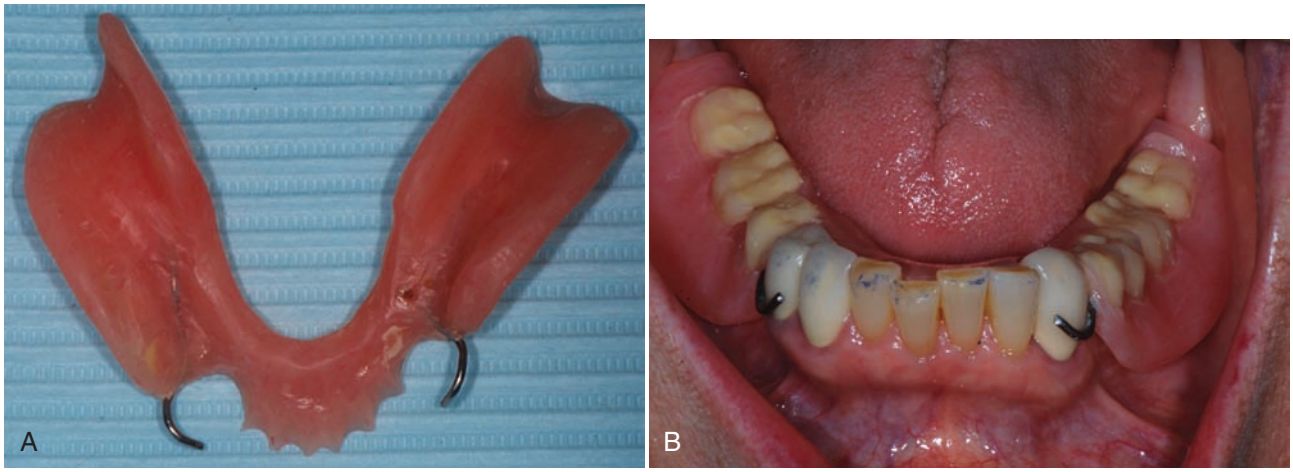


**FIG 9-18** **A** and **B,** Provisional removable partial denture. (Courtesy Dr. Carlos Barrero, Chapel Hill, N.C.)

tooth or the crown of the extracted tooth, or with a temporary removable partial denture or provisional fixed partial denture. Replacement of multiple missing teeth in the disease control phase is usually implemented with a temporary removable partial denture.

## REASSESSMENT

The plan of care for the disease control phase includes a comprehensive reevaluation of the patient. This assessment provides the dentist with the opportunity to evaluate the patient's response to treatment, ascertain the patient's current condition, and determine the risk for future disease. As noted in the introduction to this chapter, this reassessment is sometimes designated as a posttreatment assessment. The disease control phase posttreatment assessment can follow the same format as the definitive phase posttreatment assessment described in Chapter 11.

Components of the disease control phase posttreatment assessment and sample questions include the following:

- Systemic status: Includes an update of the health history and vital signs. Have current conditions improved or worsened? Is the patient complying with recommended therapy? Have any new problems developed?
- Chief complaint: Have the patient's major concerns been addressed? Are there any new concerns?
- Caries status: Are there new lesions? Has the patient complied with all recommended therapy? What are the results of repeated caries susceptibility tests? What is the current caries risk status?
- Condition of the marginal periodontium (see *Periodontal Reevaluation* section earlier in this chapter): Is the patient at future risk for periodontal disease?
- Condition of the pulp and periapical tissue of any previously symptomatic teeth or teeth that have had a PCE or direct pulp cap procedure: Are there any residual signs or symptoms? What are the findings on a 6-month postoperative image of the tooth? Current pulp and apical diagnosis?
- Status of the occlusion and tooth alignment: Is there evidence of occlusal trauma? Does the patient have any esthetic concerns or functional limitations? What is the risk for tooth fracture?
- Condition and function of the TMJ complex: Are there signs or symptoms of any TMJD? Is the patient at risk for any TMJD?
- Health of other oral tissues: Has all previously diagnosed oral pathology been managed or treated? Are there any new lesions? Is the patient at risk for new or recurrent pathologic lesions or conditions?

## MAKING THE TRANSITION TO THE DEFINITIVE PHASE OF CARE

After the comprehensive reevaluation or disease control phase posttreatment assessment, the dentist determines whether to continue disease control therapy or progress to the definitive phase. Both patient and practitioner will have been working toward definitive care and at this point are hoping to move to the next stage. A setback can be frustrating to both parties and can cause the patient to doubt his or her own resolve or to question whether confidence in the dentist has been misplaced. Nonetheless, it is also in the interest of both parties that aggressive reconstruction *not* be undertaken until the disease control phase has been completed successfully. To do otherwise is to invite failure of the treatment and an even greater level of frustration for the patient. Failure at that stage also carries greater legal risk for the dentist.

If the dentist deems it appropriate to move to the definitive phase, discussion can begin for the planning of care. If the plan includes fixed or removable prosthodontics, it is recommended that study casts be generated at this juncture. From these diagnostic records, the dentist often can more easily and accurately determine what treatment options are feasible and should be presented to the patient. This is also an ideal time for options to be redefined in light of the patient's response to treatment. Previous options may be discarded

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and new ones considered. As the patient engages in the conversation and comes to understand each option with its associated risks, benefits, costs, and demands, the best plan of care for the patient can be selected and informed consent acquired. In this way, the patient will move seamlessly into the definitive phase of care.

## REVIEW QUESTIONS

- When is a disease control phase indicated?
- What elements should be included in a disease control phase?
- How should treatment be sequenced within the disease control phase?
- What is included in the basic caries control package? What is the rationale for each component?
- What caries control measures may be needed beyond the basic caries control package? What are the indications for each?
- What are the common causes of periodontal diseases?
- What treatment modalities are included in initial periodontal therapy?
- What are the indications for doing a partial caries excavation (indirect pulp cap) procedure?
- What are some common occlusal problems that need to be addressed in the disease control phase of treatment?
- How do you differentiate RDD from NDD? How do you manage each condition?
- What are the oral and systemic effects of tobacco use?
- What activities should be included in a disease control phase posttreatment assessment?

## SUGGESTED PROJECTS

- Design a caries control protocol for your practice.
- Design a tobacco cessation plan for your practice.

## REFERENCES


1. Marcenes W, Kassebaum NJ, Bernabe E, et al: Global burden of oral conditions in 1990-2010: a systematic analysis, *J Dent Res* 92(7):592–597, 2013.
2. Mellberg J: The mechanism of fluoride protection, *Compend Contin Educ Dent* 18(2 Spec No):37–43, 1997.
3. Tavss E, et al: High-potency sodium fluoride: a literature review, *Compend Contin Educ Dent* 18(2 Spec No):31–36, 1997.
4. Bader JD, Shugars DA, Bonito AJ: A systematic review of selected caries prevention and management methods, *Community Dent Oral Epidemiol* 29(6):399–411, 2001.
5. Reference deleted in pages.
6. DePaola P: The benefits of high-potency fluoride dentifrices, *Compend Contin Educ Dent* 18(2 Spec No):44–50, 1997.
7. Marsh PD: Are dental diseases examples of ecological catastrophes? *Microbiol* 149(2):279–294, 2003.
8. Pearce EI, Dibdin GH: The effect of pH, temperature and plaque thickness on the hydrolysis of monofluorophosphate in experimental dental plaque, *Caries Res May-Jun* 37(3): 178–184, 2003.
9. Gustafsson BE, et al: The Vipeholm dental caries study; the effect of different levels of carbohydrate intake on caries activity in 436 individuals observed for five years, *Acta Odontol Scand Sep* 11(3-4):232–264, 1954.
10. Harris R: Biology of the children of Hopewood House, Bowral, Australia. 4. Observations on dental-caries experience extending over five years [1957-1961], *J Dent Res* 42:1387–1399, 1963.
11. Fontana M, Gonzalez-Cabezas C: Are we ready for definitive clinical guidelines on xylitol/polyol use? *Adv Dent Res* 24(2):123–128, 2012.
12. Ahovuo-Saloranta A, Forss H, Walsh T, et al: Sealants for preventing dental decay in the permanent teeth, *Cochrane Database Syst Rev Mar* 28(3):CD001830, 2013.
13. Beauchamp J, Caufield PW, Crall JJ, et al: American Dental Association Council on Scientific Affairs. Evidence-based clinical recommendations for the use of pit-and-fissure sealants: a report of the American Dental Association Council on Scientific Affairs, *J Am Dent Assoc Mar* 139(3):257–268, 2008. Review.
14. Simonsen RJ: From prevention to therapy: minimal intervention with sealants and resin restorative materials, *J Dent Dec* 39(Suppl 2):S27–S33, 2011.
15. Randall RC, Wilson NHF: Glass-ionomer restoratives: a systematic review of a secondary caries treatment effect, *J Dent Res* 78(2):628–637, 1999.
16. Donly KJ, et al: Evaluating the effects of fluoride releasing dental materials on adjacent interproximal caries, *J Am Dent Assoc* 130(6):817–825, 1999.
17. Raggio DP, Hesse D, Lenzi TL, et al: Is atraumatic restorative treatment an option for restoring occlusoproximal caries lesions in primary teeth? A systematic review and meta-analysis, *Int J Paediatr Dent Nov* 23(6):435–443, 2013.
18. de Amorim RG, Leal SC, Frencken JE: Survival of atraumatic restorative treatment (ART) sealants and restorations: a meta-analysis, *Clin Oral Investig Apr* 16(2):429–441, 2012.
19. Mickenautsch S, Yengopal V: Failure rate of atraumatic restorative treatment using high-viscosity glass-ionomer cement compared to that of conventional amalgam restorative treatment in primary and permanent teeth: a systematic review update, *J Minimum Intervent Dent* 5:63–124, 2012.
20. Frencken JE, Peters MC, Manton DJ, et al: Minimal intervention dentistry for managing dental caries - a review: report of a FDI task group, *Int Dent J Oct* 62(5):223–243, 2012.
21. Ramfjord SP, Morrison EC, Burgett FG, et al: Oral hygiene and maintenance of periodontal support, *J Periodontol* 53(1):26–30, 1982.
22. Mousques T, Listgarten MA, Phillips RW: Effects of scaling and root planing on the composition of the human subgingival microbial flora, *J Periodontal Res* 15(2):144–151, 1980.
23. Michalowicz BS, Aeppli D, Virag JG, et al: Periodontal findings in adult twins, *J Periodontol* 62(5):293–299, 1991.


http://dentalebooks.com

24. Michalowicz BS, Diehl SR, Gunsolley JC, et al: Evidence of a substantial genetic basis for risk of adult periodontitis, *J Periodontol* 71(11):1699–1707, 2000.
25. Kinane DF, Shiba H, Hart TC: The genetic basis of periodontitis, *Periodontol 2000* 39:91–117, 2005.
26. McGuire MK, Nunn ME: Prognosis versus actual outcome. IV. The effectiveness of clinical parameters and IL-1 genotype in accurately predicting prognoses and tooth survival, *J Periodontol* 70(1):49–56, 1999.
27. Kornman KS, et al: The interleukin-1 genotype as a severity factor in adult periodontal disease, *J Clin Periodontol* 24(1):72–77, 1997.
28. Divaris K, Monda KL, North KE, et al: Exploring the genetic basis of chronic periodontitis: a genome-wide association study, *Hum Mol Genet* 22(11):2312–2324, 2013.
29. Barros SP, Offenbacher S: Epigenetics: connective environment and genotype to phenotype and disease, *J Dent Res* 88(5): 400–408, 2009.
30. Grossi SG, Genco RJ: Periodontal disease and diabetes mellitus: a two-way relationship, *Ann Periodontol* 3(1):51–61, 1998.
31. Hart TC, Atkinson JC: Mendelian forms of periodontitis, *Periodontol 2000* 45:95–112, 2007.
32. Kinane DF: Periodontitis modified by systemic factors, *Ann Periodontol* 4(1)54–64, 1999.
33. Kinane DF, Peterson M, Stathopoulou PG: Environmental and other modifying factors of periodontal diseases, *Periodontol 2000* 40:107–119, 2006.
34. Robinson PG: Treatment of HIV-associated periodontal diseases, *Oral Dis* 3(Suppl 1):S238–S240, 1997.
35. Offenbacher S: Periodontal diseases: pathogenesis, *Ann Periodontol* 1(1):821–878, 1996.
36. Johnson GK, Guthmiller JM: The impact of cigarette smoking on periodontal disease and treatment, *Periodontol 2000* 44:178–194, 2007.
37. Heitz-Mayfield LJ: Peri-implant diseases: diagnosis and risk indicators, *J Clin Periodontol* 35(Suppl 8):282–285, 2008.
38. Dietrich T, Bernimoulin JP, Glynn RJ: The effect of cigarette smoking on gingival bleeding, *J Periodontol* 75(1):16–22, 2004.
39. Tomar SL, Asma S: Smoking-attributable periodontitis in the United States: findings from NHANES III. National Health and Nutrition Examination Survey, *J Periodontol* 71(5):743–751, 2000.
40. Blanton PL, Hurt WC, Largent MD: Oral factitious injuries, *J Periodontol* 48(1):33–37, 1977.
41. Lang NP, Kiel RA, Anderhalden K: Clinical and microbiological effects of subgingival restorations with overhanging or clinically perfect margins, *J Clin Periodontol* 10(6):563–578, 1983.
42. Brunsvold MA, Lane JJ: The prevalence of overhanging dental restorations and their relationship to periodontal disease, *J Clin Periodontol* 17(2):67–72, 1990.
43. Deas DE, Mealey BL: Is there an association between occlusion and periodontal destruction? Only in limited circumstances does occlusal force contribute to periodontal disease progression, *J Am Dent Assoc* 137(10):1381, 1383, 1385, 2006.
44. Harrel SK, Nunn Me, Hallmon WW: Is there an association between occlusion and periodontal destruction? Yes – occlusal forces can contribute to periodontal destruction, *J Am Dent Assoc* 137(10):1380, 1382, 1384, 2006.
45. Greenstein G, Polson A: Understanding tooth mobility, *Compendium* 9(6):470–471, 473–476, 478–479, 1998.
46. Claydon NC: Current concepts in toothbrushing and interdental cleaning, *Periodontol 2000* 48:10–22, 2008.
47. Ciancio SG: The dental water jet: a product ahead of its time, *Compend Contin Educ Dent* 30(Spec No 1):7–13, 2009.
48. Van der Sleen MI, Slot DE, Van Trijffel E, et al: Effectiveness of mechanical tongue cleaning on breath odour and tongue coating: a systematic review, *Int J Dent Hyg* 8(4):258–268, 2010.
49. Gunsolley JC: A meta-analysis of six-month studies of antiplaque and antigingivitis agents, *J Am Dent Assoc* 137(12): 1649–1657, 2006.
50. American Academy of Periodontology: Systemic antibiotics in periodontics, *J Periodontol* 75(11):1553–1565, 2004.
51. Segelnick SL, Weinberg MA: Reevaluation of initial therapy: when is the appropriate time? *J Periodontol* 77(9):1598–1601, 2006.
52. Larson TD: Clinical uses of glutaraldehyde/2-hydroxyethlmethacrylate (GLUMA), *Northwest Dent* 92(2):27–30, 2013.
53. Sjogren U, Hagglund B, Sundqvist G, Wing K: Factors affecting the long-term results of endodontic treatment, *J Endod* 16(10):498–504, 1990.
54. Strindberg LZ: The dependence of the results of pulp therapy on certain factors, *Acta Odontol Scand* 14(Suppl 21):1–175, 1956.
55. Christensen GJ: Pulp capping 1998, *J Am Dent Assoc* 129(9):1297–1299, 1998.
56. National Cancer Institute: *Tobacco research implementation plan: priorities for tobacco research beyond the year 2000, National Cancer Institute and National Institutes of Health*, Bethesda Md, 1998, NIH Publication.
57. Somerman M, Mecklenburg RE: Cessation of tobacco use. In Ciancio SG, editor: *ADA Guide to Dental Therapeutics*, Chicago, 1998, American Dental Association.
58. Gelskey SC: Impact of a dental/dental hygiene tobacco-use cessation curriculum on practice, *J Dent Educ* 66(9):1074–1078, 2002.
59. Fiore MC, Bailey WC, Cohen SJ, et al: *Treating tobacco use and dependence: quick reference guide for clinicians, U.S. Department of Health and Human Services, Public Health Service*, Rockville Md, 2000, USDHHS Publication.
60. U.S. Department of Health and Human Services: *Cigars: health effects and trends. Smoking and tobacco control program, monograph 9, National Cancer Institute and National Institutes of Health*, Bethesda Md, 1998, USDHHS Publication 98-4302.
61. Regezi JA, Sciubba JJ, Jordan RC: *Oral pathology: clinical pathologic correlations*, ed 4, Philadelphia, 2003, Saunders.
62. Silverman S: *American Cancer Society atlas of clinical oncology: oral cancer*, ed 5, Hamilton, Ontario, 2003, BC Decker.
63. Mecklenburg RE, Greenspan D, Kleinman DV, et al: *Tobacco effects in the mouth. A National Cancer Institute and National Institute of Dental Research guide for health professionals, National Cancer Institute and National Institutes of Health*, Bethesda Md, 2000, NIH Publication No. 00-3330.
64. DeWitt KD, Lee N: Benign and malignant lesions of the oral cavity, oropharynx, and nasopharynx. In Lalwani AK, editor: *Current diagnosis and treatment in otolaryngology—head and neck surgery*, New York, 2004, Lange Medical Books/McGraw-Hill.
65. U.S. Department of Health and Human Services: *Smokeless tobacco or health, monograph 2, National Cancer Institute and National Institutes of Health*, Bethesda Md, 1993, USDHHS Publication.
66. Houston JP, McCollum J, Pietz D, et al: Alveolar osteitis: a review of its etiology, prevention, and treatment modalities, *Gen Dent* 50(5):457–463, 2002.
67. Karoussis IK, Muller S, Salvi GE, et al: Association between periodontal and peri-implant conditions: a 10-year prospective study, *Clin Oral Implants Res* 15(1):1–7, 2004.


http://dentalebooks.com

68. Tomar SL: Dentistry's role in tobacco control, *J Am Dent Assoc* 132(Suppl):S30–S35, 2001.
69. Bergstrom J: Tobacco smoking and chronic destructive periodontal disease, *Odontology* 92:1–8, 2004.
70. Warnakulasuriya S, Sutherland G, Scully C: Tobacco, oral cancer, and treatment of dependence, *Oral Oncol* 41:244–260, 2005.
71. Dietrich T, Hoffmann K: A comprehensive index for the modeling of smoking history in periodontal research, *J Dent Res* 83:859–863, 2004.
71a. *Harms of Cigarette Smoking and Health Benefits of Quitting*. http://www.cancer.gov/about-cancer/causes-prevention/risk/tobacco/cessation-fact-sheet. Accessed June 5, 2015.
71b. *Cessation Fact Sheet*. http://www.cancer.gov/about-cancer/causes-prevention/risk/tobacco/cessation-fact-sheet. Accessed June 5, 2015.
72. Chapman S, MacKenzie R: The global research neglect of unassisted smoking cessation: causes and consequences, *PLoS Medicine* 7(2):e1000216, 2010.
73. Ramseier C: Smoking prevention and cessation, *Oral Health Prev Dent* (Suppl 1):427–439, 2003.
74. Miller WR, Rollnick S: *Motivational interviewing*, New York, 2002, Guilford Press.
75. Prochaska JO, DiClemente CC: Stages and processes of self-change of smoking: toward an integrative model of change, *J Consult Clin Psychol* 51:390–395, 1983.
76. Fagerstrom KO: Measuring degree of physical dependence to tobacco smoking with reference to individualization of treatment, *Addict Behav* 3:235–241, 1978.
77. Hughes JR, et al: Antidepressants for smoking cessation, *Cochrane Database Syst Rev Jan 8* 1:CD000031, 2014.

## SUGGESTED READINGS

**Caries**

American Academy of Pediatric Dentistry: Guideline on Caries-risk assessment and management for infants, children, and adolescents, *Pediatr Dent* 35(5):E157–E164, 2013.

Cochrane Collaboration: *Dentistry and oral health/Dental caries*. http://www.cochrane.org/reviews/clibintro.htm/.

Doméjean S, White JM, Featherstone JD: Caries management by risk assessment (CAMBRA) group validation of the CDA CAMBRA caries risk assessment—a six-year retrospective study, *J Calif Dent Assoc* 39(10)709–715, 2011.

Fejerskov O, Kidd E: *Dental caries: the disease and its clinical management*, Oxford, UK, 2008, Blackwell.

Heymann HO, Swift EJ, Ritter AV: *Sturdevant's the art and science of operative dentistry*, ed 6, St Louis, 2012, Elsevier.

Young DA, Fontana M, Wolff MS: Current concepts in cariology, *Dent Clin N Am*, 54(3):xiii–xv, 2010.

**Periodontal Disease**

Armitage GC: Periodontal diseases: diagnosis, *Ann Periodontol* 1(1):37–217, 1996.

Cobb CM: Non-surgical pocket therapy: mechanical, *Ann Periodontol* 1(1):443–490, 1996.

Hughes F, Seymour K, Turner W, editors: *Clinical problem solving in periodontology and implantology*, St Louis, 2012, Elsevier.

Lindhe J, Karring T, Lang NP, editors: *Clinical periodontology and implant dentistry*, ed 5, Oxford, UK, 2008, Blackwell.

Newman MG, Takei HH, Klokkevoid PR, Carranza FA: Carranza's clinical periodontology, ed 12, St Louis, 2014, Saunders.

**Temporomandibular Joint Disorders**

Dawson PE: *Functional occlusion: from TMJ to smile design*, ed 1, St Louis, 2006, Elsevier.

De Leeuw R, editor: *American Academy of Orofacial Pain: Orofacial pain—guidelines for assessment, diagnosis and management*, ed 4, Chicago, 2008, Quintessence.

Okeson JP: *Management of temporomandibular disorders and occlusion*, ed 7, St Louis, 2012, Mosby.

Zakrewska JM: *Orofacial pain*, Oxford, 2009, Oxford Press.

**Endodontics**

Hargreaves KM, et al: *Cohen's pathways of the pulp*, ed 10, St Louis, 2010, Mosby.

Torabinejab M, Walton RE, Fouad AF: *Principles and practice of endodontics*, ed 5, St Louis, 2014, Saunders.

**Oral Pathologic Conditions**

Neville BW, Damm DD, Allen CM, Bouquot J: *Oral and maxillofacial pathology*, ed 3, St Louis, 2008, Saunders.

Regezi JA, Sciubba J, Jordan RC: *Oral pathology: clinical-pathological correlations*, ed 6, St Louis, 2011, Saunders.

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10

# Definitive Phase of Treatment

*Samuel P. Nesbit, Jonathan Reside, Antonio Moretti, George Gerdts, Lee W. Boushell, and Carlos Barrero*

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## OUTLINE

**DEFINITIVE PHASE TREATMENT OPTIONS**
**Periodontal Therapy**
Periodontal Disease and Related Conditions
Keys to Decision Making
Procedures for Treating Periodontal Disease
**Orthodontic Treatment**
Malocclusions and Related Conditions
Keys to Decision Making
Procedures for Treating Malocclusion
**Other Occlusal Therapies**
Procedures for Treating Occlusal Problems
**Restoring Individual Teeth**
Keys to Decision Making
Single Tooth Restorative Procedures
**Cosmetic Dentistry**
Keys to Decision Making
Representative Esthetic Problems and Treatment Procedures
**Elective (Nonacute) Endodontic Problems**
Keys to Decision Making
Procedures for Treating Nonacute Endodontic Problems
**Extractions and Preprosthodontic Surgery**
Extraction
Preprosthodontic Surgery
**Replacing Missing Teeth**
Keys to Decision Making
Procedures for Replacing Missing Teeth
**Conclusion**

The **definitive phase of care** forms the core of virtually every treatment plan. Exceptions are made for those patients whose needs are limited to preventive services only and those currently in a disease control plan (see Chapter 9) for whom a definitive treatment cannot yet be delineated. For patients whose oral health needs do not warrant a disease control phase, all active restorative, periodontal, and orthodontic therapy is addressed in the definitive phase. For those patients whose oral health has necessitated special disease control measures, the definitive phase that follows may include elective surgical and endodontic procedures; orthodontic therapy; single tooth restorations not completed in the control phase; implants; any definitive tooth replacement; and any additional, more extensive therapy required for periodontal disease.

For the patient with complex oral needs, significant changes in oral health or attitude toward treatment may have occurred since the first oral examination. Therefore, before engaging in definitive phase treatment, the practitioner should affirm that the following requisites have been met.

- For those patients who required a disease control treatment plan, all such therapy must have been completed and all active disease and infection eliminated, arrested, or otherwise addressed. After a posttreatment assessment, the success or failure of the control phase should be discussed with the patient. If the objectives of the disease control phase have not been met it is imperative that appropriate additional control phase treatment be instituted or that the definitive phase plan is adjusted to accommodate this new reality.
- All reasonable definitive phase treatment options must have been thoroughly evaluated and discussed with the patient. If this process occurred at an earlier point (possibly at the time that the disease control plan was formulated), the plan should now be reviewed and reconsidered.
- Finally, the dentist must reach an informed consent agreement with the patient. This will involve a clear understanding of the diagnoses, the advantages and disadvantages of the various treatment options, and the details of the proposed plan, including time required for completion, associated risks and hazards, the prognosis for treatment results, and costs.

In general, the discussion of these topics in the following pages reflects the spectrum of today's practice of general dentistry. The aim of this chapter is to suggest the range of


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clinical options available for representative situations. For each topic, professional considerations and patient considerations that influence and shape the decision-making process are discussed. For more in-depth coverage of specific areas, several excellent texts are available for each of the clinical disciplines of dentistry covering diagnosis, treatment planning, and therapy (see *Suggested Readings*).

# DEFINITIVE PHASE TREATMENT OPTIONS

## PERIODONTAL THERAPY

After initial therapy, additional treatment may be indicated for residual diseased sites in which periodontal pockets and bleeding persist after scaling and root planing. Before nonsurgical reinstrumentation, reflecting gingival flaps to improve access and increase visibility of root deposits may be necessary. Surgical solutions to noninflammatory periodontal conditions may also be considered for esthetic problems such as ridge or soft tissue deficiencies, gingival recession exposing tooth roots, or excessive gingival display. Candidates for implant-supported prostheses who have too little existing bone for implant retention may receive bone augmentation in preparation for implant placement. In addition to surgical treatment, antibiotic therapy delivered locally or systemically may be a useful adjunct. Occlusal therapy (discussed later in this chapter) may be indicated to reduce occlusal trauma.

The following series of clinical situations relate to the periodontal tissues and structures.

### Periodontal Disease and Related Conditions

#### Periodontitis Not Responsive to Initial Therapy

As discussed in Chapter 9, initial therapy for periodontitis usually consists of meticulous scaling and root planing (often performed under local anesthesia); specific instruction in oral hygiene; and, after a 4- to 8-week period, a detailed reevaluation including new periodontal charting.[1] Although most patients respond favorably to this regimen, some do not. Others may respond well at some sites and not so well at others. The causes of failure may include specific pathogenic bacteria, poor oral hygiene, site-specific impediments to plaque and debris removal, or inadequate host response as a result of systemic factors, such as smoking or poorly controlled diabetes.

#### Angular Bone Defects

Angular or vertical bone loss associated with periodontal disease may be classified according to the number of remaining bony walls, that is, a one-, two-, or three-walled defect. The characteristics of angular bone defects are primarily identified during the course of periodontal surgery. It is sometimes possible to regenerate the periodontium within these defects with a treatment called *periodontal regeneration*. In general, teeth with untreated, progressive angular bone defects have a poor long-term prognosis.

#### Furcation Involvement

When progressive alveolar bone loss advances to the furcation area of a multirooted tooth, the condition is described as *furcation involvement*. The presence of bone loss in this area worsens the long-term prognosis for retaining the tooth.

#### Root Proximity

In some individuals, the roots of two adjacent teeth may have developed in close proximity to one another at the cervical third of the root. This condition can also arise when a significant loss of proximal coronal tooth structure has occurred (usually because of caries or fracture), with the result that the roots move closer together. In either case, root proximity may make the remaining interproximal bone vulnerable to rapid and dramatic destruction. After the bone is lost, it becomes difficult or impossible to induce periodontal regeneration.

#### Congenital or Medication-Associated Gingival Enlargement

Gingival enlargement can occur as a result of a genetic predisposition or in response to certain medications, including anticonvulsants such as phenytoin (Dilantin); calcium-channel blockers (e.g., Nifedipine); or the immunosuppressant drug cyclosporine.[2] Gingival enlargement may compromise esthetics and often inhibits effective oral hygiene (Figure 10-1). In extreme instances, if it extends past the coronal surfaces of the teeth, overgrowth can interfere with mastication.

#### Mucogingival Deformities and Conditions

Mucogingival conditions are defined as altered relationships between the gingival margin and mucogingival junction that either do not allow for control of inflammation or are associated with progressive gingival recession. Common examples include gingival recession, minimal or absent keratinized gingiva, and probing depths that extend beyond the mucogingival junction. Mucogingival defects can result from local factors or from mechanical trauma to the tissue, such as toothbrush trauma (Figure 10-2). Patients with a thin gingival biotype are more susceptible to gingival recession than those with a thick gingival biotype. Special attention should be given to sites with thin and narrow bands of keratinized tissue, especially when subgingival margin placement or orthodontic tooth movement is planned.

#### High Frenal Attachment

If the maxillary labial frenum is coronally inserted, it may contribute to the presence of a diastema that the patient may regard as unesthetic. High buccal or facial frenula may complicate denture construction. A coronally positioned lingual frenum (i.e., ankyloglossia) can interfere with tongue movement and speech.

#### Esthetic and Architectural Defects or Problems

Some patients present with periodontal conditions that they perceive to be unesthetic. Examples include a high lip

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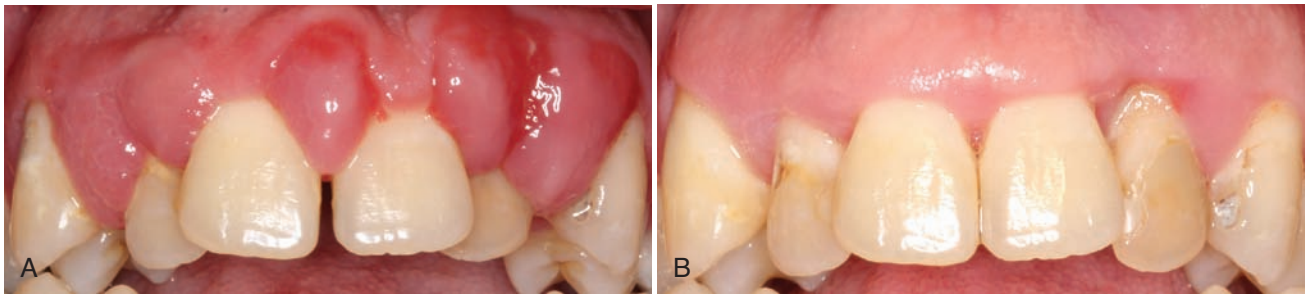


**FIG 10-1 Drug-influenced gingival enlargement. A,** This patient is a 36-year-old male with hypertension managed with amlodipine. On initial presentation he had enlarged gingival contours, heavy supragingival and subgingival plaque deposits, probing depths of 8–10 mm, and diffuse bleeding on probing. **B,** His gingival enlargement diminished dramatically after completion of nonsurgical periodontal therapy and the substitution of amlodipine with a different class of antihypertensive medication. Tooth positioning also improved, incidentally, as his gingival inflammation decreased. (Courtesy Dr. Jonathan Reside.)

**FIG 10-2 Recession defects.** Gingival recession may be caused by a number of factors, including thin gingival biotype, periodontal disease, improper tooth position (i.e., facial tooth positioning), and trauma (i.e., heavy toothbrushing). Gingival recession may be confined to the keratinized tissue or extend to the mucogingival junction leading to a loss of attached gingiva. Various soft tissue augmentation procedures have been developed to help address recession defects. (Courtesy Dr. Jonathan Reside.)

line, short clinical crowns, or an excessive display of gingival tissue, particularly when smiling. Patients with clefts of the lips and/or ridges will typically seek correction. Similarly, patients with traumatic injuries or oral cancer may require reconstruction of the oral and periodontal tissues.

A more recent and now common request is for tissue recontouring or increasing the roundness and size of the papilla around an implant or other fixed prostheses to create more natural and hygienic papillae and gingival contours.

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## Keys to Decision Making

### Professional Considerations

Before considering retreatment, new surgical periodontal therapy, or other adjunctive periodontal procedures, the dentist should evaluate the importance of any relevant systemic issues, tooth-related problems, and localized periodontal conditions. The following are some common systemic concerns and related questions. If the patient is diabetic, how well is the diabetes being controlled? If the patient is a smoker, has smoking cessation been recommended? (See Chapter 9 for discussion of smoking cessation.) If medication-induced problems are present (e.g., medication-induced gingival enlargement), can the drug regimen be altered with concomitant approval by the patient's medical provider? If periodontal surgery is considered, will the patient's general health be a limiting factor?

Tooth-related issues include an assessment of whether the teeth in question have a good restorative prognosis independent of the periodontal findings. Is there a tooth-related cause for the current periodontal problem, such as an open proximal contact, calculus, or a poorly contoured restoration? How important is retention of the tooth (or teeth) to the patient's overall oral condition?

Localized periodontal factors that should be assessed include plaque accumulation, bleeding on probing, soft tissue and bone topography, probing depths, clinical attachment levels, furcation invasions, mucogingival relationships, mobility, and occlusal factors (Figure 10-3). In addition to conventional methods of evaluation, the patient's periodontal status may warrant use of additional diagnostic procedures, such as microbial testing or medical laboratory tests. Other factors that the dentist will assess include the level of overall patient compliance and response to previous therapy and oral self-care instructions. In addition, the prognosis for any treatment options under consideration, including the option of no treatment, should be weighed.

### Patient Considerations

Some behavioral issues can be pivotal to the treatment decisions for the periodontal tissue–related conditions described earlier. Does the patient engage in a healthy lifestyle and has the patient been able to follow recommended dietary changes? Does the patient use any tobacco products? Does the patient understand and value the importance of the proposed treatment? Is the patient motivated to preserve the teeth in question? If not, can he or she be motivated to accept and appreciate the treatment?

Patient-specific issues may affect the planning, timing, and sequencing of definitive periodontal therapy. Is the patient in discomfort or experiencing any symptoms related to the condition? Are there personal reasons motivating the patient to have the treatment (e.g., esthetics, halitosis)? If so, the dental team will need to be sure that these concerns are addressed in the course of therapy. Does the patient have a preference for a particular form of therapy? Is he or she willing to undergo the removal of hopeless teeth? Is he or she willing to accept treatment for teeth with a guarded prognosis? Is he or she willing to undergo the postoperative discomfort of a surgical procedure?

Other important questions to ask before proceeding with definitive care include: Does the patient have the necessary time and financial resources for the treatment? Is the patient willing to follow through with long-term maintenance therapy?

## Procedures for Treating Periodontal Disease

### Local Delivery Antimicrobials

Local delivery antimicrobials have been an important addition to the periodontal disease armamentarium. When indicated, they can be of significant benefit to the patient. The site-specific use of antimicrobials is recommended when only a few localized and persistently inflamed pockets have been unresponsive to conventional therapies, including initial scaling and root planing and/or periodontal surgery.[3] The use of these agents in most periodontitis patients is not a substitute for periodontal surgery and should be considered only after conventional periodontal therapies have been completed. Other indications would be the presence of isolated deep probing depths in an immunocompromised host, aggressive periodontal disease, cases refractory to treatment, and select peri-implant defects (Box 10-1).

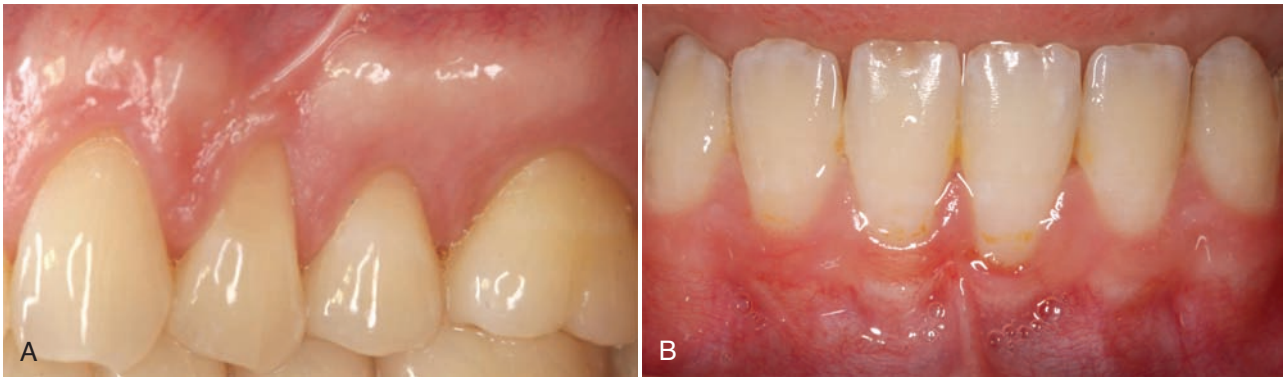


**FIG 10-3** Frenal position contributing to periodontal disease. **A,** Patients with high frenum positioning and thin biotype are more likely to develop gingival recession. **B,** Plaque control may be more difficult for patients with this condition. Treatment normally requires frenectomy and/or soft tissue grafting. (Courtesy Dr. Jonathan Reside.)

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**BOX 10-1 Advantages and Disadvantages of Local Delivery Antimicrobials**

**Advantages of Local Delivery**
- Patient compliance is not an issue.
- High doses of the medication are established at the disease site without altering the ecology of the remainder of the oral cavity.
- Side effects and adverse reactions are minimized.

**Disadvantages of Local Delivery**
- Cannot inhibit or kill all pathogenic organisms.
- May depopulate normal oral flora.
- Will only affect adjacent tissues.
- Patient remains susceptible to reinfection.

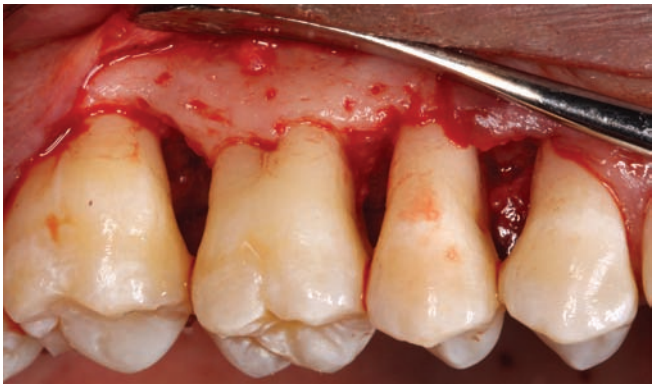

**FIG 10-4 Periodontal flap surgery.** The careful elevation of a full-thickness mucoperiosteal flap permits improved access to the tooth root to facilitate complete debridement (i.e., scaling and root planing). It also provides access to the underlying alveolar bone to assess the need for periodontal regeneration and/or bone recontouring. (Courtesy Dr. Jonathan Reside.)

Three local antibiotic-antimicrobial delivery systems have been approved for use in the United States and are commercially available: (1) Atridox (doxycycline in a polylactic acid polymer), (2) Perio-Chip (chlorhexidine [CHX] in a gelatin chip), and (3) Arestin (minocycline in a polyglycolide-co-DL-lactide carrier). These agents are resorbable and, in some jurisdictions, may be placed by the dental hygienist. A meta-analysis of more than 50 studies recently confirmed that the overall effect of the subgingival application of antimicrobials was statistically significant for improvements in probing pocket depth and clinical attachment level though no significant changes were seen in plaque index or bleeding on probing. Evidence supports the use of local antimicrobials with proven sustained release as an adjunct to debridement in deep or recurrent periodontal sites.[4]

## Host Modulation

The clinician should consider host modulation as part of periodontal management to enhance treatment outcomes for select cases or in the treatment of cases that are poorly responsive to traditional treatment modalities. Host modulation is based on the principle of modifying or influencing the host's immune response to bacterial challenge.[5] Currently, there is only one Food and Drug Administration (FDA)-approved agent for systemically administered periodontal host modulation: a subantimicrobial dose of doxycycline.

## Periodontal Surgery

Periodontal surgery performed in the management of periodontitis typically involves flap reflection to gain visual access to the root surfaces and alveolar bone (Figure 10-4). After reflection, the dentist removes granulation tissue and performs scaling and root planing. Gingival and osseous tissue heights and contours may be altered in an attempt to idealize the bony architecture and reduce probing depths. Elective periodontal surgery is also strategically used for the correction of gingival overgrowth, mucogingival defects, high frenal attachments, and other esthetic and architectural problems.

Periodontal surgery has a relatively high success rate, especially in patients who do not use tobacco, who have good oral self-care, and who comply with maintenance therapy recommendations. Postoperative complications of surgical therapy can include bleeding, pain, and infection. Long-term negative outcomes may include a loss of periodontal attachment, gingival recession, and tooth sensitivity.

## Periodontal Regeneration Therapy

Periodontal regenerative therapy draws on multiple techniques and materials, including placement of bone graft materials and biologic agents to induce bone formation and/or provide a substrate for the regeneration of previously lost alveolar bone, periodontal ligament (PDL), and cementum (Figure 10-5). Case selection for these procedures is important; the success rate is best for three-walled infrabony periodontal defects. Regeneration is also possible in select furcation and recession defects. Complications occurring after placement of these materials are similar to those associated with periodontal flap surgery. In addition, material placement increases the cost and the time required for treatment.

## Summary

Not all patients or disease sites respond acceptably or equally to periodontal therapy. When trying to manage periodontitis that has not responded to initial therapy, any of the professional or patient considerations discussed earlier may significantly affect the outcome. Successful periodontal therapy requires a sound plan, good execution, and a motivated patient. Long-term success depends on an appropriate maintenance program. Patient noncompliance with maintenance therapy can lead to disease recurrence or progression. A few patients may experience recurrent or progressive disease despite adequate maintenance therapy. For these patients, additional treatment may be indicated.

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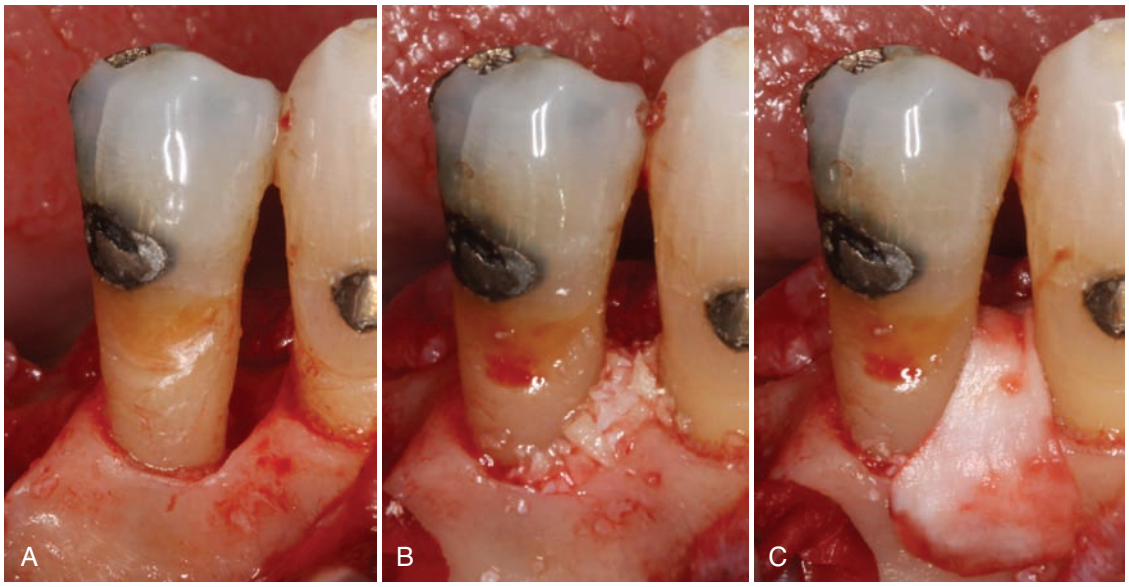


**FIG 10-5 Placement of materials for periodontal regeneration.** In some cases it may be possible to regenerate the periodontal attachment apparatus previously lost because of severe disease. Vertical osseous defects and some furcation defects are the most favorable for successful regeneration. After complete degranulation of the osseous defect and scaling and root planing **(A),** bone graft particles are placed within the defect and covered with a barrier membrane **(B** and **C).** In addition, today's practitioner has a number of biologic material choices available to consider in treatment, such as enamel matrix derivative or recombinant platelet-derived growth factor. (Courtesy Dr. Jonathan Reside.)

eTable 10-1 summarizes guidelines for the selection of common treatment options for each of the seven periodontal tissue–related conditions discussed.

## ORTHODONTIC TREATMENT

Orthodontic treatment is usually considered to be an elective therapy for adolescent patients, most frequently initiated to improve appearance. In addition to esthetic considerations, however, there are many other reasons why limited or comprehensive orthodontic treatment may be recommended to adult patients. For example, it may be advantageous to orthodontically move an impacted tooth into the dental arch. Or the vertical dimension of occlusion may need to be increased and an orthodontic approach may be the least invasive and most efficient way to accomplish this goal. Restorative or periodontal therapies may be enhanced by uprighting tipped teeth before fabrication of a fixed partial denture or placement of implants in an edentulous space. No matter what the reason, the patient deserves to be informed when orthodontics is a reasonable treatment option and what the potential benefits of orthodontic treatment may be. Malocclusion and tooth position problems may be treated with orthodontics alone or with orthodontics in combination with restorative and/or surgical procedures.

### Malocclusions and Related Conditions

The common factor with the following series of clinical problems is malalignment of the teeth and/or jaws.

#### Angle Class I Malocclusion

This diagnosis typically involves tooth-arch discrepancies in which the cumulative anteroposterior dimension of the teeth is greater than the length of the available alveolar bone (Figure 10-6). Often the opposing first molars and canines are in normal relationship relative to each other. This type of malocclusion most often is characterized by crowded or malposed teeth, but also may be associated with rotated or tipped teeth, impactions, or isolated cross-bites.

#### Impacted Maxillary Canines

The occurrence of this condition presents the dentist with a unique treatment planning challenge. Because of their arrival

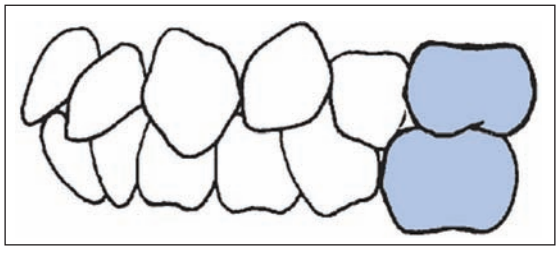

**FIG 10-6** Angle class I malocclusion. (From Proffit WR, Fields HW, Sarver DM: *Contemporary orthodontics,* ed 5, St. Louis, 2013, Mosby.)

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## eTABLE 10-1 Periodontal Treatment Alternatives

| Condition | Treatment Options | Keys to Decision Making |
|---|---|---|
| Periodontitis not responsive to initial therapy | Reinstrumentation | An option in the presence of calculus or root roughness where access limitation does not preclude the procedure |
| | Surgical flap procedure | In locations where access to calculus or root roughness is compromised and instrumentation would be more effective after elevating a full-thickness flap; situations in which bone osteoplasty, removal, or augmentation is indicated; in locations where apical repositioning of the gingival margins will be beneficial |
| | Local or systemic antimicrobial agents | An option when local factors have been removed; local delivery is an option for isolated inflamed sites; systemic antibiotics may be considered in aggressive forms of periodontitis; microbial testing can be of value in selecting an appropriate regimen |
| Localized infrabony defects | No treatment | Possible approach if the patient is resigned to losing the tooth but wishes to retain it in the short run for space maintenance or esthetics |
| | Extraction | Possible option if patient has an immunocompromising condition or debilitated health (ASA III or IV) and the likelihood for improvement is guarded, or if patient has poor compliance with recommended oral self-care, or lacks the time, energy, or financial resources necessary to retain the tooth |
| | Closed reinstrumentation | When the patient refuses a surgical approach and the defect can be stabilized in its present condition using nonsurgical therapy |
| | Root resection | May be an option if the defect is isolated to one root and the prognosis for the remaining root or roots is favorable (Note: requires root canal therapy) |
| | Guided tissue regeneration or augmentation of the site using osseous grafting materials | Patient and disease site must be a good candidate for regenerative therapy; material and technique selection is determined on a case-by-case basis |
| Furcal involvement | No treatment except for maintenance procedures | May be appropriate if furca is stable, cleansable, and without inflammation or disease progress; in the presence of progressive disease the "no treatment" option would be encouraged only if patient is resigned to losing the tooth but wishes to preserve it temporarily for space maintenance or esthetics |
| | Extraction | An option if patient has no desire to save the tooth or if dentist deems the tooth unsalvageable and retention would lead to additional bone loss around the tooth and/or adjacent teeth |
| | Bone regeneration | Patient must be motivated to save the tooth and have the financial resources and desire for optimal treatment; case and site selection is important |
| | Root amputation or hemisection [Note: RCT required] | If the patient has motivation, financial resources, and desire as noted earlier and augmentation has been tried unsuccessfully, or if augmentation has been ruled out and at least one residual root is thought to have a good prognosis |
| Root proximity problem | No treatment | Current periodontal condition is healthy and stable and patient accepts responsibility for possible disease progress and tooth loss |
| | Periodontal maintenance treatment with bone augmentation as feasible and appropriate | Preferred option if patient wishes to retain the teeth as long as possible, but is unwilling to undergo orthodontic therapy |
| | Orthodontic correction followed by definitive periodontal therapy | Ideal solution for a motivated, compliant, and consenting patient who wants optimal treatment to save the teeth |

*Continued*

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**eTABLE 10-1 Periodontal Treatment Alternatives—cont'd**

| Condition | Treatment Options | Keys to Decision Making |
|---|---|---|
| Congenital or drug-induced (e.g., phenytoin) gingival overgrowth | No treatment | May be an option if the overgrowth is limited in scope, asymptomatic, not progressive, does not exhibit inflammation, and is maintainable in a healthy state |
| | Gingivectomy or gingival flap surgery | Indicated if hyperplasia is symptomatic, progressive, inflamed; recommended if tissue cannot be maintained in a healthy state without surgery |
| Mucogingival defects (clefts, recession, absence of attached gingiva) | No treatment except for maintenance procedures | The condition is stable, no active inflammation or infection, and no definitive restoration or orthodontic therapy is planned for that location |
| | Pedicle graft | When the earlier-mentioned conditions are not met and the defect is isolated to one tooth; adjacent papillae must contain sufficient bulk to reposition into the affected area without detaching the base of the flap |
| | Autogenous graft from separate donor site | An option when defect is progressive or has persistent inflammation, or if a definitive restoration is planned for the area, or when the defect involves multiple adjacent teeth or a pedicle graft would otherwise not be adequate; a subepithelial connective tissue graft is the most popular procedure for esthetic procedures involving root coverage |
| High frenal attachment | No treatment | In the absence of patient esthetic, phonetic, or functional concerns; no inhibition of desired orthodontic movement or limitation to construction of a prosthesis |
| | Frenectomy | When the patient is symptomatic or when the frenectomy would improve the prognosis for orthodontic or prosthodontic treatment |

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**FIG 10-7** Anterior open bite in an adolescent. (Courtesy Dr. Emile Rossouw, Chapel Hill, N.C.)

in the eruption sequence after the incisors and premolars, the maxillary canines are more likely to be impacted or blocked out of the normal dental arch configuration. Maintaining these teeth in a proper alignment has important advantages given their long root length and their pivotal functional and esthetic role.

### Anterior Open Bite

This condition occurs when the posterior teeth are in maximum intercuspation, and there is vertical space between one or more pairs of maxillary and mandibular anterior teeth. Depending on the size of the open bite, this occurrence may represent a significant esthetic, phonetic, or functional problem for the patient (Figure 10-7).

### Skeletal Abnormalities

Several abnormalities of maxillary or mandibular size, form, or relationship can be recognized and diagnosed by the general dentist. These include Angle class II or III malocclusions, micrognathia, macrognathia, and a complex open bite.

## Keys to Decision Making

### Professional Considerations

Before a decision can be made to engage in orthodontic treatment, the dentist must carefully assess the patient's condition and any potential modifiers to the treatment. Individually or collectively, these items may have a bearing on deciding whether to treat, how to treat, and when treatment should take place. For each situation previously discussed, a definitive orthodontic case analysis is in order, such as the "Facial Form Analysis," developed by Proffit and Fields (see *Suggested Readings*). At a minimum, panoramic radiographs and a complete full mouth series of radiographs and study casts is required. In those cases in which a skeletal component to the malocclusion exists, cephalometric radiographs and a cephalometric analysis are also necessary.

Unless the general dentist has had considerable additional training in orthodontic assessment and treatment, it is usually prudent to enlist the services of an orthodontist during this treatment planning process. Key questions include determining the scope of care (limited vs. comprehensive), whether extractions are necessary or desirable, and whether the option of orthognathic surgery should be pursued. For some adult patients, it may be best to displace teeth relative to the supporting bone to compensate for an underlying jaw discrepancy. This repositioning of teeth primarily for improving facial esthetics is referred to as **camouflaging** and is often a viable alternative to orthognathic surgery.

Before considering orthodontic treatment, the dentist must be certain that the patient does not have active caries or periodontal disease and is not at significant risk for future development of these conditions. The teeth and restorations must be in a stable state, capable of supporting the retention of orthodontic appliances for the duration of treatment. It is also the dentist's responsibility to identify any apical pathology or root abnormality, such as resorption, before orthodontic treatment is initiated. In addition, the dentist should assess the scope and magnitude of the problem for which orthodontic treatment is considered. If the problem goes untreated, will any significant negative sequelae arise? Is the problem causing, or is it likely to cause, a functional or esthetic problem? In some cases, identifying the specific cause of the problem is critical to the outcome of treatment. For example, if the dentist or orthodontist attempts correction of an anterior open bite without recognizing and addressing the underlying cause, such as a tongue thrust habit, it is likely that relapse will occur and the treatment will ultimately fail.

Other issues to be considered include the generalist's training, expertise, and level of confidence in providing orthodontic treatment. Every general dentist should be able to recognize the clinical problems described in this section and converse with the patient about them. Some general dentists prefer to refer all orthodontic treatment to specialists. Others will manage limited tooth movement cases. A few generalists who have had extensive additional training can handle more complex malocclusions. In any case, it is wise for the general dentist to carefully define the limits of his or her knowledge and ability and treat only those cases that offer a high likelihood of success. It is also advisable for the general dentist to cultivate a close working relationship with an orthodontist and an oral and maxillofacial surgeon so that cases can be discussed and referrals made when appropriate.

### Patient Considerations

A fundamental determinant in orthodontic treatment planning is the patient's own perceived need for that treatment. For most patients, the willingness to accept orthodontic treatment is motivated by a desire to improve appearance; a direct correlation can be made between the strength of that desire and the motivation to receive orthodontic treatment. Changes in the patient's personal life or career can be extremely powerful and effective motivators for initiating orthodontic treatment. Some influences, such as the desire to please a spouse or family member, can be short-lived and if the patient lacks a strong internal motivation to continue, the outcome of treatment may be in jeopardy. The wise practitioner carefully

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investigates these issues before engaging the patient in orthodontic treatment.

It is important to gain a sense of the patient's expectations about the treatment. Are those expectations realistic? Is the patient interested in limited treatment or comprehensive care? If limited care is preferred, is it technically possible to achieve the patient's goals? If comprehensive orthodontic care is favored, does he or she have any misperceptions that the treatment can be accomplished in a matter of weeks or by putting braces on a few selected teeth? Does the individual have an aversion to either fixed or removable orthodontic appliances or retainers? If so, will this compromise the treatment?

It is also important to ensure that the patient has a full appreciation of the costs of treatment in terms of both financial resources and the time and inconvenience that may be required. Is the individual aware of the number of visits that may be required and the number of months over which the treatment will extend? Does he or she recognize that there may be some discomfort to the teeth and soft tissue? Most importantly, can the patient maintain the health of the oral cavity with effective daily oral self-care despite the impediments to plaque removal that orthodontic appliances may raise? If orthognathic surgery is recommended or required, is the patient fully aware of the costs, hazards, inconvenience, and discomfort that the procedure may entail?

## Procedures for Treating Malocclusion

### Comprehensive Orthodontics

Comprehensive orthodontics involves the movement of multiple teeth, usually in multiple sextants and in both arches, to improve tooth alignment, function, and esthetics. Usually the practitioner affixes bands and brackets to the teeth, coupled with arch wires and elastic bands. A newer form of treatment that has gained considerable popularity with patients and within the profession involves the use of Invisalign functional appliances. These appliances are more esthetic than some other types and are tolerated well by most patients.

Extraction of some teeth may be necessary in conjunction with comprehensive orthodontic treatment. The treatment time varies and can range from 1 to more than 3 years depending on the individual characteristics of the case. Orthodontic treatment has fairly predictable success rates and outcomes. Potential negative sequelae include root blunting and resorption, gingival recession, increased caries activity, and discomfort to the teeth, periodontium, and other soft tissue during treatment.

### Limited Orthodontic Tooth Movement

Limited orthodontic tooth movement involves tipping, rotation, or bodily movement of a limited number of teeth (usually no more than six), usually in just one arch. Several techniques are available to the dentist and include both fixed and removable appliances. Treatment is usually accomplished in less than a year and has less potential for side effects compared with longer-term treatment. A specific example of limited tooth movement is forced eruption of an anterior tooth in which caries or fracture of the crown (and root) has compromised the biologic width. Another frequently implemented minor tooth movement involves uprighting tipped posterior teeth in preparation for use as prosthodontic abutments or to facilitate implant placement (see *In Clinical Practice: Uprighting a Tipped Molar Tooth* box and Figure 10-8).

## IN CLINICAL PRACTICE

### Uprighting a Tipped Molar Tooth

When a posterior tooth has been removed and is not replaced, over time the potential exists for any remaining distally positioned posterior teeth to move or tip mesially into the edentulous space. If, at a later date, the patient wishes to replace the missing tooth or teeth, a significantly tipped molar may not be optimally positioned to serve as an abutment for a fixed or removable partial denture, or to provide adequate space for implant placement in the bounded edentulous site. Two options are available: (1) attempt placement of a prosthesis or implant despite the presence of the tipped adjacent tooth, or (2) upright the tooth orthodontically before prosthesis fabrication.

#### *Professional Considerations*

What is the periodontal prognosis with and without molar uprighting?

Would gingival contours, risk of food impaction, or the patient's ability to remove plaque from the adjacent tooth be favorably or unfavorably altered with molar uprighting?

Can occlusal function be improved with uprighting? If so, will the effect be significant?

With molar uprighting, will the tooth be retained in the mouth for a longer or shorter length of time? Or will there be no difference either way in expected time for retention?

If the molar is not uprighted, what restorative compromises must be made (such as alteration in size, shape, or contour of the replacement tooth or adjacent teeth)?

Are there other compelling professional issues that favor or contraindicate molar uprighting?

#### *Commonly Asked Questions by Patients*

- What are the reasons for doing this?
- Must I do this?
- What will happen if I don't do this?
- Are there other alternatives?
- Will I have to wear braces? How visible will they be? What will they look like?
- Will they be uncomfortable?
- How much will it cost?
- How long will I have to wear them?

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***Reaching a Decision***

If the dentist determines that significant periodontal, functional, or restorative advantages can be gained through molar uprighting, and if the patient concurs, uprighting is the ideal and best course of action. Often, however, the patient is not enthusiastic even though orthodontic uprighting is the best and the recommended treatment from a professional perspective. The patient may think the appearance or feel of orthodontic appliances will be unpleasant. He or she may be apprehensive about the expected discomfort, and may not like the prospect of the tooth loosening during the treatment. The patient may not see the procedure as worth the required expenditure of financial resources.

Whether the patient accepts or declines the recommendation to implement the uprighting, the consent discussion must be documented in the patient's record. If the patient declines orthodontic treatment, the dentist must clearly explain to the patient the consequences of that no treatment decision – and document the conversation. At that point, the dentist then must make the final decision as to whether to proceed with restorative treatment despite the possibility of a compromised result or decline to attempt to replace the missing tooth on professional grounds.

### Orthognathic Surgery

**Orthognathic surgery** may be indicated when the patient has significant skeletal abnormalities in addition to a dental malocclusion. These procedures, usually performed by an oral and maxillofacial surgeon in a hospital setting, involve surgical realignment of the jaws or repositioning of dentoalveolar segments. Surgical treatment may be preceded and/or followed by comprehensive orthodontic treatment.

Orthognathic surgery may be the only satisfactory option for correcting a severe skeletal defect, especially in the adult patient. Significant swelling and pain can be associated with the procedure, and 1 to 2 days of hospitalization will usually be required. The patient's jaws may be immobilized after surgery for 6 to 12 weeks to stabilize the new occlusal relationship. Nerve damage during surgery may result in areas of paresthesia involving the teeth, lips, tongue, and other surrounding tissues. This usually resolves in weeks or months, but in some cases may be permanent.

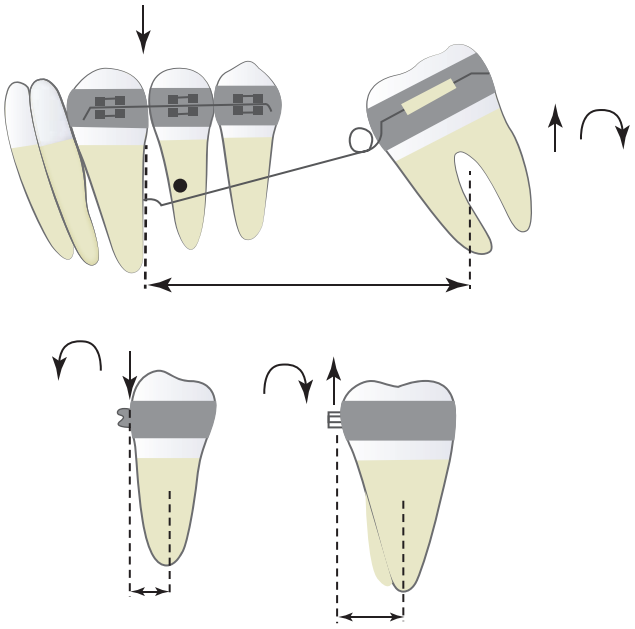

**FIG 10-8** Schematic diagram of a typical appliance for molar uprighting. (Courtesy Dr. L. Bailey, Chapel Hill, N.C.)

Typical treatment options for four common problems that can be treated with orthodontics are summarized in eTable 10-2 with guidelines for selecting the most appropriate option.

## OTHER OCCLUSAL THERAPIES

Occlusal therapy incorporates those treatment modalities available to the dentist to manage occlusal abnormalities that can cause damage to the teeth and periodontium. Common clinical problems in this group include acute or chronic occlusal trauma, occlusal plane discrepancies, and **parafunctional habits,** such as bruxism, clenching, or nail biting. Some patients with occlusal abnormalities may experience increased inflammation in the muscles of mastication and/or temporomandibular joint(s) with resultant acute or chronic pain in the associated structures. When careful occlusal analysis confirms the presence of occlusal disharmony, strategic modification of maxillary/mandibular occlusal relationships of individual teeth (occlusal adjustment) may help resolve the problem.

Occlusal treatment is often indicated in preparation for prosthodontic rehabilitation. In some cases it may be provided in conjunction with adjunctive or comprehensive orthodontic treatment. Individuals who engage in contact sports or other physical activities that place the teeth at risk for blunt trauma are good candidates for protective occlusal (athletic) guards.

### Procedures for Treating Occlusal Problems

#### Athletic Guard

A soft, plastic, removable appliance, the athletic guard is designed to protect teeth from blunt injury trauma (Figure 10-9). Most frequently prescribed for younger patients who engage in contact sports such as football and wrestling, the athletic guard can benefit adults too, particularly those who play basketball and racquet sports. If used consistently, the athletic guard effectively protects the teeth from damage.

Patients can make their own guards using kits available in sporting goods stores, or the dentist can fabricate a custom-fitted appliance by vacuum-forming the guard material onto a plaster cast of the patient's maxillary arch. To maintain an adequate fit for children, the guard will need to be remade periodically as deciduous teeth are lost and new teeth erupt. The

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## eTABLE 10-2 Treatment Alternatives for Malocclusions and Related Problems

| Condition | Treatment Options | Keys to Decision Making |
|---|---|---|
| Angle class I malocclusion | No treatment | Patient not interested in correction; limited financial resources or presence of active oral disease precludes treatment |
| | Limited tooth movement | Patient wants limited care only; goals of limited tooth movement are feasible and meet patient expectations; no systemic or oral contraindications to treatment are present; no financial, motivational, or other psychosocial barriers to care |
| | Comprehensive orthodontic treatment by generalist | Patient consents to comprehensive care; no contraindications to treatment or absolute barriers to care; generalist has the training, expertise, and desire to provide the treatment |
| | Comprehensive orthodontic treatment by orthodontist | Patient consents to comprehensive care; no contraindications to treatment or absolute barriers to care; generalist does not have the training, expertise, or desire to provide the treatment |
| Impacted or partially erupted maxillary canines | No treatment | Patient has no motivation to correct the problem; systemic disease contraindicates surgery or orthodontics; presence of active caries or periodontal disease precludes orthodontics |
| | Surgical removal of canines | Impacted canines and poor prognosis for successful forced eruption; no contraindications to surgery; orthodontic treatment is precluded by lack of financial resources or motivation, or presence of active oral disease; retention of canines may jeopardize the long-term well-being of the adjacent teeth |
| | Extraction of first premolars and comprehensive orthodontics | Patient seeks correction; root form and tooth position of canines conducive to forced eruption; orthodontics without extraction is not a feasible option (insufficient space available for good alignment if all teeth are retained) |
| | Comprehensive orthodontics | Patient seeks correction; canine root form and tooth position conducive to forced eruption; orthodontics without extraction is a feasible option (sufficient arch space exists to allow good alignment when all teeth are retained) |
| Anterior open bite | No treatment | Patient has no interest in treatment; no phonetic or functional deficiency |
| | Correction of tongue thrust habit | Primary tongue thrust must be corrected before initiation of any surgical or orthodontic treatment (management of secondary or acquired tongue thrust can be deferred until after orthodontic or surgical therapy) |
| | Orthodontic correction | Patient seeks correction; skeletal relationship is adequate to support an all-orthodontic solution |
| | Surgical and orthodontic correction | Patient seeks correction; the skeletal relationship is insufficient to support an all-orthodontic correction |
| Skeletal malocclusion | No treatment | Patient not interested in correction; no significant phonetic or functional problem exists; health problems, limited financial resources, or presence of active oral disease preclude treatment |
| | Orthodontic treatment alone (camouflage) | Patient seeks esthetic improvement, but lack of motivation, presence of systemic disease, or other reasons preclude surgical-orthodontic treatment; camouflage option is feasible, practical, and likely to yield desired result |
| | Comprehensive orthodontics in conjunction with orthognathic surgery | Patient seeks comprehensive, ideal solution; good surgical candidate (ASA I or II); oral disease under control; patient has satisfactory oral hygiene; patient is cooperative, motivated, and has adequate time and financial resources; professional support from competent specialists is available |

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**FIG 10-9** Examples of different types of athletic guards. (Courtesy Dr. Ralph Leonard, Chapel Hill, N.C.)

most significant limiting factor is the failure of some patients to always use the athletic guard when engaged in contact sports.

## Occlusal Guard

An **occlusal guard** (also referred to as a **bite guard** or **night guard**) is a custom-fitted device commonly used to prevent additional occlusal tooth wear in patients who have marked bruxism or attrition. The dentist also may use such a device to assess the patient's tolerance for an increased vertical dimension of occlusion before prosthodontic rehabilitation. It is usually fabricated from a hard or slightly flexible acrylic material and fits over the maxillary occlusal and lingual tooth surfaces. Commonly the occlusion is flat plane and developed from a simple maximum intercuspation (MI) bite. Fitting is usually uncomplicated, and follow-up adjustments and reevaluation are rarely necessary.

## Occlusal Splint

An **occlusal splint**, also referred to as a **bite splint,** is a custom-fabricated hard acrylic device that fits over the occlusal and incisal surfaces of the maxillary or mandibular teeth (Figure 10-10). Occlusal splints have several uses. For patients with symptoms of temporomandibular dysfunction (TMD), the use of a splint promotes a more orthopedically stable temporomandibular joint (TMJ) position and fosters reorganization and reduction of neuromuscular reflex activity. Decreased hyperactivity of the masticatory muscles allows for resolution of associated inflammation-mediated pain. Along with providing some measure of relief from pain symptoms for the patient, use of the splint may also confirm the diagnosis of an occlusal component contributing to the patient's TMD.

**FIG 10-10** Occlusal splint or bite splint. (Courtesy Dr. Lee Boushell.)

To gain maximum benefit from the occlusal splint therapy, the dentist must carefully adjust the splint at the time it is delivered and periodically thereafter. Adjustment of the device should allow even centric occlusal contacts for anterior and posterior teeth. Furthermore, the design must utilize anterior and condylar guidance to ensure disclusion of all posterior teeth during protrusive, excursive, and any parafunctional mandibular movements. Initial adjustment of the functioning surface of the splint may require multiple visits to allow modification as masticatory muscle tonus and TMJ inflammation/effusion begins to resolve.

A major advantage to an occlusal guard and an occlusal splint is that the treatment is reversible and noninvasive. Both require patient cooperation, however, because the device is only effective when the patient is wearing it.

## Occlusal Adjustment

Occlusal adjustment, also referred to as **occlusal equilibration,** involves selective grinding of tooth surfaces with the goal of improving tooth contact patterns and the associated masticatory muscle response. The treatment can be an adjunctive therapy used to alleviate symptoms of temporomandibular dysfunction or, more commonly, to complement comprehensive prosthodontic reconstruction. Treatment goals for selective grinding include establishment of an acceptable centric relation contact position for the patient, providing for atraumatic lateral and protrusive guidance, and establishing an acceptable plane of occlusion with adequate interarch space for any prosthesis replacing missing teeth.

Occlusal adjustment is an irreversible procedure and the dentist must carefully study the patient's existing occlusion before removing any tooth structure for this purpose. This includes analyzing precisely articulated diagnostic casts and carefully observing the patient's occlusion intraorally. Careful observation of occlusal/incisal wear facets followed by use of articulating paper and occlusal indicating wax enables identification of occlusal patterns. Before performing the procedure, the dentist should inform the patient that grinding the teeth may cause tooth sensitivity in some individuals. Areas of adjustment are strategically planned so that the vertical dimension of occlusion is not modified and interferences to normal mandibular movement are removed from offending cusp inclines. The patient also needs to be aware that when gross occlusal reduction is used to correct an occlusal plane discrepancy—such as that caused by a hypererupted or extruded tooth—root canal treatment, surgical

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crown lengthening, and/or a crown restoration also may be required.

## RESTORING INDIVIDUAL TEETH

Single tooth restorations replace tooth structure lost because of caries, tooth fracture, abrasion, attrition, abfraction, erosion, or a combination of these conditions. These restorative techniques may also be used to improve the appearance of teeth, establish more normal contours, or close proximal contacts. Some restorative materials are designed to seal areas that have the potential to decay or to desensitize tooth surfaces. Commonly, new restorations are necessary to replace older restorations that have failed because of **secondary caries,** fracture, material loss, marginal leakage, or stain. Because amalgam, composite resin, or ceramic inlay restorations are usually placed in preparations that are *within the confines of* teeth, they are, therefore, considered to be **intracoronal restorations**. **Extracoronal restorations,** such as the gold or ceramic onlay, or full cast, PFM, or all-ceramic crown, encompass most or all of the coronal surface of the tooth. An extensive review of restoration longevity can be found in Chapter 3; *In Clinical Practice: How Long Do Restorations and Prostheses Last?* box.

### Keys to Decision Making

Throughout this text, an overriding perspective has been that the patient should be involved in the decision making for his or her dental treatment. As discussed in Chapter 4, it is the role of the dentist to determine the reasonable and feasible treatment options for any given situation and to present those options to the patient. When dentist and patient are faced with the single tooth restorative options described in this section, a well-informed and knowledgeable patient can and should be able to make the final treatment decision. In some cases, however, compelling professional issues such as the structural integrity of the tooth and the forces of occlusion will be paramount. In such cases, it will be appropriate for the dentist to limit the choices offered to the patient or to make a stronger recommendation for one of the available options.

#### Professional Considerations

When recommending single tooth restorative options to the patient, the dentist will need to consider several issues. The following are frequently encountered clinical questions that the dentist may need to address so that he or she can properly inform the patient about the treatment options and thereby assist the patient in making the best treatment choice:

- What is the diagnosis? Is the caries lesion active or arrested? Is it incipient or overt? These issues are discussed in Chapters 1 and 2.
- Is a restoration needed? Can the condition (such as an incipient caries lesion) be managed with chemotherapeutic or other non-invasive treatment? What negative outcomes may arise if restorative intervention is not made? Frequently, the dentist will recognize that an existing restoration is not ideal, but the patient is asymptomatic and is not currently suffering any deleterious effects from the defect. The concept of minimalist dentistry holds that the dentist should not intervene surgically unless necessary. In any case, the patient needs to be informed in an unbiased way about the risk and benefits of the restorative options and of no treatment.
- What is the patient's caries risk? The concept of caries management by risk assessment (CAMBRA) is described in Chapter 3. If the patient is at relatively low risk for caries, then more conservative and less invasive measures are preferred. See Chapter 9 for more information on managing the active caries patient. See eBox 10-1.
- Does the patient need a disease control phase plan of care? In the disease control phase, if restorations are indicated, interim restorations or direct-fill definitive restorations are preferred; indirect restorations are almost always contraindicated.
- What is the fracture potential for the proposed restoration and for the tooth? Some restorations, depending on the restorative material, the patient's occlusion, and the tooth's position in the mouth, are inherently more prone to fracturing. Also, some restorations (e.g., full coverage crowns) will usually reduce the risk for tooth fracture though others (e.g., large amalgam in a tooth with compromised cusp integrity) may actually increase the risk for fracture.
- Is the restoration likely to cause significant attrition to or abrade the opposing tooth or restoration? Over time, ceramic or porcelain will abrade natural teeth. From a wear perspective, gold is most compatible with tooth enamel. It is desirable to have restorations that oppose each other fabricated out of the same material (i.e., metal occluding with metal; ceramic occluding with ceramic).
- What are the esthetic benefits or deficits of the various restorative options? Esthetic (i.e., tooth colored) restorative materials vary in translucence, surface texture, polishability, and effectiveness at concealing intrinsic stains. Some can be characterized to match other teeth or restorations, but others cannot. The dentist must make a determination as to what type of material and what particular brand and formula will be best suited to the situation.
- What is the expected longevity of the restoration? See Chapter 3, *What's the Evidence? How Long Do Restorations and Prostheses Last?* box for a detailed evidence-based summary of restoration longevity.
- What will the cost to the patient be for the restoration and the alternatives?

#### Patient Considerations

If the patient has teeth that are sensitive or that display visible dark areas, he or she will likely request treatment. In either of these situations, however, the patient is unlikely to have a full understanding of the available treatment options or the inherent limits and risks of each. Although the patient will be the final decision maker, considerable education may need to take place before an informed decision about the treatment can be made.

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## eBOX 10-1 Is it Necessary to Restore a Caries Lesion?

On a tooth- or surface-specific basis, diagnosing caries can be a challenge for both the novice and the experienced practitioner. Even when this issue has been resolved in the practitioner's mind, the question of whether restoration is necessary can be similarly problematic. Two examples illustrate this point.

### Example 1: "Incipient" Caries

The occlusal surface of a maxillary molar has darkly stained fissures. Demineralization and tooth loss appear to have penetrated through the enamel and into dentin, but there is no apparent chalkiness or opacification of the adjacent enamel (eFigure 10-1). There is no "stick" on gentle exploration. A caries lesion exists, but is it active or is it arrested? In either case should the lesion be restored? Many issues can affect this decision. Are there caries lesions on other teeth? What is the level of caries activity in the patient's mouth? Can the patient keep the area clean and maintain it in a healthy state? What is the patient's caries risk status? Are there specific risk factors such as a cariogenic diet or hyposalivation in play here? Will the patient be available for follow-up periodic evaluations at regular intervals?

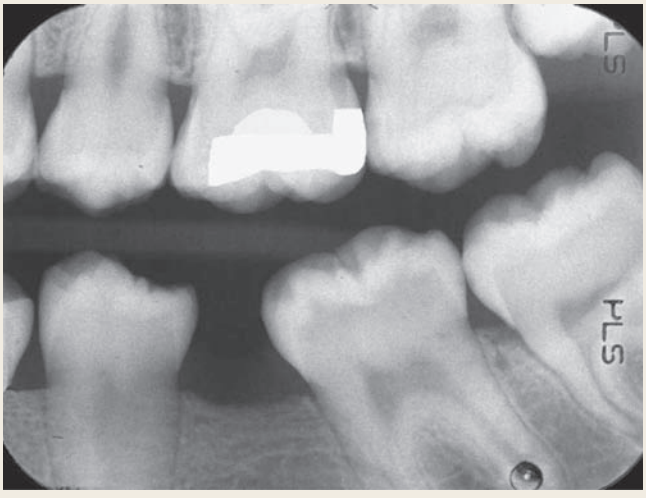
The responses to these and other questions will influence the dentist's decision as to what course of treatment to recommend – whether it be observation, behavioral and chemotherapeutic, sealant placement, or surgical (restorative) intervention.

### Example 2: Proximal Caries

A bitewing radiograph reveals a mesial proximal radiolucent lesion on a maxillary second molar (eFigure 10-2). On the radiograph the lesion extends through enamel to the dentoenamel junction and the lesion appears to penetrate slightly into the dentin. In the absence of symptoms or any overt clinical evidence of caries, should the dentist recommend restoring the tooth? Again, many factors can have a bearing on the dentist's treatment recommendation. What is the patient's current caries activity level? What is the risk for future caries? Are there other similar lesions in the mouth, and how have they fared? What are the prospects for lesion **remineralization** with additional fluoride use? Will this patient be available for maintenance visits so that the lesion can be monitored at regularly specified intervals? While the responses to these questions, and other questions, can be helpful in guiding the dentist to a recommendation, commonly there is still uncertainly whether restorative treatment is the best course of action. As in Example 1, periodic reevaluation and monitoring, chemotherapeutic (i.e. fluoride) treatment, and behavioral (e.g. dietary modification; site specific plaque removal) intervention are alternatives to restorative treatment. Even when a restoration is indicated, there are choices to be made in materials and techniques.

In both of these cases sharing the uncertainties with the patient, informing the patient about each of the treatment options – and their attendant benefits and deficits (risks), and engaging the patient in the decision making, is the best way to proceed.

**eFIG 10-1** "Incipient" occlusal caries lesion. (Courtesy Dr. Andrea Zandona, Chapel Hill, N.C.)




**eFIG 10-2** Radiographic caries lesion on the mesial surface of the maxillary second molar.

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Unlike problems involving the periodontal tissues, malocclusion, or missing teeth, single tooth restorative needs may not be self-evident to the patient. In addition, obvious problems, such as a missing restoration or a symptomatic or visible gross carious lesion, probably will have been addressed in the disease control phase of treatment. As a result, these definitive phase problems present the dentist with a twofold educational challenge: first, to inform the patient as to why a restoration may be necessary, and second, to describe the available restorative options.

Some patient issues are indispensable to single tooth treatment decision making. If restorative treatment is not mandatory, as would be the case with a stained but sound composite resin restoration, then the decision to treat or not treat is left to the patient. Certainly, the patient's willingness to invest time and financial resources will have a significant bearing on the decision. What benefits does the patient perceive? How highly are those benefits valued? How committed is the patient to improving esthetics or warding off future problems? Is he or she willing to accept the risks and hazards if treatment is not provided?

When restorative intervention is necessary and the patient accepts this, the patient may contribute significant input to the selection of restorative material. Is the patient averse to amalgam? Does he or she prefer, or insist on, a tooth-colored restoration? Will a metal margin on a crown present an esthetic problem? What are the individual's priorities: longevity of the tooth and restoration or the cost in time and financial resources required for the immediate work? Is optimal treatment preferred now in hope of preventing future problems? Or does the individual prefer to wait and see, accepting the fact that the tooth may break or even be lost prematurely?

## Single Tooth Restorative Procedures

### Pit and Fissure Sealant

Sealants are low-viscosity unfilled or filled resin materials designed primarily to be used to prevent caries development in susceptible pits and fissures of posterior teeth in children and adolescents. With time, however, sealants have gained wider application and are commonly used for patients of all ages, not only to prevent the formation of new carious lesions but also to interrupt caries progression in areas with shallow incipient carious lesions.[6] Frequently, the dentist will be faced with the diagnostic challenge of differentiating between deep fissures with stains and incipient caries. Placement of a sealant in this circumstance is an inexpensive, noninvasive approach with a proven benefit. Consistent with the concept of minimally invasive dentistry, sealants will be preferred to a composite or amalgam restoration—both of which require tooth preparation and removal of some tooth structure. Sealants are even more likely to be recommended rather than a more invasive restorative procedure if the patient is at low caries risk and will be able to return for regular maintenance visits.

When placing sealants, some have advocated the use of mechanical instrumentation (enameloplasty or prophylactic odontotomy) if there is a high degree of probability that demineralization has occurred in the depth of the fissure. However, research has suggested that this is not recommended for a non-cavitated pit or fissure.[6] Sealant resins have many other uses, including sealing slight voids or surface imperfections and defects in enamel or composite materials, resurfacing a new or existing composite, and sealing dentin tubules as a desensitizing treatment.

### Composite Resin Restoration

**Composite resin** is a direct-fill, tooth-colored restorative material (Figure 10-11). Composites were first used to restore anterior teeth but are now routinely used in conservative occlusal and proximal preparations on posterior teeth as well. Composite resin restorations exhibit excellent color-matching characteristics and the material is versatile and relatively easy to manipulate. Light-cure composite material has almost unlimited working time. Disadvantages include the possibility of microleakage, staining, and wear, especially when used in large posterior preparations. Composite restorations can fail because of secondary caries, fracture of the restoration, or fracture of adjacent tooth structure. It is frequently possible to repair previously placed composite restorations with new composite material and, thus, extend the life of the initial restoration. Composite resin restorations are more technique-sensitive than amalgam restorations. Isolation of the operative field from contamination (e.g., saliva, gingival sulcular fluid, hemorrhage, handpiece lubricants, excess water) is necessary for good bonding and long-term success of the restoration.[7] From a treatment planning perspective, posterior composites are usually advocated: (1) for relatively small preparations, (2) when all margins of the preparation can be isolated and dried, (3) when esthetics is an overriding concern for the patient, and (4) when the patient has a documented allergy/sensitivity to metallic alternatives. Outside the United States, composite is often the preferred material for all direct-fill posterior restorations.

### Glass Ionomer Restoration

Glass ionomer restorations can be used in various applications when a tooth-colored material is preferred. This material is commonly used to restore carious and noncarious cervical defects (e.g., erosion, abfractions, abrasion). It has often been recommended for use as an interim or definitive restoration in caries-active patients and in the Atraumatic Restorative Treatment (ART) technique (see Chapter 9). Because a glass ionomer restoration will bond to dentin and enamel, cavity preparation

**FIG 10-11** Composite restorations. (Courtesy Dr. Lee Boushell.)

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may not be necessary in areas of cervical notching or erosion. Because it bonds to tooth structure and will set quickly in bulk, glass ionomer is ideal as a temporary or provisional direct-fill restoration for large carious lesions, endodontic access openings, and cusp fractures. Glass ionomer restorations are more prone to fracture and wear than composites. Compared with composites, esthetics are generally regarded as inferior because shade ranges are more limited, and the materials have a more opaque appearance. Compomers and resin-modified glass ionomer materials have properties that blend the qualities of glass ionomer and composite in various combinations.

From a treatment planning perspective, glass ionomer restorations should be considered for the high-risk caries patient when esthetics is a consideration and composite resins may not be the best choice. For many practitioners, glass ionomer cements are the material of choice for xerostomic patients and for patients with root caries.[8,9] Glass ionomer cements also have wide use as temporary restorations in the acute care setting.

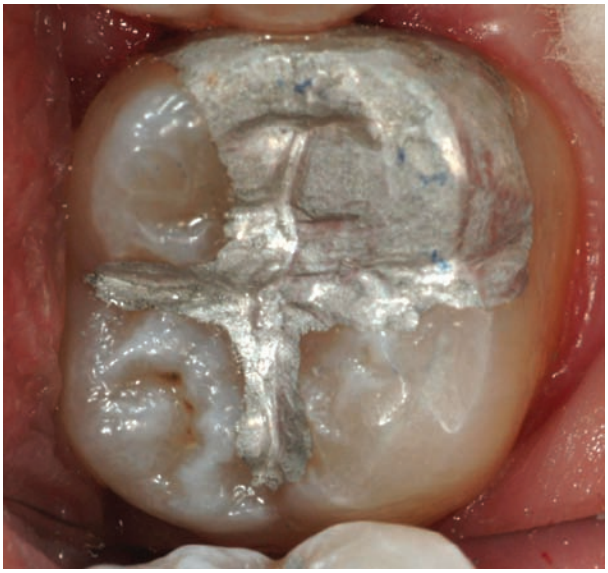

**FIG 10-12** Amalgam restoration. (Courtesy Dr. Lee Boushell.)

## Amalgam Restoration

Amalgam is a direct-fill material used primarily for restoring lesions or defects on the mesial, distal, occlusal, and lingual surfaces of posterior teeth (Figure 10-12). Amalgam can be used to replace missing cusps, especially nonfunctional cusps, and as a build-up material for a core (foundation) before placing a crown.

Dental amalgam is inexpensive, easy to handle, strong, durable, resistant to fracture and marginal leakage, and can be expected to have a relatively long service life in the patient's mouth. It is the preferred restorative material for posterior teeth where operator visibility is compromised or where isolation of the preparation from contamination is a problem. Disadvantages include the fact that its color does not match tooth structure, and additional sound tooth structure may have to be removed to provide adequate retention for the restoration. Amalgam restorations can fail because of secondary caries, fracture of the restoration, or fracture of adjacent tooth structure. Although numerous studies support the safety of amalgam, some patients and dentists choose to avoid using it citing health and safety reasons (see *In Clinical Practice: Responding to the Patient Who Wants No "Silver Fillings"* box). In some European nations, the use of amalgam has been banned because of environmental concerns, which focus on the handling and disposal of the mercury in dental amalgam.

## IN CLINICAL PRACTICE

### Responding to the Patient Who Wants No "Silver Fillings"

For various reasons, patients may be opposed to having amalgam restorations in their mouths. These reasons may include esthetic concerns, allergy to metal fillings, or concerns for the toxic effects of mercury (or other metals) on their body. A few healthcare providers have advocated the elimination of amalgam restorations as a means of promoting optimal oral health and as an approach to eliminating various systemic diseases, including chronic depression, multiple sclerosis, and cancer. The American Dental Association has issued a clear statement on this issue affirming that, except in the presence of a confirmed allergy, no scientific evidence justifies the removal of otherwise sound amalgam restorations for the sole purpose of promoting the health of the patient.[1] Despite this public pronouncement, some healthcare providers and some patients still insist on the removal of all amalgam or other metallic restorations. To complicate the issue further, some dentists do not themselves use amalgam and others have eliminated all metallic restorations (dental amalgam, gold alloys) from their practice.

Before making any judgments or decisions, the dentist needs to listen carefully to the patient's concerns, responding to any questions. If the patient has a legitimate health concern, such as an allergy to amalgam, an alternative treatment should be provided. Reasonable *dental* indications also may justify replacing amalgam restorations, such as a defective restoration or the patient's desire for a more esthetic restoration.

If the patient wants to replace restorations, ostensibly for health reasons, and the likelihood of a health benefit is in doubt, the dentist must carefully consider the options. If the existing restorations are intact and serviceable and no obvious dental benefit to replacing them can be cited, the dentist is justified in refusing to provide the treatment. This is particularly true when the replacement restoration, a composite for example, may be less durable and more prone to wear than amalgam.

Unfortunately, many cases are not so clear-cut. Often the ostensible health benefits are not obvious to the dentist but cannot be totally discounted; and the replacement restorations would not be expected to provide significant improvement in function or longevity than their predecessors. Recognizing the potential for the patient to incur substantial cost, particularly if gold or ceramic restorations are the only alternative, is it ethical or professionally responsible for the dentist to proceed with removing the amalgam? One approach is to respectfully decline the patient's request. Another approach is to proceed with the requested replacement but only after ensuring that *full informed consent has been achieved* and the patient fully understands that the *dentist is not promising or expecting that the patient's health will be improved* as a result of the restoration replacement.

In an effort to find acceptable middle ground, the dentist may offer to replace only those restorations that would improve

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the patient's dental condition. Indeed, environmental issues and the development of a more ideal and esthetic posterior restorative material may eventually eliminate the use of dental amalgam, but until that occurs, the dental practitioner will have to face this treatment planning challenge.

**Reference**

1. ADA principles of ethics and code of professional conduct, April 2012. Available at: http://www.ada.org/~/media/ADA/About%20the%20ADA/Files/code_of_ethics_2012.ashx (see Section 5, paragraph 5.A.1–Dental Amalgam).

## Inlays and Onlays

An **inlay** is an indirect intracoronal restoration that can be made of gold, composite resin, or ceramic material (Figure 10-13). Newer alternatives are the ceramic optimized polymers, also known as ceramers or polyglass, which are highly filled bondable materials that combine the esthetics of ceramics with the flexural strength and shade control of a resin. Traditionally, a laboratory indirectly fabricates the restoration on a cast of the prepared tooth. The prepared tooth is **temporized** during this interval. The final restoration is tried in the mouth and, after occlusion and proximal contacts have been adjusted, is cemented in place.

Composite and ceramic inlays have the advantages of excellent esthetics with increased resistance to abrasion and occlusal wear compared with direct-fill composites. It is currently unknown whether long-term strengthening of tooth structure is achieved by adhesively bonding to conditioned tooth surfaces. As with other indirectly fabricated restorations, more precise control of contours and proximal contacts can be achieved. Disadvantages (compared with direct-fill restorations) include increased chair time, increased cost, and the technical demands of preparation and cementation. Chairside computer-assisted milling of ceramic inlays, onlays, and crowns (CAD/CAM) is currently available, making same-day delivery possible. With time, more dentists are likely to have this technology and to offer this service in their offices. The initial cost for such systems is considerable, however, and significant chair time may be required for adjustment and cementation of an inlay generated by this method.[10]

**FIG 10-13** Porcelain inlays. (Courtesy Dr. Lee Boushell.)

An **onlay** is an indirect restoration covering one or more cusps of a posterior tooth. It is designed to strengthen a tooth that has been weakened by caries, tooth fracture, or a previously placed large restoration. Resin, cast gold, or ceramic may be used. An onlay is defined as an extracoronal restoration covering most of the occlusal surface and up to five-eighths of the surface tooth structure. An onlay that covers or "shoes" all of the cusps provides excellent protection against fracture, but tooth preparation is technically challenging. A digital or elastomeric impression must be taken and a temporary restoration placed while the onlay is indirectly fabricated. Porcelain onlays, which are available through conventional and CAD/CAM technology, provide excellent esthetics but are more prone to fracture than cast metallic restorations.

## Definitive Crown

A crown covers five eighths or more of the external tooth surface and is made of gold (Figure 10-14), ceramic

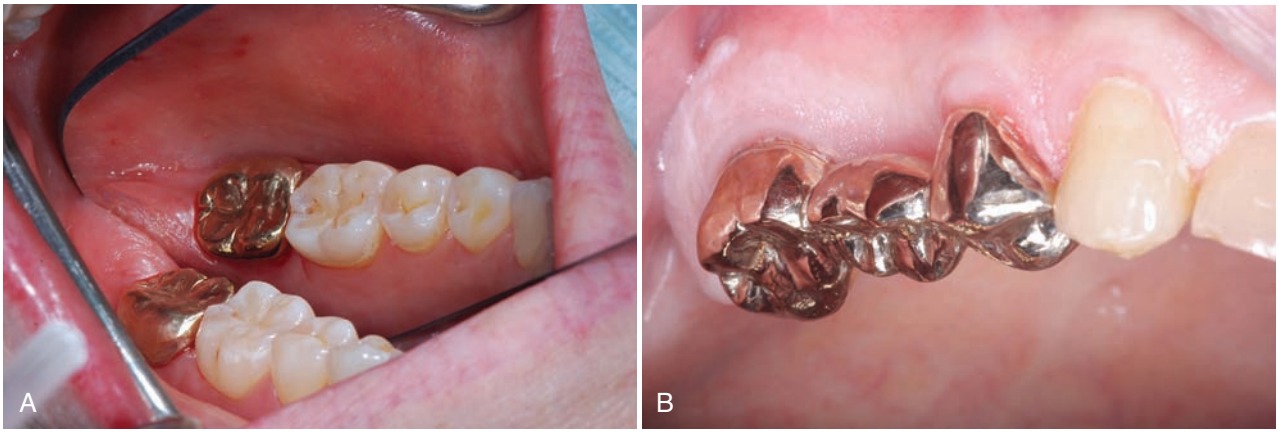


**FIG 10-14** Gold full coverage restorations on a single tooth **(A)** and multiple teeth **(B).** (Courtesy Dr. Carlos Barrero.)

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(Figure 10-15), or PFM. Like the onlay, a crown provides protection for a tooth that has been severely compromised by caries or fracture. Because a crown is fabricated indirectly, improved proximal contacts and occlusion can be obtained. PFM and all-ceramic crowns are good esthetic replacements for lost tooth structure. As with an onlay, a digital image or elastomeric impression of the preparation is required. With CAD/CAM technology chairside fabrication and same-day delivery is possible.

In the case of severe caries or breakdown of the tooth, it may be necessary to replace missing structure by performing root canal therapy and placing a foundation or a prefabricated or cast **post and core** (Figure 10-16). This cost, when added to that of the crown and the root canal therapy, may make restoration of the tooth cost-prohibitive for the patient.

Common restorative problems, treatment options, and keys to decision making are presented in eTable 10-3.

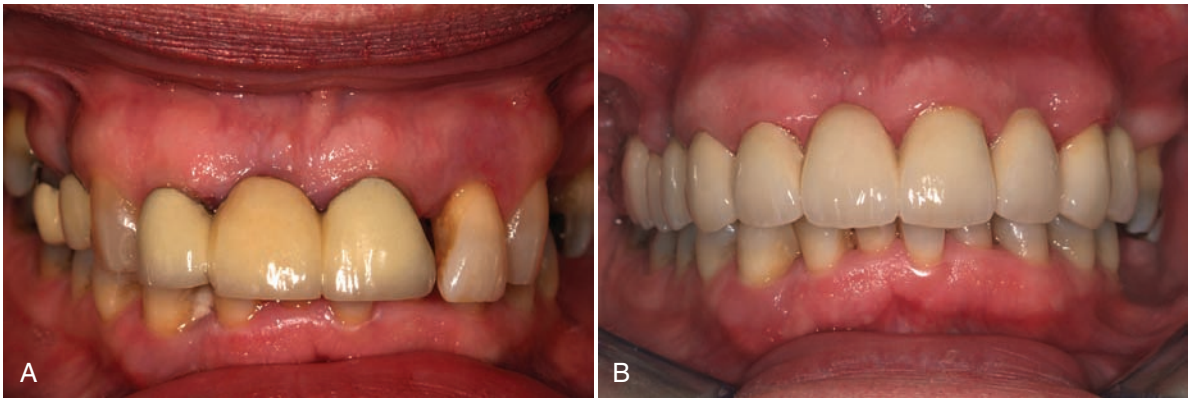
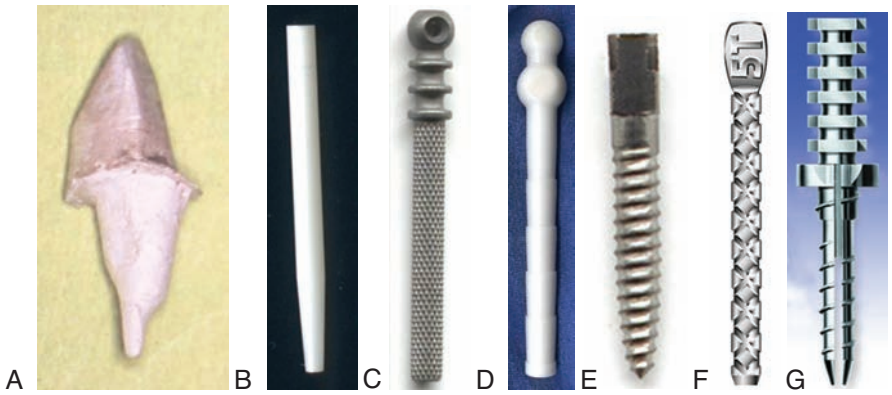



**FIG 10-15** Example of how poor esthetics **(A)** can be remedied with a full coverage ceramic restoration **(B).** (Courtesy Dr. Ed Kanoy, Durham, N.C.)



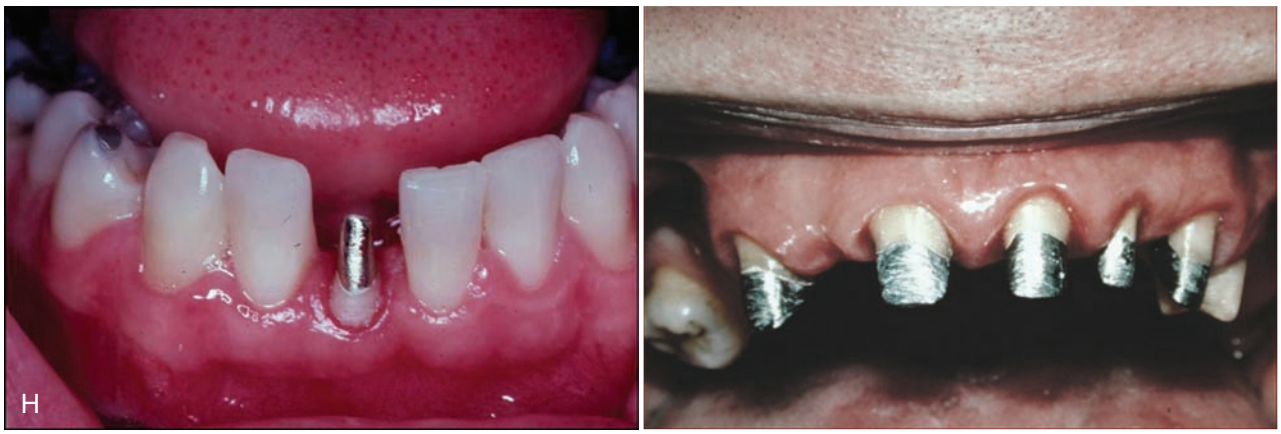




**FIG 10-16** Post and core restorations. Various post designs: **A,** cast post/core; **B,** ceramic post; **C,** titanium post; **D,** fiber post; **E,** old style threaded post; **F,** original parallel sided prefab, Parapost (stainless steel); **G,** new style threaded post; **H** and **I,** full crown restoration preparations on post and core buildups. (**A-E, H, I,** Courtesy Dr. Thomas Ziemiecki, Chapel Hill, N.C.; **F,** courtesy Coltène/Whaledent, Cuyahoga Falls, OH; **G,** courtesy Essential Dental Systems, Hackensack, N.J.)

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## eTABLE 10-3 Single Tooth Restoration Alternatives

| Condition | Treatment Options | Keys to Decision Making |
|---|---|---|
| Incipient pit and fissure caries | No surgical treatment; manage with behavioral and chemotherapeutic modalities, and periodic surveillance | Patient declines intervention; preferred choice in adult patient with low caries activity, low risk for new caries, and when the tooth can be monitored at regularly prescribed intervals |
| | Enameloplasty with reevaluation (after reevaluation, may leave as-is, seal, or restore as necessary) | Option for adult patient when uncertain whether caries has progressed to dentin |
| | Sealant (with or without enameloplasty) | Recommended for all adolescents and for adults who are at risk for new caries |
| Occlusal and proximal carious lesions and defects on posterior teeth | Composite | Preferred restoration for most conservative lesions when esthetics is a concern, when the patient prefers to avoid amalgam, and when isolation of the preparation is not a problem |
| | Amalgam | Proven performance; preferred when acceptable to patient and when isolation of the preparation is a problem |
| | Porcelain inlay | Infrequently used option with optimal esthetics and resistance to wear; requires extended chair time (CAD/CAM) or multiple visits (indirect laboratory technique); increased cost to patient |
| Isolated proximal carious lesions and defects on anterior teeth *not* involving the incisal edge | Composite | Restoration of choice because of esthetics, ease of placement, low cost |
| | Glass ionomer restoration | Alternative choice when optimum esthetics not critical and patient has active caries and remains at risk for new caries |
| | Amalgam | Recommended in selected cases when esthetics is not an issue and deep subgingival margins preclude isolation of preparation |
| Proximal carious lesions and defects on anterior teeth involving the incisal edge | Composite | Restoration of choice for an immediate repair or when cost is a significant limiting factor; durability under prolonged use or heavy occlusal forces is uncertain |
| | Porcelain-fused-to-metal (PFM) crown | Traditional, durable, full coverage esthetic restoration provides high degree of resistance to fracture; requires reduction of all coronal surfaces and is more costly to the patient than composite |
| | All-ceramic crown | Full coverage restoration, provides ultimate in esthetic realism; newer materials promising even in presence of heavy occlusal forces or bruxism; requires reduction of all coronal surfaces and is more costly to the patient than composite |
| Compromised cusp integrity | No treatment or intracoronal restoration | No symptoms, no loss of function; patient does not want or cannot afford more complex restoration; patient assumes responsibility and/or liability for possible future tooth fracture |
| | Protective cusp alloy | Less expensive alternative to a crown; offers some measure of protection when patient needs or wants a restoration |
| | Composite veneer repair | Esthetic repair for missing portion of tooth or to mask an exposed or perforated metallic restoration; inexpensive, easy to place; longevity and durability highly variable |
| | PFM crown | Esthetic full coverage restoration; provides durable, fracture-resistant, long-term replacement of missing tooth structure; requires multiple visits and is more costly than options shown earlier |
| | All ceramic crown | Highly esthetic full coverage restoration; newer materials have improved fracture resistance; can be less costly than PFM |

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**eTABLE 10-3 Single Tooth Restoration Alternatives—cont'd**

| Condition | Treatment Options | Keys to Decision Making |
|---|---|---|
| | Full-cast gold crown | Recommended alternative to PFM crown for patients who accept appearance of gold; required visits and costs comparable to PFM, same or greater durability, longevity, and resistance to tooth fracture; requires less tooth reduction than PFM and is not susceptible to material fracture |
| Cervical notching/abfractive lesions and cervical caries | No restorative treatment | No active caries, tooth is asymptomatic, and patient has no compelling esthetic need for restoration |
| | Composite restoration | Preferred restoration when esthetics is important, margins are not subgingival, and retention by mechanical means and/or etched enamel is readily available |
| | Glass ionomer restoration | Preferred restoration when esthetics is less important and patient has active caries or is at risk for new caries |
| | Amalgam | Restoration choice when esthetics is not a concern and deep subgingival margins preclude isolation of the cavity preparation |

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## COSMETIC DENTISTRY

The place of cosmetic dentistry in general dental practice has expanded rapidly in the past 15 years in the United States, primarily as a result of the introduction of new techniques for changing the color and appearance of teeth. The availability of these techniques has generated a strong, positive response from many patients. If a patient is interested in changing the appearance of his or her teeth and smile, the general treatment options available include bleaching, tooth-colored restorations, **veneers,** crowns, and several other tooth-specific esthetic treatments.

Esthetic treatments for individual teeth vary in terms of the level of invasiveness involved (eTable 10-4). At one end of the spectrum are over-the-counter whitening toothpastes that affect tooth color only minimally, primarily by removing extrinsic stain. At the opposite end is the PFM or all ceramic crown, which requires removal of a significant amount of enamel and dentin to allow space for the restoration. Some appearance-altering procedures, such as composite restorations and ceramic inlays and onlays, have already been discussed in this chapter. The procedures discussed in this section include microabrasion, tooth contouring, bleaching of vital and nonvital teeth, and the placement of tooth-colored veneer and full coverage restorations.

### Keys to Decision Making

#### Professional and Patient Considerations

Before any cosmetic dental therapy commences, the dentist must carefully assess the cause or causes of the esthetic concerns raised by the patient and determine whether a successful outcome can be achieved. Some perceived discoloration problems are better left uncorrected because the attendant costs are not worth the gain. Some esthetic concerns may be correctable only with orthodontic treatment or with complex restorations, such as crowns and porcelain veneers. The dentist has the responsibility to delineate these issues, framing the discussion so that the patient can make an informed decision. In many cases, there may be multiple treatment options, and the patient must make the final decision. In some cases, it may be appropriate for the dentist to suggest a sequential approach to the problem, beginning with simplest and least expensive treatment options first and later progressing to more invasive and costly options as the patient's finances, time, and wishes permit.

After discussion of the type of treatment approach to be used, the dentist must carefully document the original condition of the patient's mouth. For single tooth treatments, this may simply be an entry in the patient's record describing the present appearance and proposed treatment objectives. Using a shade guide, the dentist should determine and record the original color of the teeth. Documentation of more extensive treatment plans may include study casts (with and without wax-up) and intraoral photographs. Image manipulation with a computer may be helpful when discussing the case with the patient to clarify the patient's desires and the mutual objectives of the treatment.

### Representative Esthetic Problems and Treatment Procedures

#### Microabrasion

Microabrasion is considered a safe and conservative method of removing intrinsic enamel discolorations and defects and is used to treat such conditions as fluorosis, postorthodontic demineralization, and superficial enamel hypoplasia.[11]

A number of microabrasive techniques and materials have been reported. Basically, the defective surface layer of enamel is removed using a combination of abrasion and erosion. This is achieved by using acids, such as hydrochloric acid or phosphoric acid, along with abrasive powders, burs, stones, and discs. A paste formed from mixing hydrochloric acid with an abrasive powder is commonly used with a slow speed handpiece and rubber cup or brush to gently remove the outermost layer of enamel. Clinically, the microabraded surface looks smooth and esthetically pleasing because the procedure causes a prismless layer of enamel to form. Care should be taken to protect the soft tissues from the acid by using a rubber dam during the procedure. Although this procedure can provide significant improvement, some patients may require more invasive procedures such as composite resin restorations, veneers, and crowns.

#### Contouring Teeth

One of the simplest techniques for minor alteration in tooth structure is cosmetic contouring. Contouring or reshaping can be especially useful in improving the appearance of fractured, chipped, extruded, or overlapped teeth. Teeth are typically recontoured using rotary instrumentation. The sequence of steps may begin with finishing burs and/or stones followed by fine-abrasive impregnated rubber points/cups/discs (sometimes supplemented with polishing paste). Finishing strips are often useful for polishing proximal surfaces of the dentition. Contraindications to contouring include hypersensitive teeth, thin enamel, and situations in which contouring would expose dark or discolored dentin in the esthetic zone.

#### Vital Bleaching

Bleaching vital teeth involves application of a bleaching chemical to change tooth color (Figure 10-17). For many patients, use of over-the-counter whitening strips (Figure 10-18) can be an inexpensive and generally innocuous means of achieving the desired effect. For patients who desire more whitening than over-the-counter products can provide or who prefer to have the treatment directed by the dentist, other options are available. The treatment can be provided exclusively by the dentist in the office, or by the patient at home using a bleaching gel in custom-fitted plastic trays fabricated by the dental team. The in-office treatment provides more immediate results, whereas the at-home method may require 2 to 6 weeks to lighten the teeth.

The primary disadvantage associated with bleaching vital teeth is the risk of pulpal sensitivity, usually manifested as sensitivity to heat and cold. Irreversible damage to the pulp can occur with the stronger chemicals and heat used for

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## eTABLE 10-4 Treatment Alternatives for Changing Tooth Color or Appearance

| Treatment | Keys to Decision Making |
|---|---|
| Over-the-counter toothpastes and whitening kits | Inexpensive and easily available to the patient; efficacy variable; toothpastes primarily affect extrinsic staining |
| Microabrasion | Minimally invasive technique; effective in removing superficial stains in association with enamel roughness, porosity, or demineralization |
| Cosmetic contouring | Useful for smoothing sharp, worn, or chipped tooth edges, leveling incisal edge unevenness, and softening the appearance of overlap or rotation |
| Night guard bleach (custom tray fabricated by the dentist and used with a prescribed bleaching agent) | Relatively easy to use and generally effective; adverse reactions, such as sensitivity to hot and cold, are generally mild |
| In-office external bleach | More expensive than night guard bleaching but preferred by some patients because the change is immediate and dramatic; more effective in some problem cases, especially those in which discoloration is isolated to a single tooth or site; higher incidence of tooth sensitivity |
| Internal bleach | Most effective method when discoloration is internal and stain is associated with pulpal necrosis; bleaching material is placed inside the coronal pulp chamber of an endodontically treated tooth, requiring placement of a restoration to seal the access |
| Porcelain veneer | Moderately expensive and moderately conservative treatment to change the appearance and shape of anterior teeth; can effectively correct a wide range of esthetic defects; contraindicated when teeth have been heavily restored |
| Composite veneer (direct) | Less expensive and less time consuming alternative to porcelain veneers; wide range of applications; esthetic results range from good to excellent with best results where stain not as deep or pervasive; translucency and durability not as good as porcelain veneers |
| Porcelain-fused-to-metal (PFM) or all-ceramic crown | Most expensive and invasive therapy; recommended when other options are not viable or when a crown is indicated for reconstruction of a compromised tooth |

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**FIG 10-17** Proprietary vital bleaching materials. (Shown: Opalescence Tooth Whitening System, Ultradent Products, Inc. Courtesy Dr. Ralph Leonard, Chapel Hill, N.C.)

in-office treatments. In contrast, the sensitivity to heat and cold that some patients experience as a result of home bleaching is usually reversible and relates to frequency of use of the bleaching agent.[12] Home bleaching has proven to be effective and safe for patients when implemented as directed.[12] Patients with multiple composite restorations on anterior teeth and hypersensitive teeth are not good candidates for vital bleaching. Some types of tooth discoloration, especially that resulting from tetracycline staining, do not respond to treatment as predictably as do age-related tooth color changes.

## Bleaching Devitalized Teeth

For discolored, devitalized teeth, the dentist can alter tooth color by placing bleaching chemicals inside the pulp chamber. The treatment can be professionally applied in the office or by sealing bleaching agents such as a sodium perborate paste, hydrogen peroxide gel, or carbamide peroxide gel into the tooth for several weeks.[13] The latter procedure is often referred to as the "walking bleach" technique.

Bleaching devitalized teeth can produce excellent esthetic results with minimal trauma or discomfort. However, if the coronal portion of the root canal is not sealed effectively during the bleaching process, nonvital bleaching may induce external resorption. To avoid this complication, the gutta-percha root canal filling should be seared 2 mm apical to the cementoenamel junction (CEJ), and a barrier layer of restorative material placed to isolate the bleach material from the gutta-percha.[13] Some teeth do not respond to this bleaching therapy; and with others, relapse can occur, necessitating retreatment.

## Veneers

Veneers are placed on teeth to improve esthetics by changing the color, contour, or size of the tooth. The materials commonly used as veneers are porcelain and composite. Composite veneer restorations can be fabricated using a direct (chairside) or indirect (laboratory fabricated) technique. The former technique is more commonly used and generally affords a more conservative and less costly alternative to porcelain veneers. (See the discussion of composite resin restorations in *Restoring Individual Teeth* for more information.) For porcelain veneers, the teeth are prepared by removing 0.3 to 0.7 mm of enamel, primarily from the facial and incisal surfaces. An impression is made, the tooth temporized (if desired by the patient), and the porcelain veneer is fabricated by a laboratory and then bonded in place.

Porcelain veneers are indicated in cases involving extreme enamel discoloration, such as is seen with tetracycline staining or fluorosis. Attempts to bleach the affected teeth (either in the office or at home) should precede veneering procedures. Veneering may begin 2 weeks after the completion of any bleaching phase of treatment. Veneers can also be used to close diastemas, lengthen short teeth, or to replace small amounts of missing tooth structure (Figure 10-19). Porcelain is natural looking, stable in color, relatively strong (after bonding in place), and has good biocompatibility with gingival tissue. In addition,

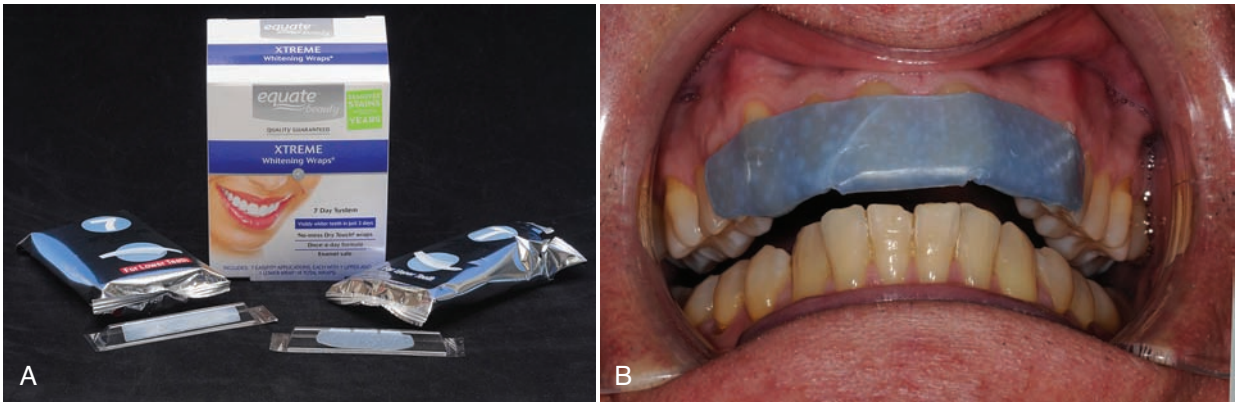


**FIG 10-18** **A,** Example of a tooth whitening system that uses bleaching strips. **B,** Patient wearing plastic strip that contains bleaching material. (Courtesy Dr. Samuel Nesbit.)

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**FIG 10-19** Before **(A)** and after **(B)** placement of porcelain veneers. (Courtesy Dr. Lee Boushell.)

porcelain resists staining and is resistant to wear and abrasion. Porcelain veneers offer a significant change in the appearance of the tooth in exchange for only a small loss in structure. Every attempt should be made to ensure that preparations for veneers do not extend through the enamel into dentin.[14]

Porcelain veneers are contraindicated for patients who have habits such as bruxism or pencil chewing[14] because of the excessive force that may be placed on the restoration. Patients with Class III and end-to-end bite relationships also may not be suitable candidates for veneering. Sound enamel on the periphery of the preparation is necessary to seal the veneer to the tooth surface. Thus, if the tooth has several composite restorations, a ceramic crown rather than a veneer may be a better choice. Considerable technical skill is required to prepare teeth for porcelain veneers, fabricate the restorations, and successfully cement them in place.

### Porcelain-Fused-to-Metal (PFM) or All-Ceramic Crown

If a veneer restoration is warranted, but insufficient tooth structure remains to support it, then a full coverage restoration is appropriate. Both the PFM and the all-ceramic crown are indirect restorations. The all-ceramic crown provides a more translucent and lifelike appearance. Historically, the all-ceramic alternative to the PFM crown has been the (feldspathic) porcelain jacket crown (PJC). The PJC is more fragile and less likely to resist fracture than a PFM, and is generally contraindicated if the patient has an aggressive bite or a clenching or bruxing habit. With recent improvement in the ceramic materials, there is now evidence to demonstrate that all-ceramic crowns have strength, fracture resistance, and longevity comparable with PFM crowns.[15] The all-ceramic crown is rapidly becoming the preferred treatment option to the traditional PFM crown whenever the patient elects a tooth colored full coverage restoration.

## ELECTIVE (NONACUTE) ENDODONTIC PROBLEMS

Endodontic procedures often are provided for teeth with pulpal or periapical disease during the acute phase of care because the patient is experiencing pain or swelling. During the definitive phase, however, endodontic therapy may be appropriate in the following situations even in the absence of symptoms.

- Apical pathology associated with a necrotic pulp represents a prime indication for root canal therapy. The patient and the dentist may not detect such a problem until the tooth darkens in appearance or distinctive signs are visible on periapical radiographs.
- Teeth with a large portion of the crown missing (usually caused by caries or fracture), teeth with deep or large direct-fill restorations, and teeth treatment planned for an indirect restoration, may benefit from elective root canal treatment. When the dentist determines that there is a high probability that the tooth will eventually need root canal treatment, then the patient should be presented with the option of doing the root canal treatment prior to fabrication of the indirect restoration. An even more compelling rationale for doing the root canal treatment is if the retention and integrity of the indirect restoration would be improved by doing the root canal treatment and either anchoring the foundation into the pulp chamber or placing a post and core.
- Elective endodontics should be considered for teeth that will be devitalized in the process of overdenture construction or for those hypererupted teeth in which the pulp is likely to be devitalized in the process of altering the occlusal plane.
- Retreatment of a previously endodontically-treated tooth may be necessary when signs of reinfection (i.e., contamination of the root canal system) appear. This may become apparent clinically in the form of

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a parulis or fistula, or radiographically as a new or enlarged apical rarefying osteitis (see Chapter 3 for evidence-based discussion of this topic).

## Keys to Decision Making

### Professional Considerations

Before proceeding with endodontic therapy, the dentist must first assess the clinical significance of the involved tooth in relation to the other teeth and to the overall treatment plan. Although an important goal of dentistry is to help patients retain teeth, it may not be in the patient's best interest to invest the time and financial resources on endodontic therapy for a particular tooth. An example is the patient whose third molar would require root canal therapy if it were to be retained. The tooth's position in the arch and its often complex canal anatomy make it difficult to treat with root canal therapy. Even more compellingly, the lack of functional benefit to retaining the wisdom tooth, and the potential for caries, or pericoronal or periodontal infection, often make extraction the best alternative.

After establishing the value of retaining a tooth, the dentist assesses whether the tooth can be restored and what procedures will be required to retain it. The question of restorability commonly hinges on how much tooth structure remains coronal to the alveolar crest. Often a bitewing radiograph can help facilitate that analysis (Figure 10-20). In questionable cases, to reliably assess restorability, it may be necessary to first remove the caries. If there is infringement of the biologic width, or if there is insufficient ferrule to retain a crown, a crown lengthening procedure (CLP) may be appropriate. If the tooth already has significant clinical attachment loss then the CLP may be contraindicated because such a procedure could contribute to an unfavorable crown-to-root ratio and a poor periodontal prognosis. Endodontically treated teeth are often inherently fragile as a result of the loss of tooth structure to caries, large restorations, cuspal fractures, and even the root canal therapy itself. A full coverage restoration, such as a crown, is often needed to restore the tooth to function. A related issue that must be addressed is the prognosis for such a heavily restored tooth. Having determined that a tooth can be restored, how does the long-term prognosis for the tooth compare with what it would be after the usual treatment alternative of an extraction and an implant-retained crown? (See Chapter 3 *In Clinical Practice: A Common Dilemma – Deciding Between Extraction and Placement of an Implant Retained Crown versus Restoration with a Root Canal Treatment, Foundation, and Crown.*)

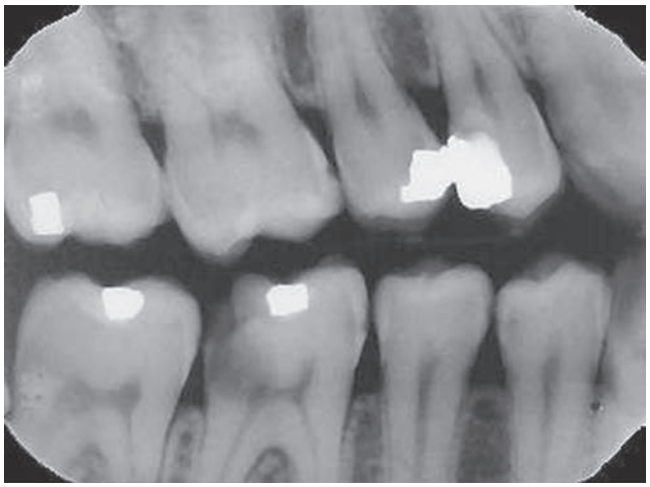

**FIG 10-20** The bitewing radiograph is a helpful adjunct to establish the relationship of a proximal carious lesion to the bone crest, as with this lower first molar because it helps in the assessment of the need for a crown lengthening procedure (CLP) and helps to determine the restorative prognosis for the tooth. (Courtesy Dr. J. Ludlow, Chapel Hill, N.C.)

The dentist must also assess whether there are anatomic or other treatment issues that may affect the outcome of root canal treatment. **Root dilacerations,** calcified canals, or poor access (e.g., limited opening) can make treatment more challenging and the prognosis less favorable.

Upon completion of root canal treatment, it is imperative that a definitive seal be placed to prevent recontamination of the root canal system. This seal may be in the form of a definitive direct-fill restoration (amalgam or composite) or a foundation. If a definitive indirect restoration is planned for the tooth, it is recommended that this be implemented as soon as practicable. If the patient still has disease control treatment needs (see Chapter 9), however, or if there are other more pressing definitive phase needs at this time, and placement of an indirect restoration needs to be deferred, it is important to protect the tooth by:

- placing a provisional cusp protective restoration on the tooth or reducing the occlusion and placing a long-term direct-fill provisional restoration, such as glass ionomer;
- advising the patient to be cautious when chewing and to avoid applying heavy force on the tooth;
- informing the patient about the possibility of tooth fracture and the negative outcomes that may result;
- examining the tooth at regular intervals for signs that the restoration is deteriorating or that the seal may be compromised.

### Patient Considerations

The plan for definitive restoration, the prognosis for endodontic and restorative treatment, and the anticipated fees for all associated treatment must be presented to the patient before beginning endodontic treatment. For some patients, the added cost of the procedures required to restore the tooth to function, such as crown lengthening, a post and core, and a crown, may make the expense of the root canal treatment prohibitive. The patient may instead choose to have the tooth extracted. For medical-legal reasons, the dentist should document in the patient's record that all treatment options, including endodontic therapy, have been discussed before moving to extraction.

Some patients may choose to have root canal therapy to retain a tooth but then delay the final restorative treatment because of cost considerations. Such a delay may worsen the prognosis for severely broken down teeth, leaving them more

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susceptible to fracture and endodontic treatment failure. Patients must be informed of this risk, and the conversation needs to be documented in the record.

## Procedures for Treating Nonacute Endodontic Problems

### Root Canal Therapy

Root canal therapy can permit a patient to retain a tooth with pulpal problems when the only other option might be extraction. The procedure is indicated as a treatment option when irreversible pulpitis, pulpal necrosis, apical periodontitis, or acute apical abscess is diagnosed. The technique involves removing pulpal tissue; cleaning and shaping the root canals; and filling the canals with a thermoplastic material such as gutta-percha.

### Apical Surgery

Apical surgery involves reflecting a gingival flap to access the apical end of the tooth, removing the apical 3 mm of the root tip, cleaning and preparing the apical portion of the root canal with ultrasonics (retropreparation), and sealing the root tip with a biocompatible material such as Super-EBA and MTA (Figure 10-21). When properly done with modern microsurgical protocols, this procedure has a 90+% success rate.[16]

This retrograde surgical procedure may be necessary when conventional root canal therapy has been unsuccessful and the patient declines retreatment (see *Should a Tooth With a Failed Root Canal Treatment Be Retreated?* in Chapter 3); or when calcification, a restoration, or an irretrievable cemented post prevents accessing the root canal system through the crown of the tooth.

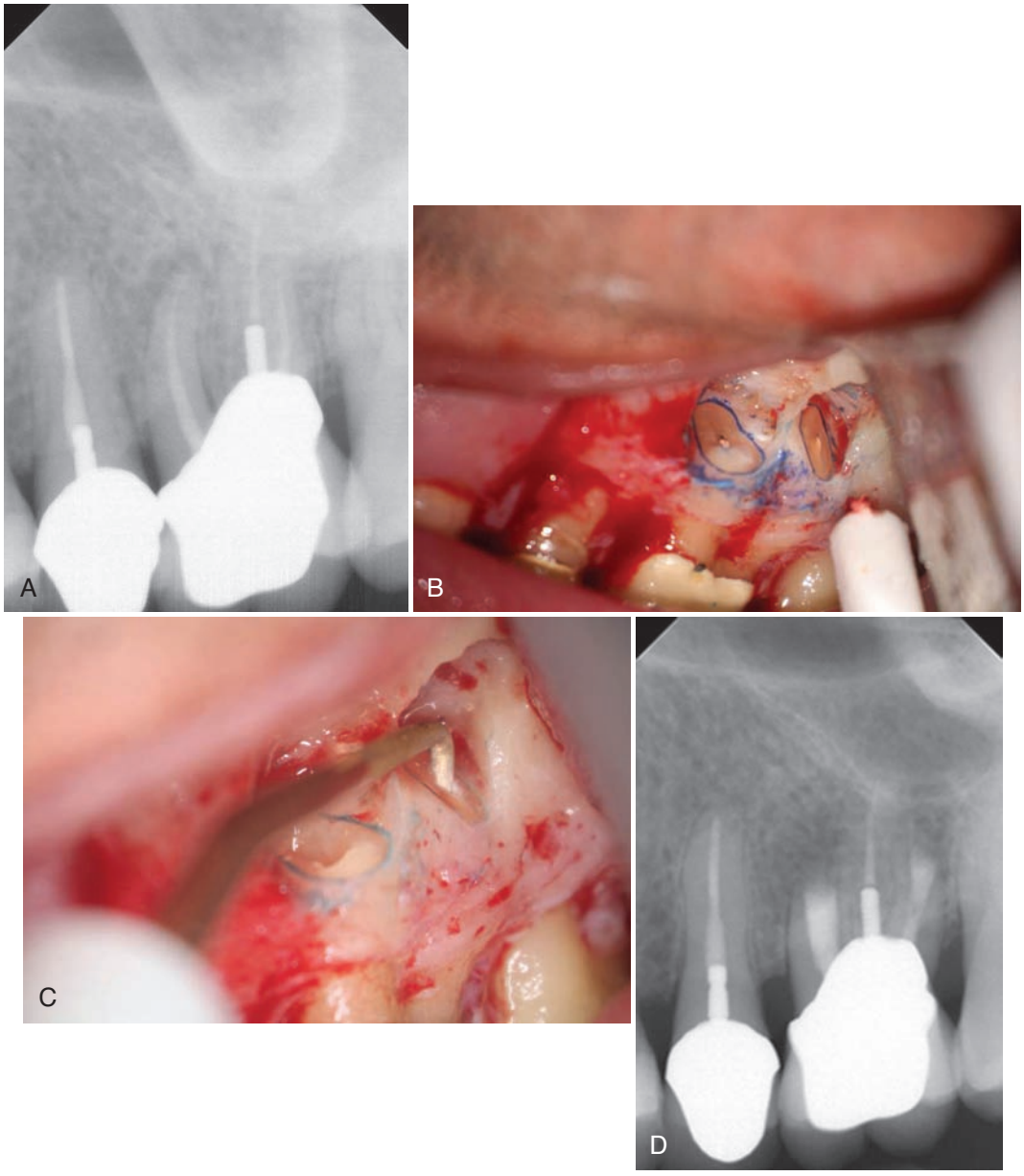


**FIG 10-21** Apical surgery. **A,** Preoperative radiograph. **B**, root apex exposed; and **C,** root apex resected and restored. **D,** 3-month postoperative radiograph. (Courtesy Dr. Peter Tawil.)

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## EXTRACTIONS AND PREPROSTHODONTIC SURGERY

When teeth are hopelessly compromised from a restorative or periodontal standpoint, extraction may be necessary. Teeth sometimes must be removed in conjunction with excision or block removal of a cyst, tumor, or carcinoma. Teeth with a guarded prognosis that would be in the portal of radiation therapy for oral cancer are generally extracted prior to cancer treatment. In some cases, teeth may be salvageable, but the patient does not possess the time, financial resources, or motivation to undergo the necessary procedures required to save them. Sometimes the recommendation to extract is made because, if retained, the teeth would not serve as satisfactory abutments for prostheses or might jeopardize the prognosis for the surrounding teeth.

Other surgical procedures may be necessary or beneficial before fabrication of any prosthetic appliances. Such procedures include removing exophytic lesions, reducing bulbous maxillary tuberosities, and removing tori or other **exostoses. Site preservation** and implant placement are also forms of preprosthetic surgery. In some situations, preprosthetic surgery is mandatory to achieve a successful prosthetic outcome. In others, the surgery is optional. When faced with the cost, time, and inconvenience of undergoing preprosthetic surgery, some patients may decline, but all patients who could potentially benefit from the surgery should be presented with the option.

### Extraction

Simple dental extraction typically involves the removal of a tooth or root fragments with elevation and forceps delivery. A surgical extraction is often indicated for severely broken down or impacted teeth. This entails elevating a gingival flap for access and removing bone around the tooth and/or dissecting a multirooted or impacted tooth to facilitate its removal. Extraction is indicated to remove teeth with a hopeless prognosis. Extraction is sometimes indicated to provide space for orthodontic treatment or succedaneous tooth eruption. Extraction is often the treatment of choice for third molars (see the *In Clinical Practice: Should Asymptomatic Third Molars be Removed?* box). The most common complications associated with extraction include bleeding, postoperative pain, dry socket (localized alveolar osteitis), and infection.

### IN CLINICAL PRACTICE

#### Should Asymptomatic Third Molars be Removed?

***The Issues***

Third molars, also known as wisdom teeth, are sometimes viewed as unnecessary and potentially problematic and are often seen as candidates for extraction. Some practitioners have recommended their universal removal as a means of preventing infection, cysts, tumors, caries, periodontal disease, or destruction to adjacent teeth. Extraction of third molars has been the definitive treatment of choice for the prevention or elimination of pericoronitis. Patients may request their removal to preclude crowding of the anterior teeth, a projected outcome that has now been discredited. Research has cast doubt on the value and the necessity of routinely removing asymptomatic and clinically sound, but impacted, third molars.[1] Public health studies assessing the cost/benefit ratio of third molar removal typically weigh in favor of no treatment.[2] It is now recognized that when pockets with bleeding on probing are found adjacent to third molars, the microbes in those sites are the same as those found in chronic periodontal disease. There is also evidence to suggest that the two disease processes are the same and that both have a similar association with markers for systemic inflammation.[3,4] Although this evidence is not compelling enough to suggest the necessity of removing all periodontally involved third molars, it does suggest the need to carefully assess the periodontal health of third molars especially for individuals with immunocompromising conditions, including the inflammatory arthropathies. In light of sometimes-conflicting evidence, the dentist must consider carefully whether or not to recommend extraction. The requirements of informed consent make it necessary that the patient be an active partner in the decision-making process.

***Reaching a Decision***

A healthy 19- to 25-year-old patient whose impacted third molars have caused repeated episodes of pain from pericoronitis is a good candidate for extraction. When there is no reasonable prospect for the wisdom teeth to become properly aligned and fully functional, and the patient has a strong desire to stave off future potential problems, consideration should be given to removal. Third molars that have a poor periodontal or restorative prognosis are usually best removed. Aside from these fairly clear-cut situations, the decision as to whether or not to extract becomes the purview of the patient after the dentist has presented the arguments for and against extraction in detail. Although there are no absolutes, the following general guidelines may help form the basis of the consent conversation with the patient.

- Younger and healthier patients (ASA I or II) generally have an easier time with the surgery, heal faster with fewer complications, and can be expected to exhibit more normal architecture in the edentulous ridge after healing.
- When the risk of future complications or problems associated with the third molars is high (e.g., caries, periodontal disease, pericoronitis), more weight should be given to extraction.
- When the possibility of surgical complications (e.g., paresthesia, fracture, dry socket, or infection) is high, more weight should be given to avoiding extraction.
- If there is a reasonable probability that the wisdom tooth may be needed in the future as an abutment for a prosthesis, as an anchor for orthodontic treatment, or to maintain the occlusal plane, more weight should be given to retention of the tooth or teeth.
- If loss of the third molars will compromise the patient's occlusion, function, or mastication, more weight should be given to retention.

In addition to these issues, the patient will want to weigh other personal considerations, such as the financial cost, potential loss of time at work, pain and anxiety control, and the timing of the procedure in relation to other life events. Two often unspoken but relevant considerations are the patient's prior experience with elective surgical procedures and personal

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philosophy in dealing with risk or uncertainty. Some patients have had unfortunate past experiences with surgical procedures and, as a result, are extremely apprehensive about such procedures. These patients are convinced that they are more likely to have complications or postoperative problems and will therefore often decline extraction unless it becomes imperative. These patients are resigned to dealing with the consequences if and when they arise. In contrast, other patients have a proactive orientation and seek to avoid preventable problems. Such patients typically elect to have the extractions if they have confidence the procedure will help them avoid pain, infection, or other clinical problems in the future. The wise practitioner is attentive to these varying perspectives and helps the patient factor them into the decision making process.

**References**

1. Tulloch JF, Antczak-Bouckoms AA: Decision analysis in the evaluation of clinical strategies for the management of mandibular third molars, *J Dent Educ* 51(11):652–660, 1987.
2. Tulloch JF, Antczak-Bouckoms AA, Ung N: Evaluation of the costs and relative effectiveness of alternative strategies for the removal of mandibular third molars, *Int Technol Assess Health Care* 6(4): 505–515, 1990.
3. White RP: Third molar oral inflammation and systemic inflammation, *J Oral Maxillofac Surg* 63(8); (Supp 1):5–6, 2005.
4. Ruvo AT, Moss KL, Mauriello SM, et al: The systemic impact of third molar periodontal pathology, *J Oral Maxillofac Surg* 63(8); (Suppl 1):69, 2005.

## Preprosthodontic Surgery

Patients scheduled to receive fixed or removable partial or complete dentures may have abnormalities of the bone or soft tissue that will be underneath the prosthesis. Four clinical conditions that often require surgical attention are discussed in this section and summarized in eTable 10-5.

### Exophytic Soft Tissue Lesions

Many different pathologies can be included under this heading; some of the more notable are hypertrophic or hyperplastic (flabby) ridges, epuli, and denture (palatal) papillomatosis. If minor, these lesions may be somewhat innocuous, but in an advanced state they may make successful denture wearing impossible.

### Bulbous Tuberosities

Enlarged tuberosities may be of soft tissue or bony origin or both. Overextended, "drooping" tuberosities can alter the occlusal plane; limit the space for teeth or denture base material; interfere with retention; and in extreme cases, render the denture unusable.

### Exostoses and Tori

Like enlarged tuberosities, large exostoses may impair the retention, fit, strength, and function of a denture. They are also notorious for causing denture sores because the overlying soft tissue tends to be thin, friable, and easily abraded or traumatized.

### Ridge Augmentation Procedures

Some patients have extensive bone loss and ridge resorption in the edentulous areas. The severity and pattern of bone loss varies by individual and site, but these sites are typically unsatisfactory as denture-bearing areas and do not provide a long-term stable base for a conventional removable partial or complete denture. If a conventional denture is the chosen course of treatment, then modifying the alveolar ridge to improve the ridge shape and increase the size of the denture-bearing area may be the only recourse. Vestibuloplasty or repositioning of the vestibular fold more apically—often with concurrent placement of grafts from skin or oral mucosa—can effectively increase the usable ridge height and area. Some cases may require osseous surgical procedures, such as a total or segmental bone graft, a palatal osteotomy, or a maxillary sinus floor graft.

**Distraction osteogenesis** is an alternative to conventional augmentation procedures.[17] With this procedure, the edentulous ridge is enhanced by incrementally separating the buccal and lingual plates horizontally, or the alveolar bone from the basal bone vertically, and encouraging new bone deposition to develop between the bony segments.

### Surgical Procedures Associated with Implant Placement

After tooth extraction, the alveolar ridge undergoes dimensional changes resulting in a reduction in both the height and width of the site.[18] **Ridge preservation** or **site preservation** refers to the placement of bone graft material within an extraction site immediately after tooth removal with the purpose of preserving bone height and width. Ridge preservation helps to minimize the extent of these changes.[19] It facilitates dental implant placement by providing increased bone support for the implant, and by reducing the need for later bone augmentation in edentulous sites with insufficient bone volume for dental implant placement.

When an insufficient amount (height and width) of alveolar bone is available in the planned dental implant site, bone augmentation and/or sinus floor elevation procedures may be necessary. In cases where ridge augmentation is indicated, **guided bone regeneration (GBR)** is performed using a variety of materials including bone grafts, barrier membranes, biologic agents, and/or space maintaining devices (e.g., tenting screws, titanium mesh). In this staged approach, GBR typically precedes dental implant placement by 3 to 6 months. In select cases, however, GBR may be completed in conjunction with dental implant placement, assuming that primary implant stability is obtained.

Because of individual patient anatomy and/or sinus pneumatization, the floor of the maxillary sinus may limit the availability of vertical bone in the posterior maxilla for dental implant placement. In these cases, subantral sinus floor elevation may be necessary. The two most commonly used techniques for sinus floor elevation include a lateral approach via a Caldwell-Luc procedure and a transalveolar approach.

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## eTABLE 10-5 Conditions that May Warrant Preprosthetic Surgery

| Condition | Treatment Options | Keys to Decision Making |
|---|---|---|
| Exophytic lesions: flabby, edentulous ridges, epulis fissuratum, and denture (palatal) papillomatosis | No treatment | Patient declines surgical correction; no-treatment option does not preclude successful denture fabrication and use; medical contraindication to surgery |
| | Surgical excision | Patient wishes surgical correction; no-treatment option precludes successful denture fabrication and use; currently the most frequently used and predictable mode of treatment |
| | Laser surgery | Alternative to conventional surgical technique when practitioner has the armamentaria, training, and expertise, and laser surgery is an appropriate alternative |
| Bulbous tuberosity | No treatment | Patient declines surgery and no-treatment option does not preclude successful denture fabrication and use; medical contraindication to surgery |
| | Soft tissue and/or bone reduction | Present condition precludes successful fabrication, retention, or use of prosthesis; patient seeks improved outcome afforded by tuberosity reduction; sufficient interarch clearance can be obtained by soft tissue and/or bone reduction (i.e., surgery will not encroach on sinus floor) |
| | Segmental osteotomy | Tuberosity reduction required, soft tissue reduction will not provide adequate space, and a pneumatized sinus precludes sufficient bone removal to accomplish desired objective; teeth in the quadrant need to be intruded, in which case, teeth and tuberosity can be moved superiorly at the same time |
| Torus or other exostosis | No treatment | Bony bulge and undercut are of insufficient magnitude to impair denture construction, retention, or function; denture treatment outcome is uncertain, but patient accepts responsibility if result is unfavorable; medical contraindication to surgery |
| | Removal | Patient requests improved outcome afforded by the surgery, osteotomy is necessary for successful full or partial denture construction |
| Ridge deficiency | No treatment | Inadequate ridge form does not preclude attempt at denture construction; patient declines surgery and accepts that retention will be compromised; medical contraindication to surgery |
| | Augmentation | Patient values the benefit that improved ridge form and increased denture stability and retention will provide |

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When the lateral approach (**lateral window sinus lift**) is used, bone is removed from the lateral aspect of the alveolus overlying the planned implant site, permitting access to the underlying Schneiderian membrane lining the sinus cavity. The clinician gently elevates the membrane and bone graft materials are placed between the membrane and bone on the sinus floor. Using this procedure, simultaneous or delayed implant placement may be completed depending on the clinician's ability to achieve primary implant stability.

The transalveolar approach (**osteotome sinus lift**) is most commonly recommended when at least 5 mm of vertical bone height is present.[20] When this technique is employed, osteotomes are introduced into the dental implant preparation site and are used to locally elevate the sinus floor. Particulate bone graft materials are commonly placed to retain the new contour of the sinus floor. If the implant fixture is stable in the prepared site, it is also placed at that same visit.

## REPLACING MISSING TEETH

The replacement of missing teeth has long been one of the fundamental services provided by the dentist. Teeth are commonly lost because of extensive caries, advanced periodontal disease, catastrophic fracture, and many other causes. When a tooth (or teeth) is lost in the **esthetic zone** or if loss contributes to speech or functional problems, the patient is usually highly motivated to replace the tooth or teeth.

The traditional modalities of complete dentures, removable partial dentures, and fixed partial dentures continue to be viable treatment options, but are now supplemented by an additional wide array of fixed and removable implant-retained prostheses. The following section discusses commonly utilized tooth replacement options and their attributes.

### Keys to Decision Making

#### Professional Considerations

The fundamental question that the dentist must first resolve is whether the missing tooth or teeth *need* to be replaced and how compelling that need is. Significant issues in this regard include whether the absence of teeth has caused limitation of function, speech, or esthetics. Has the patient experienced a loss of self-esteem because of the loss? Another important concern is occlusal stability. Has there been any tipping, drifting, or extrusion of the teeth; or collapse of arch form or loss of vertical dimension of occlusion; and what is the potential for any of these to occur in the future? These issues are critical to making a treatment versus no treatment recommendation to the patient; and if a treatment recommendation is made, how strong it should be.

When it has been determined that the patient will benefit from tooth replacement and is interested in having the procedure, the dentist must determine whether any systemic problems limit or contraindicate prosthodontic treatment.

Oral disease control must be established before definitive prosthodontic therapy can begin. Active oral disease, including caries, and periodontal and periapical disease, must be eliminated; if teeth are to be retained, the patient's risk for new disease also must be limited. A related factor is the dentist's assessment of the effectiveness of the patient's oral self-care, which can have a significant effect on the optimal selection of treatment by dentist and patient and on the prognosis for the final plan.

Given the stability, functionality, longevity, and esthetics of implant-retained prostheses, in most cases, they have become the default solution for replacing missing teeth. Professional considerations and patient considerations for implant treatment planning are discussed later in this section.

If an implant-retained prosthesis is not feasible or if implant options are ruled out by the patient, other options are available; as those are considered, other professional considerations come into play. Any potential abutment teeth must be carefully evaluated. Overall occlusion should be evaluated for irregularities in the occlusal plane, loss of vertical dimension of occlusion, malalignment or malpositioning of the teeth, and guidance patterns in excursive movements. Each of these considerations may affect which type of prosthesis will have the best prognosis. When managing bounded edentulous spaces, additional matters of interest include a detailed analysis of the vitality, bone support, periodontal status, and crown-to-root ratio of the abutment teeth. The length of the edentulous span can have a bearing on the number of abutments required and on the long-term prognosis for a fixed partial denture (FPD). Specific areas of concern when dealing with an unbounded edentulous space include the strength and suitability of the potential abutments; the height, width, and form of the edentulous ridge; the location and size of tooth and bony undercuts; and any other factors that may be unique to the various appliance designs under consideration.

One of the greatest challenges and responsibilities for the dentist is the accurate assessment of the prognosis for each of the reasonable treatment options. The patient and the dentist need this information before a fully informed consent decision can be reached. Ultimately, to make the most appropriate treatment choice, the patient must weigh the prognosis for each of the treatment options in terms of the perceived benefits and the financial, time, and other costs.

#### Patient Considerations

As with other treatment options in this chapter, key patient considerations drive the decision making. In this treatment category, there are three questions that need to be addressed: What does the patient want? How strongly does he or she want it? How much is the patient willing to invest in the process? If the patient declines treatment there may or may not be significant adverse consequences. Replacement of teeth may offer a significant benefit in the overall quality of life and in the patient's sense of self-worth, but those benefits can only be achieved if the patient desires the treatment and is willing to invest the required time, energy, and resources required to achieve it.

The first question then is "Does the patient want the missing tooth or teeth replaced?" If the patient is not interested in replacement, the dentist should be sure that the patient is aware of the possible consequences of not doing so. If the patient does

seek replacement, the dentist should review with the patient why this option is perceived as worthwhile. Is it for esthetic, functional, preventive, or other reasons? Are the patient's anticipated outcomes realistic? Follow-up questions should determine whether the patient is fully informed as to the replacement options. Does he or she have a preference for a fixed or removable appliance? Have implants been considered? Will visible metal clasps or other aspects of the appliance be esthetically acceptable? Is the patient willing to undergo adjunctive orthodontic treatment or preprosthetic surgery if necessary?

The second major question, "How strongly does the patient want the treatment?" offers a means of assessing the extent to which the patient will be willing to endure the less pleasant aspects of treatment, particularly the discomfort that may occur and the time and inconvenience required. Patients who have a strong desire for the treatment and are well informed about the risks, hazards, and possible negative consequences can be expected to be better able to adapt, more accepting of problems, and more likely to attach a high value to the outcome. Clearly, the patient who has a low tolerance for pain and who does not trust doctors may not be an ideal candidate for a full-mouth reconstruction involving extensive fixed prosthodontics.

The third major question, "How much is the patient willing to invest?" relates to the individual's willingness and ability to put time, energy, and financial resources into the process. For example, the individual on a subsistence level fixed income may not be a candidate for an implant-retained prosthesis. On the other hand, a patient with the necessary financial resources may not be willing to spend the time or undergo the inconvenience of having a dental prosthesis fabricated.

## Procedures for Replacing Missing Teeth

### Implant-Retained Prostheses

Dental implants are biologically compatible materials surgically placed within the bone to replace the roots of missing teeth. The most frequently utilized material for fabricating implants is titanium and its alloys, although use of other materials, including zirconia and tantalium, is emerging. When the titanium surface is exposed to oxygen, it forms a biocompatible coating of titanium dioxide that enables the bone cells to attach to the implant in a process called osseointegration. This process begins at the time of implant placement and continues over the life of the implant. Currently, several implant systems are available to the dentist. Typical components of an implant system include implant fixtures (body), healing caps, abutments (post), protective caps, impression copings, and (laboratory) abutment analogs and burnout copings. Each major manufacturer has its own custom design for the various components and their interlocking mechanisms (Figure 10-22).

In a **one-stage technique,** the implant fixture is surgically placed in the bone and a healing cap is screwed into place leaving the coronal portion exposed to the oral environment. After an appropriate healing time (3 to 6 months), the healing cap is removed and an impression of the fixture and the surrounding tissue (fixture level impression) is taken. An alternative approach is to place a prefabricated abutment and

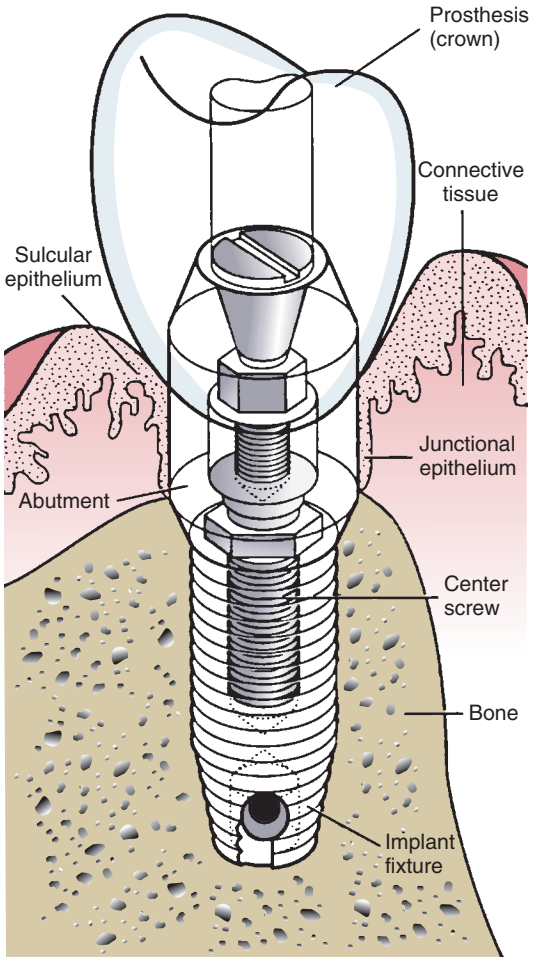


**FIG 10-22** Implant systems. (From Perry DA, Beemsterboer PL, Essex G: *Periodontology for the dental hygienist,* ed 4, St. Louis, 2014, Saunders.)

then take an impression of the abutment using a prefabricated impression coping. Subsequently, a crown, fixed partial denture, or other prosthesis is fabricated to be retained on the implant and abutment. When an implant fixture is placed in the tooth socket at the time of the tooth extraction, it is described as an **immediate placement**. If an abutment and the provisional prosthesis attached to the abutment are both placed at the time of the fixture placement, the process is described as **immediate loading.**

In a **two-stage technique,** the fixture is placed and covered with oral tissue at the first surgical appointment. The patient returns for another visit, usually 3 to 6 months later, to uncover the fixture. At that time, a fixture or abutment level impression is taken using an impression post. A restoration is fabricated in similar manner as with the one-stage technique.

For some patients and dentists, implants have become the preferred treatment option for the reconstruction of many bounded and unbounded edentulous spaces, and for fully edentulous arches. Notable advantages include improved function, preservation of remaining teeth and bone, increased stability and longevity of the prosthesis, and a realistic and

esthetically pleasing appearance. The primary disadvantages are cost, the length of the healing period during which the patient wears a temporary prosthesis, and the fact that the patient must undergo one or more surgical procedures. Usually, an 8 to 12 week waiting period is recommended between tooth extraction and implant placement in a nonimmediate placement situation. A minimum of 3 months healing time is usually recommended after fixture placement (nonimmediate loading) to allow for osseointegration of the implant fixture. With immediate placement and immediate loading these waiting periods are eliminated.

### Keys to implant decision making

**Professional considerations.** A multispecialty approach to the treatment planning of implants has some distinct advantages but is not mandatory. Depending on the local access to specialty care and the comfort level, training, and expertise of the dental professionals involved, implant treatment planning can be a team approach (at a minimum, a surgeon, a restorative dentist, and a staff team coordinator), may be the sole responsibility of a single practitioner, or may be referred by the primary provider—usually a general dentist—for selected components of the treatment. Regardless of who orchestrates the implant treatment, with certain types of patients or situations, the expertise of an oral and maxillofacial radiologist, an oral and maxillofacial surgeon, a periodontist or a prosthodontist will be valuable assets. The following listing briefly describes the professional tasks and responsibilities required in the process of evaluating, diagnosing, treatment planning, and providing implant treatment and maintenance.

- *Initial patient contact*. At the initial examination appointment the patient or the dentist may find it appropriate to raise the question of implants. The question will also arise when a patient who has been seen in a general practice for several years and whose dental condition has recently changed—perhaps with the loss of a fractured tooth—becomes a candidate for an implant. In either scenario, the general dentist provides two important functions that can prepare the way for the provision of implant services: (1) assessing the need for disease control treatment and work with the patient to establish a healthy oral condition and (2) initiating a discussion with the patient about the various implant and non-implant treatment options. If the general dentist is not directly involved with implant placement and/or implant restoration, when a determination is made that the patient both needs and desires implant services, then a referral to another practitioner for an implant consultation will be in order.
- *General health assessment*. Systemic conditions, such as poorly controlled diabetes, osteoporosis, radiation therapy to the head and neck, and immunocompromising conditions can sometimes be a contraindication to implant placement. Because cigarette smoking impairs healing and osseointegration, many practitioners will decline to place implants until the patient has stopped smoking for a period of time.
- *Assessment of the patient's desires, expectations and motivation.* The dentist must have a clear understanding of the patient's esthetic, functional, and any other desired outcomes for the treatment. Are the patient's expectations for the treatment realistic? Is it likely that they can be achieved? The dentist needs to know if there are significant time, transportation, or financial impediments. It is also important to ascertain the patient's level of knowledge about, and motivation to receive, implant services.
- Patients may have significant psychosocial issues that limit or contraindicate implant therapy. On the other hand, a patient with a severely compromised oral condition, who has tried diligently but unsuccessfully to wear a removable prosthesis in the past, may be an extremely motivated and ideal candidate for an implant prosthesis. Related issues are discussed in the following *Patient Considerations section.*
- *Assessment of the intraoral condition*. A thorough evaluation of the patient's oral condition in preparation for implant therapy is required. Site evaluation for a single tooth implant must include an assessment of bone height, width, contour, and density; mesial-distal interdental space; and interarch space. Articulated casts and photographs are a helpful adjunct and are sometimes mandatory to this process. In the esthetic zone, particular attention must be paid to the lip line and support; the shade, form, and alignment of the surrounding teeth; the facial, gingival, and bone architecture; and the height, density, and translucence of the facial gingiva.

  Intraoral assessment in preparation for patients who may need implant-retained FPDs, fixed complete dentures, or overdentures must include all of the preceding items plus evaluation of the TMJ, maxillomandibular relationship, vertical dimension of occlusion, occlusal plane, arch form and size, occlusal relationships, and guidance patterns in excursive movements. When anterior esthetics are involved, the dentist must evaluate the lip support and position, midline, smile line, and gingival display. The location and size of the edentulous areas must be considered because they will have a significant effect on the placement of the implants and the prosthesis design. Any natural teeth and/or existing prostheses remaining in the arch must be assessed for integrity, stability, and prognosis. Decisions about any implant prostheses must be made in the context of the patient's overall comprehensive restorative plan and should never be made in isolation. Mounted diagnostic casts are usually a necessity.
- *Radiographic imaging*. Single tooth implants will necessitate, at a minimum, periapical and panoramic radiographs. Patients to receive multiple implants—especially if implants are to be placed in unbounded edentulous spaces—will usually be best served by use of advanced imaging techniques such as computed tomography. Radiographic images are required to establish the relationship of the considered implant site or sites to various anatomic structures, including the maxillary sinus, nasal cavity, mental foramen, and mandibular canal. Surgical stents with radiographic markers are useful in multitooth edentulous sites and are mandatory when implant fixtures are to be placed in fully edentulous arches. Advances in computer technology have allowed the practitioner to

integrate radiographic and surgical stents into one. Simplant is one example of software that allows the dentist to plan implant placement, specify the location for the implants, and create a laboratory fabricated surgical stent to be used by the dentist when placing the dental implants.

- *Finalize the plan with informed consent.* After a detailed analysis is conducted of the issues described earlier and a clear perspective on the patient's wishes is obtained, the dentist will need to define the range of implant-based and non-implant-based options. It may be helpful to generate a diagnostic wax-up, diagram, or rendering of the expected result, or a corrected digital image to help the patient better understand what can be expected. The consent discussion follows. Consultation should be implemented between the surgeon, restorative dentist, and other team members as to the number and position of implants, prosthesis design, the need for grafting or other surgical procedures, and the need for provisional restorative care. The final design of the prosthesis will depend on many factors including the location and physiologic characteristics of the edentulous sites; the experience of the general dentist, the specialists, and the laboratory technician involved in the case; and the accessibility of surgical, restorative, and supportive treatment for the patient. When the treatment plan has been established and approved by the patient, it will be beneficial to present the patient with a copy of the treatment plan, which includes all procedures in appropriate sequence, costs for each component, and identification of all dental care providers to be involved in the process. Use of a consent form explaining details, limitations, and possible complications of treatment is recommended for all implant patients, and is essential for exacting patients and those with high expectations.
- *Monitor and coordinate the treatment.* Because multiple steps and, and in many cases several providers, will be involved in the process of planning and executing implant therapy, someone will need to coordinate that activity. This role can be filled by the dentist, but is often most efficiently and effectively implemented by a staff person—a team coordinator. This is especially true when several dental care providers are involved. Appointments may need to be made with the different providers and coordinated with the dental laboratory. These must be timed and sequenced appropriately. Surgical kits and necessary implant parts must be ordered to be available as needed. The patient may have questions or concerns that arise during the course of treatment, and these will need to be addressed by the dental team.
- *Provide supportive care during and after implant treatment.* Implant surgical complications are usually managed by the surgeon (periodontist, oral and maxillofacial surgeon, or general dentist) and restorative complications are usually attended to by the general dentist or prosthodontist who will be providing the final reconstruction. Provisional restorations or prostheses may need to be fabricated, adjusted, or repaired during any phase of implant therapy, including planning, presurgical, surgical, or postoperative care, or during prosthodontic reconstruction. The implant surgeon will usually take responsibility for any issues or problems relating to the implant fixture, and the restorative dentist can usually address any needs related to the abutment, crowns, or prostheses, but these roles can be interchangeable.

After placement of the definitive prosthesis, the restorative dentist will usually accept primary responsibility for maintaining the reconstruction and providing any indicated supportive care. If questions arise about the stability of the fixture or the hard and soft tissue response to the implant, referral back to the implant surgeon is indicated. The patient will need to be seen at regular intervals by a general dentist and/or periodontist for maintenance therapy. Ideally, probing around the implant should be done with a plastic probe to minimize the potential for scratching the fixture or abutment. Similarly only plastic scalers should be used to remove accretions from the implant surfaces. Also, it is prudent to check occlusal contacts with a thin articulator paper to assess and evaluate intensity of occlusal contacts. Heavy occlusal contacts can be detrimental to the stability of dental implants.

**Patient considerations.** The consent discussion is an essential part of the process of formulating any treatment plan. When implants are a viable treatment option, there are typically many restorative options to choose from and because the treatment is more complex, and often being carried out by several dental specialists, the consent discussion must be both extensive and detailed. Usually, the dentist will begin the process by gaining an understanding of the patient's treatment desires, expectations, and concerns. The patient should be offered all reasonable treatment options, both implant and nonimplant based. The patient must be informed about the risks and benefits associated with each of the options and the expected outcomes of the proposed treatment. This may be difficult for the patient to conceptualize and appreciate. If the patient has had previous experience with a conventional removable partial or completed denture, he or she is more likely to appreciate the benefits of an implant-retained prosthesis. Information must be provided about how the treatment will be staged, what each care provider will be doing at each stage of the treatment, how long each stage will take, and what the sequence of the treatment visits will be. The patient should also understand that he or she may need to wear a provisional prosthesis and that adjustments and relines may be necessary during transitional periods while extraction sites are healing and osseointegration is occurring.

A discussion of fees is an important part of the implant planning. The patient must be given a realistic estimate, if not a firm commitment, relating to the fees to be charged by the various providers. These fees will often include implant diagnostic evaluation, imaging, fixture placement, provisionalization and placement of any abutments, and the final prosthesis. If adjunctive surgical procedures are indicated, the patient will need to know what those fees may be as well. Initially, it may appear that placement of a single tooth implant-retained crown is more expensive than a conventional FPD in the same location. However, if a foundation, root canal treatment, and/or crown lengthening procedure are required on one or both of the abutment teeth for the FPD, that difference

may be negated. Furthermore, given the longer expected usefulness of the implant crown, the implant may be a better option for the patient in the long run. (See Chapter 3 for a more extensive discussion of this topic.)

Some important questions and issues that must be addressed with the patient include: Is the individual committed and motivated to receive implant therapy? If not, what are the perceived barriers? Can they be overcome? Is the patient averse to receiving a surgical procedure? Is he or she willing to wait for the period of time required to heal before placement of the final restoration? Will the patient be able to tolerate and function with the provisional prosthesis? Is he or she capable of making the financial commitment? Will he or she be willing and able to maintain the prosthesis, carry out daily oral self-care instructions, and return to the dental office for regular periodic visits and supportive therapy?

In short, this can be a difficult and confusing process for the patient. The dental team will need to be supportive, understanding, and forthright in answering all of the patient's questions and concerns. More than one visit may be necessary for the patient to weigh and discuss all the options and to select the plan that is most appropriate. The beneficial outcome of this process will be a committed, informed patient who is confident and enthusiastic about the treatment plan, eager to receive treatment, and appreciative of its benefits.

A variety of implant-retained prosthodontic options are available, both fixed and removable. Five types of implant retained prostheses are described here.

***Implant-retained single crown.*** The implant-supported single crown is a prosthetic replacement for a missing tooth held in place by a single implant (Figure 10-23). An implant should be the primary option when replacing a single missing tooth, especially in cases in which the adjacent teeth are sound. The advantage of an implant-retained crown compared with a fixed partial denture is that it is often more stable, has a longer life expectancy, and is easier for the patient to clean and maintain because it is not attached to the adjacent teeth. The fact that healthy tooth structure on the adjacent teeth need not be sacrificed in the preparation of the abutment, as would be the case for an FPD, is also an important benefit and a compelling reason to choose an implant.

Placement of a single tooth implant in the esthetic zone can be a challenge and requires special attention, including careful evaluation of the patient's smile line, position and angulation of adjacent teeth relative to each other and to the bone base, gingival display, existing tissue contours, and the thickness of the free gingiva. To achieve an emergence profile that resembles that of a natural tooth, implant fixtures are generally placed more apically in the anterior region (approximately 2–3 mm below the gingival margin). Inadequate bone density or volume, insufficient mesial-distal or interarch space, and mobility of adjacent teeth can be contraindications to the placement of a single tooth implant in the esthetic zone. It is particularly important to discuss these limitations with the patient before proceeding with implant placement. Sometimes these issues can be overcome with limited tooth movement orthodontics or recontouring of the proximal surface of an adjacent tooth to increase mesial-distal space. Periodontal surgery (GBR) may be needed to establish adequate ridge form and density. In these instances, the patient must be informed at the outset about the nature and cost of any necessary adjunctive treatment.

It can also be a challenge to match the soft tissue contours of the adjacent natural teeth to those around the implant. If the soft tissue contours are deficient before implant surgery, the patient must be advised that the final soft tissue contours will probably not look natural. Esthetic periodontal surgery before implant placement, at the time of implant placement, or with a separate surgical procedure later can often help create a more pleasing gingival architecture. Also, advances in dental porcelain now allow the use of pink porcelain to mimic soft tissue in restorations—creating the illusion of the presence of gingiva and masking the appearance of increased crown height.

***Implant-retained fixed partial denture.*** An implant-retained FPD is, as the name suggests, an FPD that is retained on implants rather than natural teeth (see Figure 10-23). The FPD is either screwed directly to the implant fixtures or cemented onto the implant-retained abutments. Some general principles apply to the use of implant-retained FPDs: more implants are needed where heavier occlusal forces are expected; fewer implants are generally needed in the anterior region or when the implants oppose a removable prosthesis; and implant-retained FPDs in the esthetic zone will need the same detailed consideration as noted for single implant-retained crowns.

The primary advantages of an implant-retained FPD over a natural tooth-borne FPD are that the implant prosthesis will not develop caries, is less likely to fracture, and is less likely to be subject to progressive periodontal disease. It therefore also has a better long-term prognosis. In individuals with a long edentulous span, it may be necessary to reconstruct both soft and hard tissue. In this situation, hybrid restorations combining the features of both fixed and removable prosthodontics and a more advanced type of implant abutment, such as the multiunit abutment, can be used. These restorations can be fabricated with a range of design options including incorporating resin teeth with a metal or acrylic substructure.

***Implant-retained removable partial denture.*** Tooth-borne removable partial dentures may not be an option if the proposed abutment teeth have an unfavorable crown-to-root ratio, have significant loss of clinical attachment, or need extensive restorative work with a less than ideal prognosis. Furthermore, implant retained fixed partial dentures may not be a viable option if the prosthesis will need to replace a moderate (or greater) amount of lost ridge and soft tissue—a frequent occurrence with an unbounded edentulous space in the lower arch. In this situation, the presence of one or two implants can serve as retention to a removable partial denture with the primary advantage that this removable appliance will not induce additional loading force on what may be an already compromised abutment tooth. These prostheses can also be fabricated with a wide variety of materials and designs. (See *Suggested Readings* at the end of this chapter.)

***Implant-retained fixed complete denture.*** Two treatment options are available for the completely edentulous patient who

**FIG 10-23** Implant-retained prostheses. **A-C**, Cement-retained implant crowns; **D** and **E**, screw retained implant crown; **F-H**, implant retained fixed partial denture; **I-K**, fixed (detachable) removable implant-retained prosthesis. (**A-E** and **I-K**, Courtesy Dr. Carlos Barrero; **F-H**, courtesy Dr. Ibrahim Duqum, Chapel Hill, N.C.)

prefers a nonremovable prosthesis: a hybrid prosthesis or a fixed metal ceramic restoration. The **hybrid prosthesis**, composed of a cast alloy framework with denture teeth and resin, compensates for moderate bone loss and missing soft tissue contours. When there is minimal loss of bone, the metal ceramic restoration can be an esthetically pleasing alternative. In either case, the prosthesis is typically attached to the implant abutments with screws and the patient cannot remove it for cleaning or other purposes. This type of prosthesis is substantially more stable and retentive than conventional complete dentures. Other advantages of this treatment option as compared with conventional complete dentures include less food entrapment; no need for denture relines, rebases, and/or denture adjustments; and a far greater anticipated longevity of the prosthesis. From a psychologic perspective, many patients prefer a fixed implant denture because it functions more like natural teeth and avoids the stigma, embarrassment, and inconvenience of a conventional denture. As with other forms of implant reconstruction, the biggest disadvantages are the time required for office visits, the time required for osseointegration, and the cost, which increases with each additional implant. The factors that are most influential in ensuring the success of the treatment are case selection, and the experience and training of restorative dentist and surgeon.

***Implant-retained overdenture.*** The implant-retained overdenture can be an excellent treatment option and it is considered

the standard of care for the edentulous patient with severe bone resorption. Most commonly, it is a complete denture that is supported by, but not definitively affixed to, two, three or four implants (Figure 10-24). Currently, the most common approach to connecting the denture to the implants is by utilizing an ERA or Locator replaceable attachment embedded inside the denture base. Because fewer implants are needed, the overdenture is a less expensive option for the edentulous patient than an implant-retained fixed complete denture. Compared with a conventional complete denture, it is generally more comfortable, more stable and more retentive. For many patients, facial esthetics will be enhanced by support of the lip with labial flanges. The ability to remove the prosthesis at night also carries significant benefits. With daily cleaning, plaque can be effectively removed, malodors eliminated, and candidiasis and denture stomatitis eradicated or avoided. Nighttime removal also ensures that the patient can avoid any destructive forces resulting from nocturnal parafunctional habits. Another advantage of this design is that the retentive collars are easy to replace when fatigued.

In selected cases, implants may be connected by a metal bar and the bar, or connected individual attachments, serve(s) to retain the denture. As with the individual ERA or Locator attachments, this type of overdenture can be removed and reinserted by the patient. The implant-supported overdenture with a bar attachment provides an additional measure of retention that is especially beneficial in cases of severe ridge atrophy. This prosthesis does require more vertical height (and corresponding interarch space) than an individual attachment complete denture. It also necessitates more sophisticated laboratory technique and support and, consequently, is also more expensive for the patient.

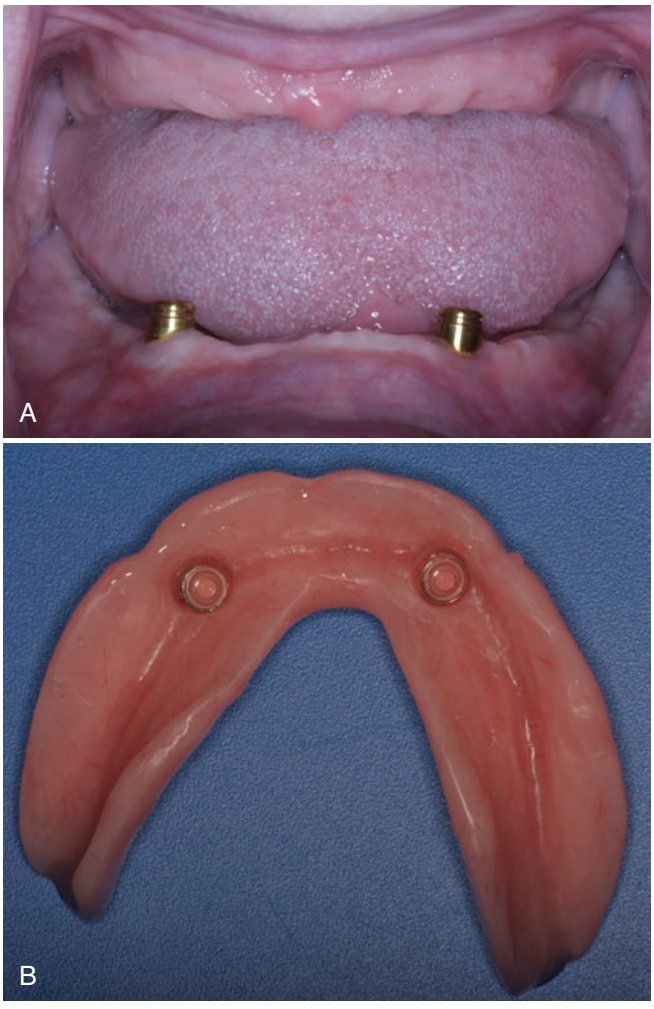


**FIG 10-24** Two implants with Locator attachments **(A)** for retaining a complete denture **(B)**. (Courtesy Dr. Carlos Barrero.)

## Fixed Partial Dentures (FPDs)

For decades, FPDs have provided a stable, reliable, and functional means of restoring bounded edentulous spaces (Figure 10-25). An FPD usually consists of at least two **retainers** attached to one or more artificial teeth, or **pontics**. The retainers with pontics are then permanently cemented to abutment teeth. FPDs are usually fabricated of cast metal or PFM, although all-ceramic and reinforced resin versions are also available. The retainers for most FPDs are full coverage restorations. A notable exception is the resin-bonded bridge, for which the retainers are etched metal wings bonded directly to the abutment teeth (Figure 10-26).

The major advantage of an FPD is that the replacement teeth are fixed in place and provide a stable and natural-appearing alternative to a removable prosthesis. An FPD generally provides good esthetics, function, and preservation of arch form. Patients must keep the FPD plaque free because the abutment teeth remain susceptible to recurrent caries and periodontal disease. The presence of the pontic is often an impediment to oral self-care and can be responsible for increased plaque retention. An FPD may compromise the abutment teeth, making them susceptible to future treatment needs such as root canal therapy or even extraction (necessitated because of a tooth or root fracture). An FPD is not indicated if the restorative and periodontal condition of the abutment teeth cannot support it.

With the increased use of an implant-retained crown as a replacement for a single missing tooth, the conventional FPD is now used more sparingly. There are still some notable indications for the FPD, however. Patients who have a bounded edentulous space and who for medical reasons, financial reasons, or other reasons are not good candidates for implants may be good candidates for an FPD. For patients who have an aversion to oral surgical procedures of any kind, an FPD may also be an appropriate alternative. The prime dental indication for placing an FPD is the patient whose abutment teeth are heavily restored and who is otherwise a good candidate for full coverage restorations on those teeth.

## Removable Partial Dentures

A typical **removable partial denture** (RPD, partial denture) consists of a cast framework with an acrylic base and replacement teeth (Figure 10-27). The forces on the partial denture are transferred to the abutment teeth via the framework and clasps, and to the edentulous ridge from the acrylic bases. Relatively inexpensive and stable, this prosthesis can provide a measured level of esthetics and function. Some

**FIG 10-25** Fixed partial dentures (FPD). **A,** All-gold FPD; **B,** framework try-in; **C,** cemented FPD; **D–G,** all-ceramic FPD. (**B** and **C** Courtesy Dr. Carlos Barrero.)

**FIG 10-26** Resin-bonded fixed partial denture. (Courtesy Dr. Carlos Barrero.)

patients may find a partial denture unappealing because it must be removed for cleansing and maintenance of tooth and tissue health and because it may have visible metal clasps. The abutment teeth remain at risk for caries and increased mobility. With extended use, particularly in the absence of adequate oral self-care, the RPD may cause traumatic ulcers, stomatitis, or epuli formation and may accelerate bone atrophy in the edentulous areas. The prosthesis itself is prone to occlusal wear, fatigue of the clasps, fracture of the cast metal components or acrylic saddles, or loss of denture teeth. The most notable disadvantage, however, is the significantly reduced function when compared with natural teeth, FPDs, or implant-retained prostheses. If the patient will accept a removable partial denture, but does not want to have visible metal clasps, tooth color clasps made of composite resin can be used to retain these prostheses.

If the patient has an allergy or aversion to the metal components in removable partial dentures, an RPD can be fabricated in acrylic. In general, an all-acrylic RPD will be less retentive, less durable, more prone to fracture, and more likely to entrap plaque and allow caries development. It also has a shorter expected life span than a cast RPD. Valplast is a flexible acrylic (PMMA) with nylon fibers and has the same deficits as the conventional heat cured all-acrylic RPD. Its primary use is as an interim prosthesis for patients who have multiple undercuts because of recession and loss of clinical attachment. A more recent alternative is an RPD made entirely in reinforced composite.

## Complete Dentures

A complete denture is a removable acrylic replacement for teeth, soft tissue, and bone lost in an entire dental arch (Figure 10-28). Complete dentures are relatively economical, easy to fabricate and repair, and provide a level of esthetics and function acceptable to many patients. Common complaints by patients include lack of denture retention and reduced ability to taste and chew as compared with natural

**FIG 10-27** Removable partial dentures. (Courtesy Dr. Carlos Barrero.)

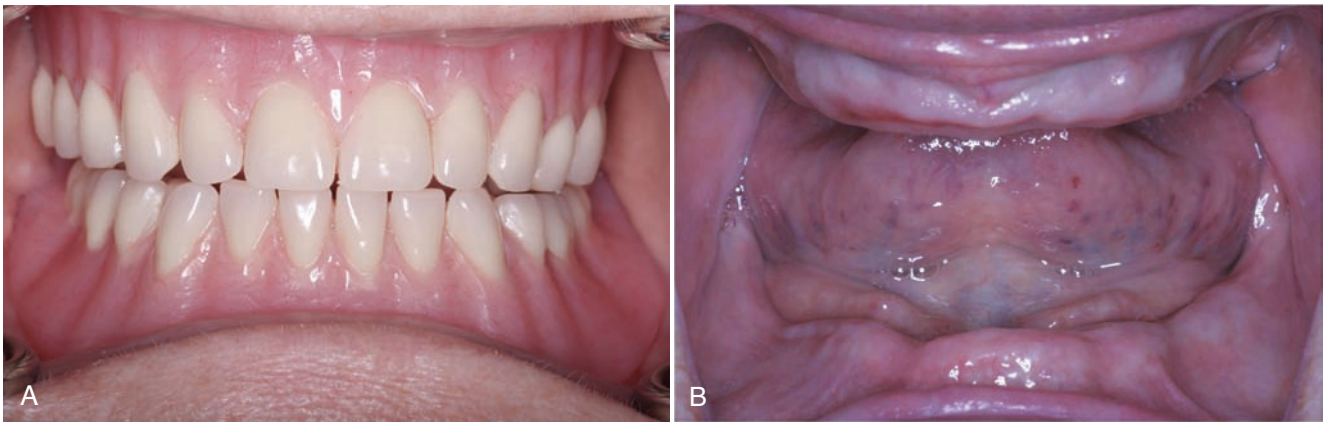


**FIG 10-28** Edentulous patient with **(A)** and without **(B)** complete dentures. (Courtesy Dr. Carlos Barrero.)

teeth. It may be possible to reduce these problems by retaining a few selected teeth in an arch to serve as overdenture abutments. These are endodontically treated roots with a capping restoration (direct-fill restoration or gold coping), which may also include a retentive (e.g., Locator or ERA) attachment on which the denture rests and attaches. Such abutments provide increased stability to the denture as compared with the traditional full denture and also help to preserve the residual ridge. Some patients report retaining a proprioceptive "feel" on chewing with a natural tooth overdenture. A disadvantage of this type of overdenture is that the retained natural teeth remain vulnerable to caries and/or periodontal disease. For patients who are fully edentulous and who want a more retentive and stable alternative to a conventional complete denture, the implant-retained overdenture is usually the best solution.

Typical treatment options for the conditions relating to missing teeth are summarized in eTable 10-6.

## eTABLE 10-6 Alternatives for Replacing Missing Teeth

| Condition | Treatment Options | Keys to Decision Making |
|---|---|---|
| Bounded edentulous space | No treatment | Patient not interested in replacing missing teeth; no compelling need for replacement; patient has active caries and/or periodontal disease |
| | Composite retained tooth (e.g., extracted tooth crown, denture tooth, porcelain pontic) | Patient has immediate need for replacement of a single anterior tooth and (natural or prosthetic); active oral disease or general health problems or lack of financial resources preclude definitive replacement; proximal surfaces on adjacent teeth must be suitable for bonding |
| | Temporary removable partial | Patient has immediate esthetic or functional need for replacement of one or more teeth in same arch; general health, financial resources, and/or presence of oral disease preclude definitive treatment at this time |
| | Resin-bonded bridge | Single tooth (or rarely multiple teeth) replacement where implants are contraindicated or declined, and a fixed prosthesis with minimal tooth preparation is sought; serves as a less expensive alternative to implants or a FPD; should not be used in the presence of heavy occlusal forces; indicated where adjacent teeth have only small or no restorations |
| | Fixed partial denture (tooth-borne) | Presents most durable fixed alternative when implants contraindicated or rejected by patient, can be used with multiple missing teeth if sufficient abutment support is available; various design options make optimal esthetics and function possible; usually requires full-crown coverage on the abutments |
| | Removable partial denture (tooth-borne) | Most common alternative when implants are contraindicated or rejected by patient and a FPD is not an option (e.g., span too long; insufficient abutment support); patient must be willing to accept removable prosthesis and presence of clasps |
| | Implant retained crown or FPD | Optimal treatment choice for most bounded edentulous spaces; requires motivated patient with financial means, adequate bone support, and sufficient interdental and interarch space |
| Unbounded edentulous space: partial edentulism | No treatment | Patient not interested in replacing missing tooth/teeth; the occlusion is stable and need for replacement is not compelling |
| | Temporary removable partial | Patient needs and wishes to have replacement, but oral disease not yet under control; denture retention and fit may be less than optimal, and prosthesis cannot be used long term |
| | Removable partial denture (tooth-borne) | Most frequently used treatment when implants contraindicated or rejected by patient; patient must be willing to accept removable prosthesis and presence of clasps; can be stable, functional long-term solution for patient with limited financial resources; can be fabricated as an overdenture with retained roots |
| | Precision attached removable partial denture (tooth-borne) | Removable appliance with higher degree of permanence and stability, allows concealed clasps; requires motivated, dexterous patient with adequate financial resources seeking optimal treatment in situation in which implants are not feasible |
| | Implant-retained crown, crowns, or fixed or removable partial denture | Patient seeks implant therapy and has sufficient time and financial resources, high motivation, and no health contraindications; requires adequate bony base to support implants and prosthesis |
| | Natural tooth overdenture | Patient wishes to retain teeth, but compromised abutments will not support a conventional cast RPD; caries and periodontal disease must be controlled; root canal treatment may be required; multiple restorative options for abutments include direct-fill restoration, cast coping, magnet, prefabricated attachment, and cast or milled bar retainer |

**eTABLE 10-6 Alternatives for Replacing Missing Teeth—cont'd**

| Condition | Treatment Options | Keys to Decision Making |
|---|---|---|
| The edentulous arch (or partially dentate and becoming edentate) | Conventional complete denture | Patient with edentulous arch seeking simple, inexpensive treatment; implants contraindicated, or patient declines implant option at this time |
| | Temporary immediate denture | Partially dentate patient requests denture placement on same day as remaining teeth extracted; significant ridge resorption anticipated (e.g., extractions necessitated by advanced periodontal disease); patient understands need to fabricate definitive denture within (3-6) months |
| | "Classic" immediate denture (conventional definitive denture construction) | Partially dentate patient requests placement of denture on same day as remaining teeth extracted; significant ridge resorption not anticipated (extractions necessitated by caries); patient understands probable need to reline denture in 6 to 12 months |
| | Implant-retained denture | Patient seeks implant-retained prosthesis; becoming the default treatment because of improved denture retention, stability and function – especially in mandibular arch; financial cost and time commitment by patient higher than with conventional denture |

## CONCLUSION

This chapter focuses on the range of definitive treatment options available to the patient and dentist, along with a review of the many patient- and dentist-based considerations that will have an effect on dental treatment planning decisions. Chapter 4 provides guidance on how these various treatments might be sequenced in the definitive phase of care. Practical experience on how to integrate treatment options and formulate complex treatment plans can be obtained from the cases on the Evolve site. The discussion of treatment options found in this chapter also serves as an information base for the chapters in Section IV of the book, in which dental treatment for patient groups who require special consideration are presented. At the conclusion of the definitive phase, the patient's care moves to the maintenance phase, which is discussed in Chapter 11.

## REVIEW QUESTIONS

- In what situations is definitive periodontal care indicated?
- What treatment options are available for the adult patient with malposed teeth?
- When is orthognathic surgery indicated?
- What is the difference between an occlusal guard and an occlusal splint? What are the indications for each?
- In what situations would the material of choice for restoring a posterior tooth be amalgam? Composite resin? A gold or ceramic crown?
- List treatment options for changing tooth color and sort them by order of invasiveness. When might you be cautious about providing these services for a patient?
- What are some reasons, other than pain, for providing endodontic therapy?
- When would you recommend to a patient *not* to have third molars removed?
- When would you recommend preprosthodontic surgery?
- With regard to implant placement, when might you consider immediate placement? Immediate loading?
- What are the challenges in placing a single tooth implant in the esthetic zone?
- What *professional considerations* have a bearing on whether and how to replace a missing tooth or teeth? What *patient considerations* have a bearing on these questions? How is the final decision made?

## SUGGESTED PROJECT

Design a "treatment options list" as a guide for patients in your practice setting. Include a complete array of procedures provided by your practice. Descriptors should include (but need not be limited to) charges, number of visits, expected length of service, and advantages and disadvantages to the patient.

## REFERENCES


1. Segelnick SL, Weinberg MA: Reevaluation of initial therapy: when is the appropriate time? *J Periodontol* 77(9):1598–1601, 2006.
2. American Academy of Periodontology: Drug-associated gingival enlargement, *J Periodontol* 75(10):1424–1431, 2004.
3. American Academy of Periodontology: Systemic antibiotics in periodontics, *J Periodontol* 75(11):1553–1565, 2004.
4. Matesanz-Pérez P, Garcia-Gargallo M, Fiquero E, et al: A systematic review on the effects of local antimicrobials as adjuncts to subgingival debridement, compared with subgingival debridement alone, in the treatment of chronic periodontitis, *J Clin Periodontol* 40(3):227–241, 2013.
5. Caton J, Ryan ME: Clinical studies on the management of periodontal diseases utilizing subantimicrobial dose doxycycline (SDD), *Pharmacol Res* 63(2):114–120, 2011.
6. Beauchamp J, Caufield PW, Crall JJ, et al: Evidence-based clinical recommendations for the use of pit-and-fissure sealants, *J Amer Dent Assoc* 130(3):257–267, 2008.
7. Ritter AV: Posterior composites revisited, *J Esthet Rest Dent* 20(1):57–67, 2008.
8. Haveman CW, Summitt JB, Burgess JO, et al: Three restorative materials and topical fluoride gel used in xerostomic patients: a clinical comparison, *J Am Dent Assoc* 134(2):177–184, 2003.
9. McComb D, Erickson RL, Maxymiw WG, et al: A clinical comparison of glass ionomer, resin-modified glass ionomer and resin composite restorations in the treatment of cervical caries in xerostomic head and neck radiation patients, *Oper Dent* 27(5):430–437, 2001.
10. Boushell LW, Ritter AV: Ceramic inlays: a case presentation and lessons learned from the literature, *J Esthet Restor Dent* 21:77–88, 2009.
11. Croll TP: Enamel microabrasion: observations after 10 years, *J Am Dent Assoc* 128:45S–50S, 1997.
12. Boushell LW, Ritter AV, Garland GE, et al: Nightguard vital bleaching: side effects and patient satisfaction 10 to 17 years post-treatment, *J Esthet Rest Dent* 24(3):211–219, 2012.
13. Plotino G, Buono L, Grande NM, Pameijer CH, et al: Nonvital tooth bleaching: a review of the literature and clinical procedures, *J Endod* 34(4):394–407, 2008.
14. Swift EJ, Friedman MJ: Porcelain veneer outcomes, part 1, *J Esthet Rest Dent* 18(1):54–57, 2006.
15. Ozer F, Mante FK, Chiche G, et al: A retrospective survey on long-term survival of posterior zirconia and porcelain-fused-to-metal crowns in private practice, *Quintessence Int* 45(1):31–38, 2013.
16. Rubinstein RA, Kim S: Long-term follow-up of cases considered healed one year after apical microsurgery, *J Endod* 28(5):378–383, 2002.

17. Boyne PJ, Hersford AS: Distraction osteogenesis of the nasal and antral osseous floor to enhance alveolar height, *J Oral Maxillofac Surg* 62(9 Suppl 2):123–130, 2004.
18. Araújo MG, Lindhe J: Dimensional ridge alterations following tooth extraction: an experimental study in the dog, *J Clin Periodontol* 32(2):212–218, 2005.
19. Ten Heggeler JM, Slot DE, Van der Weijden GA: Effect of socket preservation therapies following tooth extraction in non-molar regions in humans: a systematic review, *Clin Oral Implants Res* 22(8):79–88, 2011.
20. Rosen PS, Summer R, Mellado JR, et al: The bone-added osteotome sinus floor elevation technique: multicenter retrospective report of consecutively treated patients, *Int J Oral Maxillofac Implants* 14(6):853–858, 1999.

## SUGGESTED READINGS

### Periodontics and Periodontology

American Academy of Periodontology: 1996 world workshop in periodontics, *Ann Periodontol* 1(1):1–939, 1996.
Lindhe J, Lang NP, Karring T: *Clinical periodontology and implant dentistry,* ed 5, Oxford, 2008, Blackwell.
Newman MG, Takei H, Klokkevoid PR, Carranza FA: *Carranza's clinical periodontology,* ed 12, St. Louis, 2014, Saunders.

### Orthodontics

Proffit W, Fields H: *Contemporary orthodontics,* ed 5, St Louis, 2012, Mosby.

### Occlusion

Dawson P: *Functional occlusion: from TMJ to smile design,* St. Louis, 2006, Mosby.
Okeson J: *Management of temporomandibular disorders and occlusion,* ed 7, St. Louis, 2012, Mosby.

### Single Tooth Restorations and Dental Materials

Anusavice K, Shen C: *Phillips' science of dental materials,* ed 12, St. Louis, 2012, Elsevier.
Heymann HO, Swift EJ, Ritter AV: *Sturdevant's the art and science of operative dentistry,* ed 6, St. Louis, 2012, Elsevier.
Sakaguchi RL, Powers JM: *Craig's restorative dental materials,* ed 13, St. Louis, 2011, Mosby.

### Esthetic Dentistry

Aschheim KW: *Esthetic dentistry: a clinical approach to techniques and materials,* ed 3, St. Louis, 2014, Elsevier.
Chu SJ, Devigus A, Paravina R, Mieleszko A: *Fundamentals of color: shade matching and communication in esthetic dentistry,* Chicago, 2011, Quintessence.
El Askary AES: *Fundamentals of esthetic implant dentistry,* ed 2, Oxford, 2008, Blackwell.
Freedman GA: *Contemporary esthetic dentistry,* St. Louis, 2012, Elsevier.
Geissberger M: *Esthetic dentistry in clinical practice,* Oxford, 2010, Blackwell.
Goldstein R: *Esthetics in dentistry* (2 vols), 2014, Google eBook.
Terry DA, Geller W: *Esthetic and restorative dentistry: material selection and technique,* ed 2, Chicago, 2013, Quintessence.

### Endodontics

Hargreaves KM, Cohen S: *Pathways of the pulp,* ed 10, St. Louis, 2010, Mosby.
Torabinejad M, Walton R, Fouad A: *Endodontics: principles and practice,* ed 5, St. Louis, 2014, Elsevier.

### Oral and Maxillofacial Surgery

Hupp JR, Tucker M, Ellis E: *Contemporary oral and maxillofacial surgery,* ed 6, St. Louis, 2013, Elsevier.
Miloro M, Ghali GE, Larsen P, Waite P: *Peterson's principles of oral and maxillofacial surgery,* ed 3, Shelton, CT, 2012, People's Medical Publishing House.
White RP, Proffit WR, Sarver DM: *Contemporary treatment of dentofacial deformity,* St. Louis, 2002, Mosby.

### Prosthodontics and Implants

Carr AB, Brown DT: *McCracken's removable partial prosthodontics,* ed 12, St. Louis, 2010, Mosby.
Misch CE: *Contemporary implant dentistry,* ed 3, St. Louis, 2007, Mosby.
Misch CE: *Dental implant prosthetics,* ed 2, St. Louis, 2014, Mosby.
Palmer RM, Howe LC, Palmer PJ: *Implants in clinical dentistry,* ed 2, London, 2011, Informa.
Rosenstiel S, Land M, Fujimoto J: *Contemporary fixed prosthodontics,* ed 5, St. Louis, 2015, Mosby.
Sandowsky SJ, Bedrossian E: Evidence-based criteria for differential treatment planning of implant restorations for the partially edentulous patient, *J Prosthodont* 22(4):319–329, 2013.
Sarmet DP, Peshman, B: *Manual of dental implants,* ed 2, Hudson, OH, 2009, Lexicomp.
Shillingburg H, et al: *Fundamentals of fixed prosthodontics,* ed 4, Chicago, 2012, Quintessence.

11

# Maintenance Phase of Care

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http://evolve.elsevier.com/Stefanac/diagnosis/

## CHAPTER OUTLINE


**Posttreatment Assessment**
- Objectives for the Posttreatment Assessment
- Elements of the Posttreatment Assessment
- Documenting the Posttreatment Assessment

**Rationale for Including a Maintenance Phase in the Treatment Plan**
- Address Ongoing Patient Needs
- Patient Centered Benefits
- Practice Management Benefits

**Issues Typically Included in the Maintenance Phase**
- General Health Considerations
- Oral Homecare Instructions
- Oral Prophylaxis
- Caries Control
- Restorations and Prostheses
- Periodontal Maintenance
- Implant Assessment
- Endodontic Reevaluation
- Management of Chronic Oral Soft Tissue Disease
- Management of Radiographically Evident Hard Tissue Abnormalities (Other Than Caries or Periodontal Disease)
- Orthodontic Assessment by the General Dentist
- Radiographic Images
- Elective Treatment
- Recall Interval

**Documenting the Maintenance Phase Plan**

**Recall Visit**
- Evaluation
- Therapy
- Planning for Current and Future Needs
- Progress Note

**Conclusion**


After completion of definitive phase therapy, there will be remaining issues that must be addressed and previously rendered treatment that must be reevaluated. Some of these concerns will need attention for as long as the dentist-patient therapeutic relationship exists. In addition to their importance to patient care, good **maintenance phase** plans provide the patient-specific elements essential to the development of an organized, practice-wide system of periodic care that serves as the backbone of a successful and productive dental practice.

Although this aspect of the treatment plan may seem less important at the outset, the maintenance phase represents a critical component of any complex treatment plan. In many cases, the long-term success or failure of the plan depends on it. As this chapter unfolds, it will become clear why the dentist should discuss long-term periodic care with the comprehensive care patient. Furthermore, the rationale for initiating this discussion at the time that the original treatment plan is presented will also become apparent.

Prevention of future problems is, of course, the guiding principle of the maintenance phase. The astute practitioner works throughout all phases of treatment to educate the patient in strategies for maintaining a healthy oral condition and preventing future oral disease. Certain aspects of a systemic phase may include activities that are preventive in nature. The acute phase may include treatment that has the effect of preventing disease progression. The disease control phase, by its nature, is preventive in orientation, and numerous references to preventive therapies are made in Chapter 9. Nevertheless, significant patient education and the reinforcement of earlier oral homecare instruction will occur primarily during maintenance phase visits. For that reason, preventive concepts and preventive therapy are emphasized in this chapter. The reader is reminded that it would be shortsighted and inappropriate for the practitioner to make prevention primarily the responsibility of the hygienist and to address it solely in the maintenance phase. Prevention must be the responsibility of the entire dental team and must be carried out throughout the treatment process.

The maintenance phase must be flexible and individualized, with timing and content specifically tailored to each patient's needs. Although formulated at the treatment planning stage, it will have been modified during the disease control and definitive treatment phases and will take its final form at the posttreatment assessment, which is discussed in the following section. The dentist implements maintenance phase care through the periodic visit (discussed in section, *Recall Visit*). The terms **periodic visit** or **recare visit** are used

interchangeably with **recall visit.** The American Dental Association (ADA)–sanctioned procedure coding system uses the designation **periodic oral evaluation**. Consistent with that perspective, the terms **periodic examination** and **periodic visit** are used in this text.

## POSTTREATMENT ASSESSMENT

The posttreatment assessment is a dedicated, structured appointment scheduled at the conclusion of the disease control phase of treatment, if the original plan includes disease control, and at the conclusion of the definitive phase. The purposes of the assessment are to evaluate the patient's response to treatment, comprehensively assess current oral health status, determine any new treatment needs, and develop a specific plan for future treatment. If accomplished during the first periodic evaluation and visit, the posttreatment assessment will include oral health instruction, selected scaling as needed, and oral prophylaxis.

Most colleges of dentistry have developed a formalized process for the clinical examination that will be made when the patient is about to exit the patient care program. The following discussion uses one such system as an example. Because each practice or institution will have unique needs, the decision regarding development of a **posttreatment assessment protocol** will be made on an individual basis. Whatever mechanism the dentist decides on, the emphasis will be on the importance of engaging the patient in a comprehensive reevaluation and reassessment at the conclusion of the disease control phase of treatment and/or at the conclusion of the entire plan of care. Many practitioners prefer *not* to formalize this process, declining to take the time to develop a specific protocol or form for recording findings. Certainly the current **standard of care** in practice does not dictate a mandatory posttreatment assessment protocol. The standard of care does require, however, that patients be provided maintenance services and *continuity* of care. In that context, the concepts described here should have application to any practice. Each practitioner is encouraged to incorporate some type of patient maintenance program into the office policy manual and to implement use of that program with each patient. The information included here can be used as a guide for that purpose.

### Objectives for the Posttreatment Assessment

The purpose and intent of the posttreatment assessment is to enable the practitioner to evaluate the following:

- The patient's current oral condition
- Outcomes of treatment rendered by the dental team
- The patient's satisfaction with the care that has been provided
- Present and future treatment needs of the patient

The posttreatment assessment provides a foundation for planning any additional treatment and **maintenance therapy** that the patient will need.

### Elements of the Posttreatment Assessment

Items to be included in the posttreatment assessment and recorded in the patient record will vary with the nature and scope of the dental practice, the individual patient profile, and the patient's need. Typical elements in a posttreatment assessment include the following:

- Update of the general health history and review of systems
- Recording vital signs
- A head/face/neck examination to reassess any previously diagnosed conditions and to determine whether any new oral pathology is present
- Updating radiographs according to the practice or institutional protocol and the patient's individual need
- Evaluation of the alignment of the teeth and jaws, the occlusion, the temporomandibular joint, and the patient's ability to speak, chew, and function
- Assessment of all periapical areas, with particular focus on teeth that have received root canal therapy
- Comprehensive periodontal assessment and periodontal risk assessment
- Evaluate adherence to homecare advisories, reinforce oral homecare instructions
- Evaluation of all existing restorations and prostheses
- Comprehensive caries diagnosis and caries risk assessment
- Statement describing the patient's satisfaction (or dissatisfaction) with the treatment rendered; were all the patient's expectations met?
- Summary of the patient's response to treatment; was the patient adherent with attendance and professional recommendations?
- Description of any remaining restorative needs and how those needs will be addressed
- Specific plan to address any other ongoing or emerging issues that will need future attention
- Provide preventive and therapeutic product recommendations
- Establish an appropriate recall interval

### Documenting the Posttreatment Assessment

The posttreatment assessment may be documented in the progress notes in a narrative or bullet format, with or without a predetermined outline to guide the process. If the practice has multiple providers, a common outline or format should be developed for consistency and efficiency. In an institutional setting, it is usually advantageous to develop a form specifically for that purpose (Figure 11-1).

## RATIONALE FOR INCLUDING A MAINTENANCE PHASE IN THE TREATMENT PLAN

The primary purpose of the maintenance phase is to ensure long-term oral health, optimum function, and favorable esthetics for the patient. In the maintenance phase, continuing systemic issues can be managed, disease control measures can be reevaluated and strengthened, and restorations and prostheses can be repaired, cleaned, polished, recontoured, or relined as needed. Success or failure of previous treatment must be reassessed and any necessary additional treatment

| Posttreatment Assessment | |
|---|---|
| Patient concerns/expectations met? | |
| Patient response to treatment | |
| Medical history current (date of most recent update) | |
| Head & neck, extraoral/intraoral examination of findings (date of most recent exam) | |
| Periodontal condition (date of last recall appointment) | |
| Pulp and periapical health | |
| Occlusal/orthodontic/functional status | |
| Caries/restorative condition of the teeth | |
| Caries risk assessment | |
| Risk for occlusal/functional problems or tooth fracture | |
| Risk for periodontal disease | |
| Preventive recommendations for patient | |
| Disposition (remaining or new Tx needs and how they will be addressed) | |
| Established recall interval | |
| Type of recall: | ☐ D1110 Adult prophylaxis<br>☐ D4910 Periodontal recall |

**FIG 11-1** Posttreatment assessment record form.

planned. Multiple benefits derive from a comprehensive and strategically crafted plan for the maintenance phase. These benefits can be clustered into three categories: (1) issues that remain unresolved at the close of the definitive phase of treatment, (2) patient-based issues, and (3) practice management issues.

## Address Ongoing Patient Needs

### Follow-Up of Untreated Diagnoses

At the conclusion of the definitive treatment phase, previously diagnosed but untreated conditions may require re-evaluation. These might include reactive soft tissue lesions, asymptomatic chronic bone lesions, defective but not problematic restorations, or teeth with incipient carious lesions. The maintenance phase provides an ideal time to reassess these issues, discuss them with the patient, and develop consensus on how to manage them going forward.

### Monitoring Chronic Conditions that can Affect Oral Health

Patients may have systemic diseases that influence plans for or the delivery of dental treatment (e.g., diabetes), systemic diseases with significant oral manifestations (e.g., **Sjögren's syndrome**, or chronic oral diseases (e.g., periodontal disease). The maintenance phase provides an opportunity to reassess such chronic conditions, determine whether new intervention or retreatment is warranted, and address any new sequelae or related conditions that may have arisen since the last appointment (Figure 11-2).

### Revisiting Elective Treatment Issues

Earlier in the course of treatment, patients may have raised dental concerns or aspirations that for various reasons (e.g., time, finances, anxiety) they chose to defer. Similarly, the patient may have earlier declined certain elective treatments that the dentist recommended, such as removal of asymptomatic third molars or replacement of missing teeth. The maintenance phase provides an ideal opportunity to revisit these issues.

## Patient Centered Benefits

### Rapport Building

Patients return to their dentist for periodic care for many reasons beyond the obvious recommended scaling and oral prophylaxis. The importance of the professional trust and faith that patients place in their dental team and the personal security obtained from the relationship should not be underestimated or taken for granted. Consciously or unconsciously, most patients have a strong expectation that their dentist is diligently looking out for their best interests and will do what is best to promote and ensure their oral health. Periodic visits do much to cement the relationship and fulfill the patient's expectations.

### Patient Education

The maintenance phase serves as an effective instrument to educate and motivate the patient, and helps maintain the patient's awareness of the importance of continuing attention to oral health. As the dentist plans the maintenance phase and shares that information with the patient, the

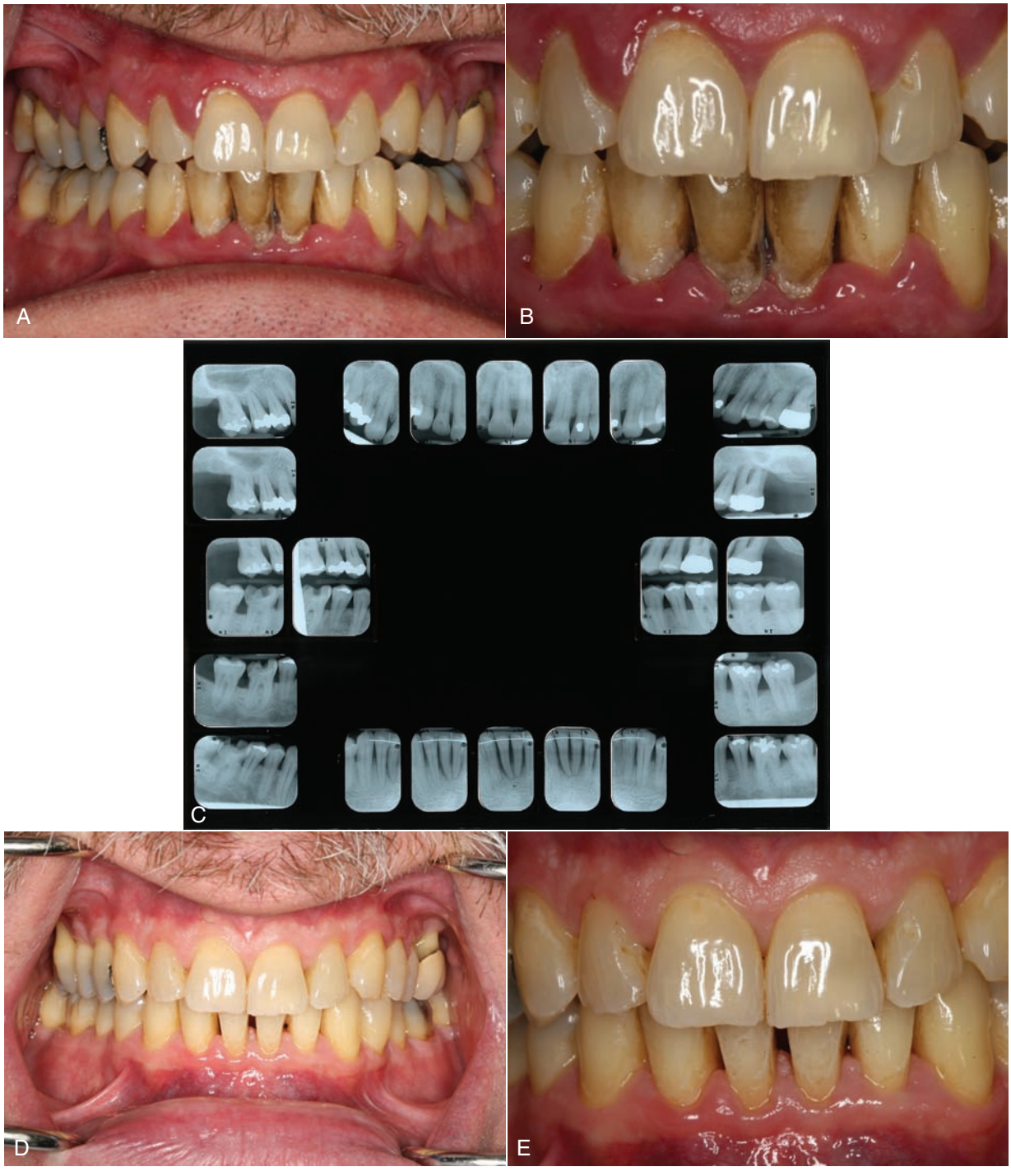


**FIG 11-2** Diabetic patient with periodontal disease. **A-C,** Demonstrates advanced periodontal disease and a very poor periodontal prognosis; **D** and **E,** show the patient after periodontal therapy and successful management of the diabetes. Remarkably, the patient has been able to retain the teeth and the periodontal prognosis is greatly improved. (Courtesy Dr. Thiago Morelli, Chapel Hill, N.C.)

patient has the opportunity to learn about the nature and importance of this aspect of the plan of care and to raise questions about it. As the dentist explains the need for maintenance therapy and the ways in which the periodic visits form an integrated part of the overall plan of care, the patient comes to appreciate the ways in which this phase of treatment will affect his or her future oral health.

More specifically, discussing the maintenance phase helps educate the patient about the details of care provided during the periodic visits and the patient's own contribution to maintaining a healthy oral condition. This is the ideal opportunity to inform the patient about oral homecare practices that will help preserve restorations and prostheses, maintain a disease-free environment, and prevent future problems. Oral healthcare suggestions may be given to the patient orally or in written form (e.g., using pamphlets or audiovisual materials), or both.

Writing the maintenance phase into the treatment plan reminds the patient of its presence and importance each time he or she picks up a copy of the plan of care. It also reminds the patient of specific tasks and expectations that are his or her responsibility. That knowledge becomes a powerful tool for the dentist in ongoing efforts to instill in the patient a sense of responsibility and confirming to the patient the value of maintaining a long-term therapeutic relationship.

### Emphasis on Individualized Care

Although patients may be unsophisticated in their understanding of dental disease or the finer elements of dental treatment, they quickly develop a sense of how a dental practice functions and share that information with their friends and neighbors. Patients may more easily characterize office policy concerning periodic visits than the dentist can. Is the standard simply a routine "6 months' checkup and cleaning"? Or is there an individually planned interval with a specified structure tailored to the needs of the individual patient? In the all-too-common first situation, patients may gain the impression that production, rather than individualized patient care, is the motivating influence.

Individualized patient care communicates the fact that the dentist focuses treatment on each individual patient, targeting specific needs by using risk assessment, social and dental history, and other data that can affect oral health. Taking time to carefully create individualized recommendations shows the patient that the dental team is invested in each patient's personal and oral health and instills a greater level of trust and respect. The benefits to the patient include more meaningful homecare routines and treatment recommendations that provide a foundation for a more successful outcome. Additionally, by tailoring treatment and preventive recommendations to the needs of each individual, rather than relying on a single lock-step approach, the patient gains a sense of ownership and responsibility for his or her own care and will be more likely to be adherent to professional recommendations.

### Health Promotion and Disease Prevention

Because the well-constructed maintenance phase places the emphasis on promoting and sustaining optimal oral health and function, rather than on restoration and reconstruction resulting from past disease, this phase makes clear the role of dentistry as a healthcare profession. This approach encourages the patient to adopt a regular schedule for visiting the dentist, rather than simply waiting for a problem to develop.

### Anticipating Further Treatment Needs

A thoughtful, comprehensive maintenance phase plan includes any issues that can realistically be expected to require reevaluation, reconsideration, or retreatment in the future. Specific notes, such as "reevaluate tooth #29 with poor periodontal prognosis" or "reassess patient need and/or desire for crown on tooth #19 with compromised cusp integrity" confirm that the patient has been alerted to potential risks and hazards and clearly puts the responsibility for accepting the consequences of deferring treatment on the patient rather than the dentist. A casual review of the original treatment plan (or progress note if recorded there) can facilitate bringing the issue to the patient's attention again.

Without a clearly articulated maintenance phase, the patient may assume that any new problems that arise are, at least in part, the responsibility of the dentist. The tooth with long-standing severe periodontitis that must now be extracted, or the tooth with a large amalgam restoration that now fractures, are examples. Recording these potential problems in the treatment plan and calling them to the patient's attention at the outset of the maintenance phase minimizes the opportunity for future misunderstanding, mistrust, or conflict.

Taking the time to develop and carry out a comprehensive and individualized maintenance phase for each patient ensures good patient care and can provide enormous benefits to the dentist, staff, and practice.

## Practice Management Benefits

### Professional Competence

Collectively, the entire patient record—if it includes a comprehensive, accurate, and complete database, diagnosis, plan of care, and consent—provides excellent evidence of professional competence. A thorough, well-written maintenance phase, although not indispensable in this regard, certainly contributes to a positive view of professional competence and may help discourage a disgruntled patient from pursuing litigation.

### Efficient Delivery of Care

A well-written maintenance phase plan of care can be used as an effective tool to alert office staff, dental assistants, hygienists, and the dentist to the particular systemic or oral health issues or other concerns that should be addressed during periodic visits. Awareness of such issues and concerns at the outset makes the visit more focused, efficient, and personalized. The patient's individual needs can be addressed immediately, without requiring the dentist to sort through the chart, looking at multiple progress notes to reconstruct the history. With a recorded plan, the entire staff approaches the periodic visit proactively and efficiently.

### Reducing Patient Emergencies

An informed patient who expects and anticipates problems is more likely to take preventive action before a crisis develops, less likely to need emergency care, more apt to have a realistic understanding of a problem (and be able to discuss it rationally), and more apt to accept recommended treatment. For the dentist and the staff, this translates into fewer interruptions, less anxiety for the patient, reduced staff stress, and smoother patient flow. Such a practice usually provides a more patient-friendly and rewarding setting in which to work.

### Partnering with Patients

The maintenance plan encourages the patient to become a partner in the long-term management of his or her oral health, rather than simply a consumer of dental goods and services. The maintenance phase, by design and necessity, engages the patient in the process. Although many patients remain quite comfortable in the conventional model of dental care, in which the dentist makes all the decisions, such an approach places all the responsibility for the success of treatment on the shoulders of the dentist, fostering an overly dependent patient-dentist relationship. The maintenance phase provides an effective way to appropriately delineate roles and responsibilities for maintaining the patient's long-term oral health.

## ISSUES TYPICALLY INCLUDED IN THE MAINTENANCE PHASE

To list all the items that could be included in the maintenance phase would be a large undertaking. To give the reader a realistic perspective on this issue, the authors suggest the following categories that might be included. Although not all inclusive, the list is representative and may serve as a menu or template from which each practitioner may begin to develop a selection list appropriate for his or her own practice. Although no individual patient would be expected to require attention to all of the areas listed here, it can be anticipated that most patients will need several.

### General Health Considerations

Specify all items from the systemic phase that will require follow-up, reevaluation, or intervention as part of the patient's long-term care. Examples include physician consultation in the presence of chronic life-threatening disease, such as liver cancer, premedication for anxiety or infective endocarditis, reevaluation of previously diagnosed hypertension or other chronic conditions, and treatment modification because of an immunocompromising condition, such as rheumatoid arthritis.

### Oral Homecare Instructions

Oral homecare instructions play a vital role in the long-term success of a patient's oral health and the overall success of the maintenance phase. As an integral aspect of the individualized patent care plan, homecare instructions should be thoughtfully developed and based on the status of the dentition, the history of restorations, any periodontal or caries risk, and the anticipated level of patient adherence. Take into account areas that may be susceptible to trapping plaque, such as open contacts, extensive restorative work, and periodontal defects. The dentist must consider oral physiotherapy aids specific to the patient's needs, such as an end-tuft brush for a third molar area or a floss threader for bridgework. Additional preventive and therapeutic agents, such as prescription-level dentifrices and antibacterial mouth rinses, should be considered and recommended as needed. Document all recommendations and instructions made to the patient, including any prescribed oral physiotherapy aids, materials, and techniques, and the advisable frequency of visits. If particular attention is necessary in specific areas, possibly with adjunctive aids such as floss threaders or proximal brushes, this should be noted as well (Figure 11-3 and Table 11-1). Documentation should also include patient

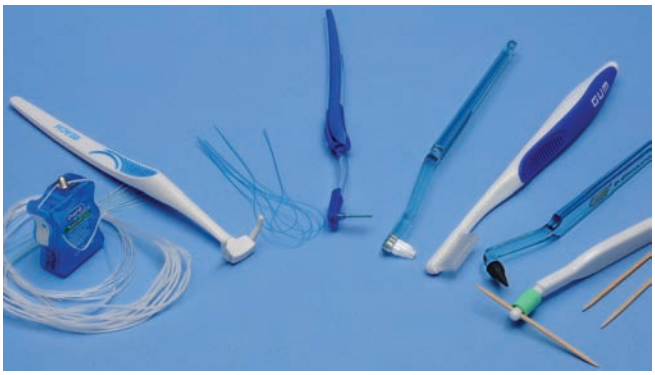

**FIG 11-3** Supplementary oral physiotherapy aids.

**TABLE 11-1 Supplementary Oral Physiotherapy Aids**

| Oral Physiotherapy Aid | Indications for Use |
|---|---|
| Dental floss and tape | Proximal surfaces |
| Tufted dental floss | Wide embrasure spaces, orthodontic appliances, abutments, under pontics |
| Floss holder | Patients with limited dexterity |
| Floss threader | Orthodontic appliances, under fixed prostheses |
| Interdental brush | Wide embrasure spaces, orthodontic appliances, fixed prostheses, dental implants, periodontal splints, space maintainers, exposed furcations |
| End-tuft brush | Fixed prostheses, wide embrasure spaces, distal surfaces of most posterior teeth |
| Interdental rubber tip | Gingival margin, embrasure spaces, exposed furcations |
| Toothpick (with holder) | Gingival margin, orthodontic appliances, exposed furcations |

questions about the oral homecare instructions, particularly if the issues need to be revisited.

## Oral Prophylaxis

Specify frequency, any areas that need special attention, and any particular products, instruments, or techniques to be used by the dental team. The appropriate *type* of recall appointment should also be determined. If a patient has had a diagnosis of and initial therapy for periodontal disease, then the appropriate type of recall appointment would be a periodontal maintenance visit. Otherwise, for the patient seeking preventive care, the recall would be designated as an adult prophylaxis. Also, it should be noted if the patient has a particular preference or objection to specific agents, such as a flavored prophy paste or any element in the armamentaria, such as the air-powder polisher.

## Caries Control

This aspect of the maintenance phase plan is a continuation of the caries management plan described at length in Chapter 9. At each periodic visit, the patient must be carefully reexamined for the presence of new or recurrent caries. If the patient has previously been assessed at moderate or high caries risk, the periodic visit interval should be no longer than 6 months and could be significantly less. In the presence of two or more new lesions, or, if in the considered opinion of the dentist, the patient is again at moderate or high risk for new caries, new caries activity tests are warranted, and the caries management plan must be reactivated.

## Restorations and Prostheses

The fit, function, and esthetics of any fixed or removable prosthesis should be evaluated at periodic intervals. Specific restorations may need to be assessed on a case-by-case basis. At a minimum, the patient and practitioner's perspective on the esthetics, tissue response to the prosthesis, occlusion, proximal contacts, periodontal status of any abutments, and retention and function of any prostheses should all be carefully assessed.

Any aspect of previous or planned restorative dental work that requires reexamination should be incorporated into the maintenance phase. Typical examples include the following:

- Evaluation of periodontal response, plaque retention, food entrapment problems, or symptoms in conjunction with preexisting bulky or over contoured restorations
- Reevaluation of faulty restoration margins and defective restorations previously deemed to be less than ideal but still serviceable
- Evaluation of the contours, proximal contacts, occlusion, and longevity of large existing restorations, such as foundations or cores, determination of the patient's need and/or desire for extracoronal restorations such as crowns on these teeth
- Reassessment of the feasibility of and the patient's need and/or wish to convert temporary, provisional, or transitional appliances to definitive prostheses

## Periodontal Maintenance

For the patient with periodontal disease, this would include maintenance appointments at specified intervals usually no greater than 3 months. The maintenance phase plan should identify specific problems, such as isolated deeper pockets, areas of furcation involvement, or mucogingival defects that will require additional therapeutic treatment—for example, localized scaling and root planing or placement of local chemotherapeutic agents. Depending on the outcome of the disease control phase and definitive phase therapy, antibiotics may be administered locally (with fibers, cord, or gel) or systemically. Antimicrobial rinses may be prescribed. In the presence of reactivated periodontitis, the patient must be comprehensively reassessed for additional definitive (i.e., surgical) intervention.

## Implant Assessment

The dental team can anticipate that some patients who have received implants may develop problems. Most common are loose healing caps, abutments or crown(s), fractured porcelain on the prosthesis, food impaction, undesirable (to the patient) spaces between teeth, or soft tissue trauma (cheek biting). A much more serious problem that can arise with implants is peri-implantitis and rejection of the implant. Each implant must be examined carefully for mobility, pocketing, swelling, exudate, and any signs of inflammation in the adjacent tissue. For the first 3 years, annual radiographs to assess bone level are recommended.[2] The patient's effectiveness in removing plaque must be carefully evaluated.

## Endodontic Reevaluation

Many endodontists evaluate the response to root canal therapy at regular intervals to confirm that all symptoms have resolved, signs of infection have disappeared, and bone has filled in the periapical area. Initially, these visits may occur at set intervals and continue until complete healing has occurred. If the root canal therapy has been done in the general dentist's practice, or if the endodontist is not completing a reevaluation, it is in the patient's best interest that these reevaluation procedures be followed as a part of the patient's regularly scheduled periodic examination. If signs or symptoms consistent with tooth fracture or clinical infection are found, the site of the root canal therapy must be carefully scrutinized. Referral to an endodontist may be warranted. After conversation with the patient, a decision must be made as to whether to extract the tooth, provide endodontic retreatment, intervene surgically, or reevaluate the situation in the future. The final decision and evidence of patient consent must, of course, be documented in the patient's record. In the absence of signs or symptoms, it is usually prudent to take a follow-up radiograph 6 to 12 months after root canal therapy. If apical periodontitis or an apical rarefying osteitis remains visible on the radiograph, the patient must be informed about treatment options, risks and benefits, the likelihood of success for each, and the potential consequences if no additional intervention is implemented.

## Management of Chronic Oral Soft Tissue Disease

Any chronic oral pathologic conditions not eliminated in the earlier stages of the plan of care should be revisited as a part of maintenance care. Examples include unresolved mucous extravasation phenomenon, dysplasias, erosive lichen planus, or (as illustrated in Figure 11-4) chronic candidiasis.

## Management of Radiographically Evident Hard Tissue Abnormalities (Other Than Caries or Periodontal Disease)

Asymptomatic lesions of bone (Figure 11-5), such as cysts, periapical cemental dysplasia, florid osseous dysplasia, or impacted teeth for which treatment has been deferred, should be reevaluated periodically with radiographs and other examination techniques.

## Orthodontic Assessment by the General Dentist

At least three possible situations can be described in which the general dentist may be involved with maintenance during and after orthodontic treatment.

### Ongoing Orthodontic Treatment by an Orthodontist

In this situation, the general dentist and the orthodontist each has the responsibility to periodically reevaluate the patient. The orthodontist is responsible for the progress of the orthodontics and any urgent or ongoing problems that arise directly from orthodontic brackets, bands, arch wires, fixed or removable orthodontic appliances, or retainers. The general dentist is responsible for the management of any oral diseases or conditions not associated with the orthodontic therapy, such as caries, tooth restorations, periodontal disease, or other unrelated oral pathology. In areas of overlap, however, both practitioners bear responsibility. Both the general dentist and the orthodontist must be vigilant in watching for signs and symptoms of recurrent caries, root resorption, periapical pathology, occlusal trauma, reactivation of preexisting periodontal disease, or soft tissue lesions induced by the orthodontic therapy or appliances. The *In Clinical Practice: The Orthodontic Patient with Active Caries* box discusses an orthodontic patient with rampant caries. Although recognition of these problems is the responsibility of the practitioner who sees the patient first, both general dentist and orthodontist need to examine regularly for new caries activity. Management of the problem depends on the issue, its complexity, and the expertise of each of the practitioners involved.

**FIG 11-4** Denture stomatitis caused by chronic candidiasis. (Courtesy Dr. V. Murrah, Chapel Hill, N.C.)

### IN CLINICAL PRACTICE

**The Orthodontic Patient with Active Caries**

Some patients may develop active caries during comprehensive orthodontic therapy (Figure 11-6). This occurs most commonly with adolescents, whose poor oral homecare, diet with high exposure to refined carbohydrates and acids, or lifestyle not conducive to optimal oral or systemic health puts them at risk. This situation places special burdens on the general dentist, orthodontist, patient, and patient's parents because all have high stakes in the outcome. The parent may risk significant financial resources. The patient risks significant discomfort, failure of treatment, tooth loss, and future loss of time, money, function, esthetics, and oral health. With a successful treatment outcome in jeopardy, the practitioners may also have much to lose.

If the patient has three or fewer new lesions and has been determined to be at low risk for future caries, it is appropriate to simply restore the lesions, removing the bands or brackets as necessary to gain access. If the patient has more than three new lesions or is considered to be at moderate or high risk for caries, the basic caries control program outlined in Chapter 9 must be initiated. Ideally, both the orthodontist and general dentist will be involved in this activity. With patient, parents, and both practitioners all participating in this process, it is much more likely that the patient will take the problem seriously and be compliant with recommended oral homecare and dietary modification.

If the patient remains caries active and is unwilling to accept recommended caries control measures, the dental team may have to consider suspending orthodontic treatment. Sometimes the mere threat of suspension will motivate the patient to become more responsive. If adherence is not forthcoming and if the patient remains at high risk, then orthodontic treatment should be discontinued, arch wires removed, and more aggressive caries control procedures instituted. When patient adherence is gained and the risk reduced, orthodontic therapy may be resumed. Documentation of all caries control measures, recommendations to the patient, caries activity tests, and response to therapy is imperative. If the situation does not improve within 12 months, all appliances should be removed and orthodontic treatment aborted. It is inappropriate, unethical, and unprofessional for the orthodontist to ignore the carious lesions and attempt to rush orthodontic treatment to completion so that the patient can be passed on to the general dentist for caries control.

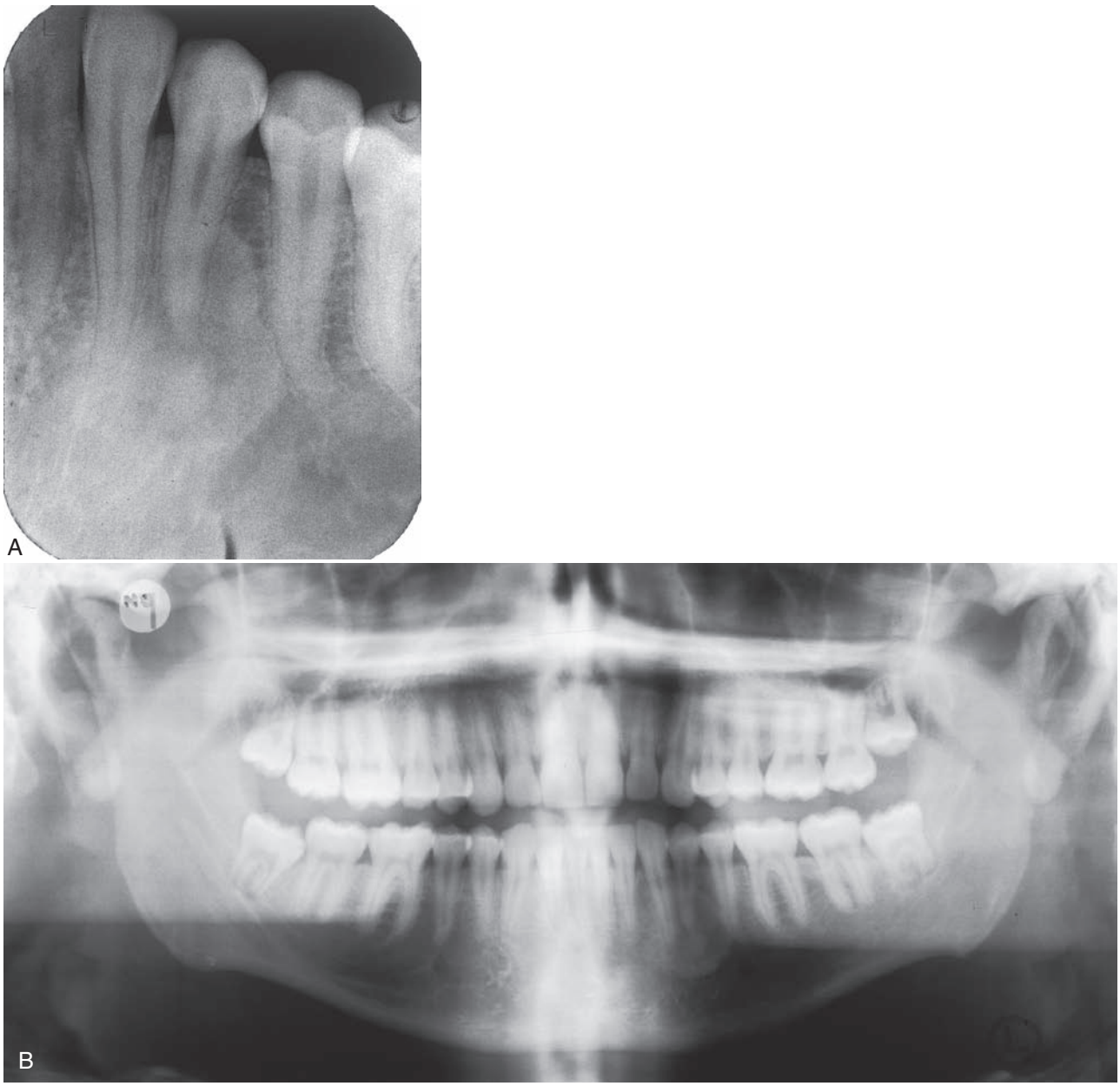


**FIG 11-5** An 18-year-old patient with cemento-ossifying fibroma—an example of a condition that needs to be reevaluated at periodic visits. **A,** Periapical radiograph. **B,** Panoramic radiograph. (Courtesy S. Addison, Chapel Hill, N.C.)

In general, if the first practitioner to recognize the problem can address the issue successfully, he or she should do so. In any case, the two practitioners must communicate and clearly document in both patient records the diagnosis and management plan, and who is responsible for each aspect of the plan. *It remains the responsibility of both practitioners to ensure that the problem is managed and resolved.*

### Ongoing Orthodontic Treatment by the Patient's Regular General Dentist

In this situation, the general dentist is responsible for all of the issues discussed in the previous section. Although the problems with referral of the patient and communication between the providers are eliminated, the general dentist takes on a significantly higher level of involvement. The general dentist is solely responsible for documentation of all aspects of the treatment.

### Orthodontic Treatment Has Been Completed

If caries develops after the orthodontic treatment has been completed, the patient can be managed in much the same manner as the patient without orthodontic treatment. If the patient wears a removable retainer, it must be removed periodically (usually during waking hours), and both retainer and teeth must be kept meticulously clean. If the patient has a fixed orthodontic retainer that collects plaque and inhibits

**FIG 11-6** Orthodontic patients with active caries. (Courtesy Dr. Richard Beane, Chapel Hill, N.C.)

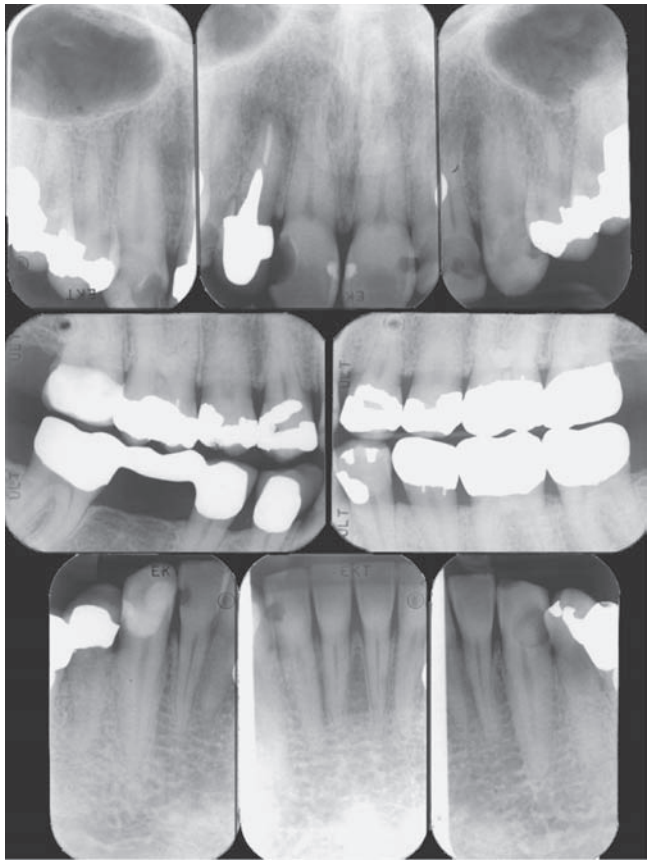

**FIG 11-7** Patient with numerous large restorations who remains at risk for caries—a prime indication for taking radiographs more frequently. (Courtesy Dr. J. Ludlow, Chapel Hill, N.C.)

effective oral homecare, it may be desirable or necessary to replace it with a removable retainer. If so, this procedure would be carried out by the orthodontic treatment provider. If the patient continues to be caries active, even in the presence of the basic caries control protocol, it may be helpful to replace the existing retainer with a mouth guard designed to serve as both an orthodontic retainer and a reservoir for fluoride gel during sleep.

## Radiographic Images[3]

The maintenance phase should include specific recommendations concerning when to consider the need for exposing follow-up radiographs. General guidelines for radiographic examination are presented in Chapter 1 (Table 1-3). If third molar assessment is needed, a panoramic radiograph is usually recommended. If, at the completion of the definitive phase, new periapical radiographs were not ordered for teeth that have received extracoronal or large direct-fill restorations (Figure 11-7), it would be wise to do so at the periodic visit. Teeth that have received restorations in close proximity to the pulp or teeth that continue to be symptomatic often need reevaluation, which should include new periapical radiographs. Asymptomatic radiographic lesions for which the initial treatment decision was to observe should also have radiographic follow-up in the maintenance phase.

In general, patients with a history of periodontal disease should be evaluated for a complete mouth radiographic series at 2- to 3-year intervals, depending on disease activity. Vertical bitewing radiographs are recommended for patients with moderate or severe bone loss. Similarly, patients with a history of active caries should be evaluated with bitewing radiographs at 2-year intervals—and more frequently in the presence of increased caries activity. In the absence of caries, periodontal disease, or other issues, such as those mentioned previously, it is often appropriate to delay taking bitewing radiographs for up to 3 years and a complete mouth radiographic survey for up to 6 years. Obviously, these suggestions will vary with specific patients, practices, and patient populations.

## Elective Treatment

At the time that the original treatment plan was formulated, treatments may have been proposed that the patient was unwilling or unprepared to commit to. Examples might include

fixed or removable partial dentures, single unit crowns, or implants. The maintenance phase is the ideal time to discuss these options with the patient again.

## Recall Interval

In the generation of the maintenance phase plan of care, it is common to indicate an estimation of how frequently the recare visit should occur for the patient. For a patient with active caries (high caries risk) or active periodontal disease, that interval may be 2 to 4 months. For patients with no active disease and for whom there is no specific indication necessitating a return to the office (e.g., to reevaluate a soft tissue lesion) then a recall interval of 6 to 12 months will often be appropriate (see *What's the Evidence? Why 6-Month Recall Intervals?* box).

## WHAT'S THE EVIDENCE?

### Why 6-Month Recall Intervals?

The origin of the 6-month recall interval is believed to have come from the 1950s Bristol-Myers Co. toothpaste commercials with the character Bucky Beaver, whose slogan advised listeners to use Ipana toothpaste and see the dentist twice a year.[1] There is little evidence to support the frequently cited standard that "You should visit the dentist every 6 months," yet often insurance companies will cover up to two recall visits per year.[1-2] Systematic reviews have found that there is insufficient evidence to support one specific interval for all individuals.[3-4]

Research has shown that in patients with gingivitis, a 6-month periodic visit including an oral prophylaxis is insufficient to control the problem.[5] However, over a 3-year period the same individuals with gingivitis and 6-month recall visits with a prophylaxis did not develop periodontitis. Many studies have shown that routine prophylactic recall visits are important in treating periodontal disease.[6-12] Maintenance visit intervals for individuals with periodontitis range from a few weeks to 6 months, but 2- to 3-month intervals are the most common.[13-14] Patients with continuously high plaque scores are more likely to exhibit recurrent gingivitis or periodontitis and should be appointed at shorter intervals. Advanced cases of periodontitis can be adequately maintained with properly spaced maintenance visits and good oral homecare.[15-16]

In addition to periodontal risk and the presence of soft tissue lesions, the recall interval should be based on age (eruption pattern and other milestones) and the review and monitoring of caries risk. Patients who are at elevated caries risk will need more frequent recalls and shorter recall intervals.[17-20]

### Reference List


1. O'Hehir TE: Is the six-month recall a realistic interval of care? *RDH* 13(10):18, 1993.
2. Tomar SL: There is weak evidence that a single, universal dental recall interval schedule reduces caries incidence, *J Evid Base Dent Pract* 11:89-91, 2011.
3. Patel S, Bay RC, Glick M: A systematic review of dental recall intervals and incidence of dental caries, *JADA* 141(5): 527-539, 2010.
4. Riley PL, Worthington HV, Clarkson JE, Beirne PV: Recall intervals for oral health in primary care patients, *Cochrane Database Syst Rev.* 12:CD004346. Dec 2013.
5. Listgarten MA, Schifter CC, Laster L: 3-year longitudinal study of the periodontal status of an adult population with gingivitis, *J Clin Periodontol* 12(3):225-238, 1985.
6. Axelsson P, Lindhe J: Effect of controlled oral hygiene procedures on caries and periodontal disease in adults, *J Clin Periodontol* 5(2):133-151, 1978.
7. Axelsson P, Lindhe J: The significance of maintenance care in the treatment of periodontal disease, *J Clin Periodontol* 8(4):281-294, 1981.
8. Axelsson P, Lindhe J: Effect of controlled oral hygiene procedures on caries and periodontal disease in adults. Results after 6 years, *J Clin Periodontol* 8(3):239-248, 1981.
9. Axelsson P, Nystrom B, Lindhe J: The long-term effect of a plaque control program on tooth mortality, caries and periodontal disease in adults. Results after 30 years of maintenance, *J Clin Periodontol* 31(9):749-757, 2004.
10. Knowles JW, Burgett FG, Nissle RR and others: Results of periodontal treatment related to pocket depth and attachment level. Eight years, *J Periodontol* 50(5):225-233, 1979.
11. Ramfjord SP, Morrison EC, Burgett FG and others: Oral hygiene and maintenance of periodontal support, *J Periodontol* 53(1):26-30, 1982.
12. Suomi JD, Greene JC, Vermillion JR and others: The effect of controlled oral hygiene procedures on the progression of periodontal disease in adults: results after third and final year, *J Periodontol* 42(3):152-160, 1971.
13. Shick RA: Maintenance phase of periodontal therapy, *J Periodontol* 52(9):576-583, 1981.
14. Wilson TG Jr, Glover ME, Schoen J: Compliance with maintenance therapy in a private periodontal practice, J Periodontol 55(8):468-473, 1984.
15. Lindhe J, Nyman S: The effect of plaque control and surgical pocket elimination on the establishment and maintenance of periodontal health. A longitudinal study of periodontal therapy in cases of advanced disease, *J Clin Periodontol* 2(2):67-79, 1975.
16. Lindhe J, Nyman S: Long-term maintenance of patients treated for advanced periodontal disease, *J Clin Periodontol* 11(8):504-514, 1984.
17. Beirne PV, Clarkson JE, Worthington HV: Recall intervals for oral health in primary care patients. *Cochrane Database Syst Rev* 17(4):CD004346, Oct 2007.
18. Clarkson JE, Amaechi BT, Ngo H, Bonetti D: Recall, reassessment and monitoring. *Monogr Oral Sci* 21:188-198, 2009.
19. Jenson L, Budenz AW, Featherstone JD, Ramos-Gomez FJ and others: Clinical protocols for caries management by risk assessment, *J Calif Dent Assoc* 35(10):714-723, Oct 2007.
20. National Institute for Clinical Excellence Guideline. *Dental recall: Recall interval between routine dental examinations.* London, 2004, NICE.

## DOCUMENTING THE MAINTENANCE PHASE PLAN

The maintenance phase can be recorded in the patient record in several different ways. The simplest and easiest way is to place it directly on the original treatment plan. Alternatively, maintenance phase needs can be listed in the progress notes. Although the latter method ensures that the information does not get separated from the patient record, it is not readily accessible, and in a relatively short time this progress note will be superseded by new progress notes as they are continually added (see Box 11-1, *Sample Maintenance Phase Plan of Care*).

Another alternative is to generate an office-specific form for recording maintenance treatment. This form can be designed to indicate what treatment is to be provided with the time interval for each activity. It can be made operator specific (hygienist, dental assistant, or patient education specialist), with a means for recording completion dates, outcomes, and patient performance. Although somewhat more labor intensive because the entire staff participates, this method, if used regularly, becomes an excellent tool for educating the patient, setting goals for the maintenance phase, organizing preventive activities, and ensuring that the patient receives the highest-quality continuous long-term care.

## RECALL VISIT

Implementation of the maintenance phase occurs at the periodic visit—the patient's return to the dental office at designated intervals, usually several months in length. The purposes of the periodic visit are to review the patient's oral health status, attend to any new problems that have emerged, and discuss any additional treatment needs. The periodic visit includes several components: evaluation, therapy, plan for ongoing and future treatment, and documentation in the progress note. Each of these components is discussed in sequence.

**BOX 11-1 Sample Maintenance Phase Plan of Care**

- Monitor type 1 diabetes
- Reevaluate denture stomatitis associated with maxillary removable partial denture; confirm proper oral homecare practice; prescribe antifungals as necessary
- Reassess tissue response to a bulky crown on the maxillary left second premolar; discuss patient need and/or desire for new crown
- Periodontal maintenance therapy at 3-month intervals; vertical bitewings at 24 months; remove chlorhexidine stain
- Reevaluate caries activity:
  - Repeat caries activity tests
  - Confirm that patient has eliminated sugar-containing beverage habit
  - In presence of new lesions or elevated *S. mutans* or *Lactobacillus* counts, fabricate custom fluoride trays and dispense fluoride gel for home use

### Evaluation

To evaluate the patient's general and oral health, a minimum of the following activities should be included in the periodic visit. Additional items can be added to this list as necessary.

#### Update of Health History Questionnaire

If a comprehensive general and oral health history questionnaire had been obtained less than 3 years earlier, the patient should be asked to review the original history and sign and date the update. If the questionnaire was completed more than 3 years ago, or if the patient's health status has changed substantially, it is advisable that a new general and oral health history questionnaire be completed.

#### Vital Signs (Blood Pressure and Pulse)

The vital signs of blood pressure and pulse should be taken at the periodic evaluation for the following important reasons: (1) to identify a reactivated or new problem with hypertension, (2) to identify patients for whom dental treatment may be contraindicated on that date, and (3) to provide a baseline value in the event of a medical emergency that arises during or immediately after the dental visit.

#### Head, Face, and Neck/Extraoral/Intraoral Examination

Because the dentist is often the healthcare professional the patient is most likely to see for periodic care, the dentist has the unique opportunity and professional responsibility to evaluate the patient for systemic and oral disease and, in particular, for signs of oral cancer (Figure 11-8).

#### Evaluation of Any Patient Concerns or Complaints

The dentist should encourage the patient to share any concerns or questions about his or her mouth. Even minor complaints can be early signs of more significant problems. For example, a tooth that is occasionally symptomatic might, on further examination, show signs of fracture of the tooth or of a restoration. Given the choice, the dental team would prefer to try to diagnose a problem, whether minor or major, while the patient is present at the periodic visit rather than later, as an unscheduled dental urgency or emergency.

#### Orthodontic/Occlusal/Temporomandibular Joint Examination

Unless the patient raises concerns, this area rarely needs extended discussion. In most cases, a simple inquiry as to whether any problems with chewing, the bite, or the jaw joint have arisen is sufficient to elicit any concerns that may require evaluation or treatment. If the patient is a candidate for elective orthodontic, occlusal, or prosthodontic therapy but has declined such treatment in the past, the periodic visit is a good time to raise those issues again. The *In Clinical Practice* box discusses an approach to discussing elective procedures with patients.

## IN CLINICAL PRACTICE

**Discussing Elective Procedures with Patients**

Patients with significant bruxism or occlusal attrition should be reminded periodically that an occlusal guard can be fabricated to protect the teeth from continued wear, sensitivity, pulpal pathology, or loss of vertical dimension. Similarly, patients who have previously declined the option of correcting malpositioned, malocluded, or missing teeth deserve to have these issues revisited. Often, with a change of life circumstance, the patient's receptivity and desire for elective treatment will also change. The recommendation for such elective treatments should be made in a relaxed, nonthreatening manner so the patient can listen carefully to all aspects of the issue and make an informed decision without feeling pressured. Printed material may be useful to the patient as the options are discussed with family members or friends.

The practitioner must be sensitive, however, not only to the patient's need to be informed about the dental problem and its attendant treatment options, but also to the patient's level of trust in healthcare providers and willingness to tolerate repeated discussions of the same issue. Some patients need and appreciate repeated discussion of comprehensive restorative and orthodontic options and are only able to make a decision after several lengthy conversations. In contrast, others are decisive at the first opportunity and view follow-up discussions as intrusive selling of unnecessary services. Both types of patient deserve to have the benefit of the dentist's professional expertise, but the nature, complexity, timing, and frequency of these discussions should be tailored to the individual patient. In any case, it is essential to document these conversations and the patient's response in the patient record.

### Periodontal Evaluation

For all patients, the periodontal portion of the recall examination should include the following:

1. Careful evaluation of the color, shape, contour, and texture of the gingiva, including notation of recession, clefting, and any mucogingival defects (Figure 11-9)
2. Plaque score and assessment of the patient's effectiveness with oral homecare
3. Complete mouth probing and a recorded bleeding index

For patients with clinical attachment loss (CAL), gingival margins and CAL should also be recorded (see *Periodontal Reevaluation* in Chapter 9 for details).

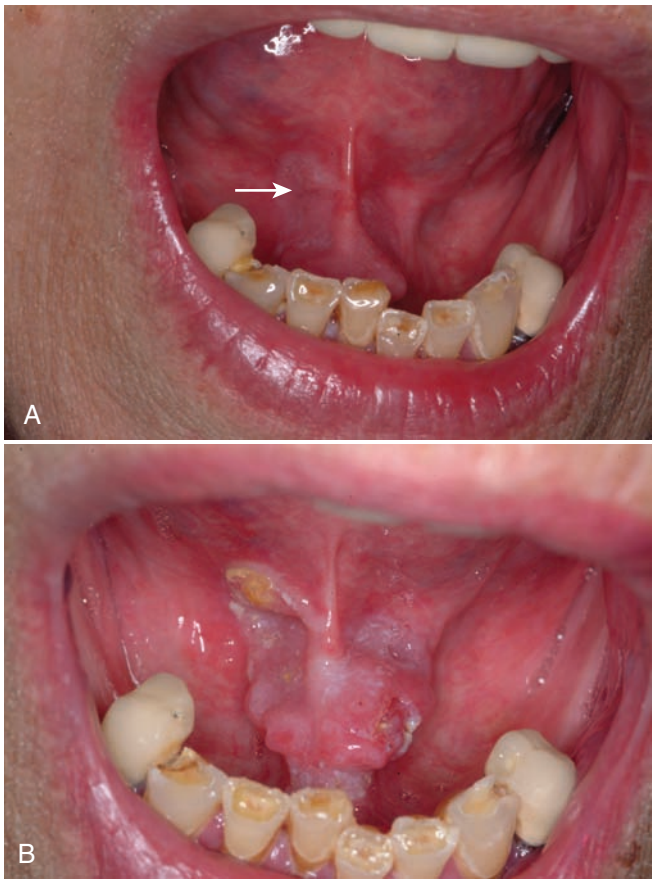


**FIG 11-8 A,** A suspicious lesion at initial presentation. The patient initially declined a biopsy and did not come in for their first follow-up appointment. **B,** The same patient returned many weeks later – note the dramatic change in the size and appearance of the lesion. The biopsy definitively confirmed the lesion to be a squamous cell carcinoma. (Courtesy Dr. Ricardo Padilla, Chapel Hill, N.C.)

### Caries/Restorative Evaluation

In general, examination of the teeth and restorations should follow the other more universal parts of the examination. Otherwise, the focus tends to be primarily on the teeth, and if notable restorative items arise, they are sometimes discussed immediately with the patient, thereby delaying, abbreviating, or bypassing other aspects of the examination. This can easily be prevented simply by doing the caries/restorative examination *last.*

The teeth must be examined carefully for new or recurrent caries. Here, the detailed notes in the maintenance phase of the plan of care (or in the patient record from previous periodic visits) are particularly helpful because they direct the dentist and staff to specific sites where incipient lesions are present or other areas that need reevaluation for signs of caries.

**FIG 11-9** Example of a mucogingival defect. (Courtesy Dr. J. Moriarty, Chapel Hill, N.C.)

Existing restorations should be evaluated for occlusal and proximal contacts, contour, and esthetics. In addition, restorations should be examined for fractures, marginal defects, improper contours, or missing restorative material. Again, it is helpful to the staff and the dentist if previously noted defects and problems that were to be watched or observed have been specified on the maintenance phase plan or on a periodic visit progress note.

If the patient had previously been judged to be at risk for future caries and a caries management plan has been developed, any remaining aspects of the plan should be attended to. If new intervention is necessary, or if previous caries control measures need to be reinstituted, they should be implemented at this visit. If the patient has not previously been caries active or at risk for caries, but present evaluation confirms that the patient is now caries active, then a caries management plan should be instituted (see Chapter 9).

### Radiographic Images

Guidelines for radiographic selection at the periodic visit are discussed earlier in this chapter. After radiographic exposures have been selected and radiographs taken, special attention should be given to interpreting the images and recording the findings. Having ordered the images, the dentist is obligated to view all of them comprehensively. Regardless of the type of image, any and all structures evident on the radiograph must be assessed and the findings recorded. The practitioner must develop a disciplined and systematic approach to radiographic interpretation. Typically, the pattern is similar to that of the clinical examination: beginning with the more general and the more peripheral structures, followed by the periapical areas, then the marginal periodontium, and concluding with abnormalities of the teeth and restorations. A panoramic image will also require an evaluation of the temporomandibular joints and maxillary sinuses. Findings from this analysis must then be recorded in detail, usually in the progress notes.

Occasionally, as described in the accompanying *In Clinical Practice: Patients Who Refuse to Update Radiographs* box, the dentist may encounter patients who do not want to update radiographs. Most opposition can be overcome if the dentist and staff are prepared to respond to the patient's concerns.

## IN CLINICAL PRACTICE

### Patients Who Refuse to Update Radiographs

At the maintenance visit, patients may question the need for obtaining updated radiographic images. To address these concerns, the following stepwise formulaic is suggested:

- Discern the patient's reasons for not wanting to have radiographs taken:
  - Many patients have a deep underlying concern about ionizing radiation and express those concerns in statements like "I don't want any more x-rays than I absolutely have to." These concerns may have evolved from information in blogs, the popular media, and/or social media, which have highlighted a one-sided perspective on the hazards of x-rays in any form. Some of these patients may have had cancer previously and recognize ionizing radiation as a potential carcinogen to be avoided. Some patients have had radiation therapy for cancer and seek to avoid any additional exposure. Others may be pregnant (or are hoping to become pregnant) and wish to avoid anything that may be harmful to the fetus.
  - Some patients want to avoid having radiographs because they consider them to be "unnecessary." These patients may have given credence to the urban legend that "dentists take too many x-rays." Some are anxious about many possible perceived ill effects of x-rays. They may not be convinced that there is any real benefit in taking new radiographs, and they are "willing to take the risk (of not taking radiographs)." Patients who are missing many or all of their teeth may think that radiographs are irrelevant.
  - There are also some patients who argue that "I can't afford it." This is often a relative issue, as the patient has the financial means but believes that the radiographs are not as important as other needs and wants. This patient may also use finances as a stated rationale for one or more of the other underlying concerns noted previously. There will be some patients who have a true financial hardship. For those patients who have a critical need for updated images but do not have the required financial resources, the dentist may elect to reduce or waive the fees (see Chapter 18 for more discussion of this topic).
- Determine the patient's individual radiographic needs using established selection criteria as a guide (2012 Food and Drug Administration and ADA Recommendations[1]):
  - In making that determination, the dentist must also consider the patient's dental history, current symptoms, past and current disease activity, current restorative condition, and future treatment needs.
- Discuss the specific benefits to the patient of taking the images in the context of the patient's past dental history and current dental condition.[1-2]
  - If the patient has symptoms or signs of new or reactivated oral infection or disease, and new images will aid in making a correct diagnosis, then the benefit of obtaining new images is obvious.
  - If the patient is considered to be at elevated risk for caries, periodontal disease, or periapical pathology, radiographs are an important element in verifying whether the risk is static, has become elevated, or is diminished.
  - In the presence of implants, root canal treatments, or large existing restorations, images may facilitate the early discovery or new or recurrent disease.
  - Even in the absence of symptoms, risk indicators for oral disease, or suspicion of new problems, periodic images may reveal the presence of pathology in the dentate, partially dentate, or edentate patient. Studies have shown that 30% to 50% of edentulous patients exhibit abnormalities in panoramic images.[3-7]
  - With early detection and accurate diagnosis of new disease, or recognition of newly elevated disease risk, preventive strategies may be more effective, interventions more successful and less costly, and more serious outcomes, such as loss of teeth, may be avoided.[1]

New images can, when no pathology is evident, give patients the peace of mind of knowing that they are disease free at this juncture. This may be especially meaningful to patients who have had oral cancer, or who have other forms of cancer and want to be sure there is no metastasis to the jaws.

- Discuss the risks of taking the images:

  All dental practices should be cognizant of and routinely practicing ALARA (As Low As Reasonably Achievable) principles. Informing the patient of efforts your office has made in this regard would be appropriate and is usually appreciated by the patient.

  Significant advances have been made in recent years to reduce the ionizing radiation exposure from dental radiographs.[1,2] The benefits from changing from D Speed to F Speed (Insight) and from round to rectangular collimation are seen in Table 11-2.

  The patient's relative risk of developing cancer from routine intraoral dental radiographs has been generally accepted to be 1 to 2 in 1,000,000. It is often useful to discuss with a patient how that risk compares with other common life events (Table 11-3).

- Consent Discussion

  The consent discussion should be carried out in a thoughtful, dispassionate, professional manner, with the dentist listening carefully to the patient's questions and responding to his or her concerns. If the patient has specific concerns not already addressed in the risk/benefit discussion, those concerns should be addressed at this time. The pregnant patient is a good example. A fundamental question for this patient may be what images are absolutely necessary at this juncture and which can be deferred until after the delivery. If the history and clinical examination suggest the serious possibility of new active disease (caries, periodontal disease, pulpal or apical disease) and new images will assist with the diagnosis and treatment, then new images should be taken. If the patient is asymptomatic, however, and has no clinical evidence of caries, periodontal disease, or other oral pathology, it may be prudent to defer routine images until after the delivery. If the dentist has determined that the patient is at high risk of developing an oral infection during the pregnancy, however, the images should be taken without delay. A factor that might weigh against taking elective radiographs during pregnancy would be the patient's high level of anxiety about radiation exposure (which could in itself increase the risk of an untoward event).

If the patient continues to decline recommended radiographs, some practices have developed a consent form: ***Informed Refusal to Take Radiographs.*** In some settings, this has become the *pro forma* response to any patient resistance to the suggestion that new radiographs be taken. Although accepting the patient's position without discussion and asking the patient to sign the refusal form may save time and avoid what can sometimes be a lengthy and challenging conversation, this approach violates professional ethical principles. Furthermore, it is not clear that a patient can legally consent to nontreatment that can be considered negligent and does not meet the standard of care, nor is it clear in case law that the dentist is not responsible for failure to diagnose and treat clinical problems that would have been evident on radiographs, had they been taken (see Chapter 6).

If, after comprehensive discussion with the patient, the patient still refuses to allow indicated images to be taken, the dentist may be faced with no alternative but to dismiss the patient from the practice. This may be the only recourse if the dentist is confident that he or she cannot in good conscience continue to treat the patient without violating his or her own ethical standards and the professional standard of care. If dismissal is decided on, the patient must be given due process, as discussed in Chapter 6. In many cases, however, the mere threat of dismissal will be enough to cause the patient to reconsider the issues and consent to having radiographs taken. Regardless of the outcome, however, the consent discussion must be thoroughly documented in the patient record.

**Reference List**


1. American Dental Association, Council on Scientific Affairs, and U.S. Department of Health and Human Services, Public Health Service, Food and Drug Administration: Dental radiographic examinations: recommendations for patient selection and limiting radiation exposure. Rev ed 2012. http://www.ada.org/sections/professionalResources/pdfs/Dental_Radiographic_Examinations_2012.pdf/ (Accessed February 24, 2015).
2. ADA Council on Scientific Affairs: The use of dental radiographs: Update and recommendations, *JADA* 137:1304-1312, 2006.
3. Jindal SK, Sheikh S, Kulkarni S, Singla A: Significance of pretreatment panoramic radiographic assessment of edentulous patients—a survey, *Med Oral Patol Oral Cir Bucal* 16(4): e600-e606, 2011.
4. Edgerton M, Clark P: Location of abnormalities in panoramic radiographs of edentulous patients, *Oral Surg Oral Med Oral Pathol* 71(1):106-109, 1991.
5. Sumer AP, Sumer M, Guler AU, Bicer I: Panoramic radiographic examination of edentulous mouths, *Quintessence Int* 38(7):e399-e403, 2007.
6. Masood F, Robinson W, Beavers KS, Haney KL: Findings from panoramic radiographs of the edentulous population and review of the literature, *Quintessence Int* 38(6):e298-e305, 2007.
7. Awad EA, Al-Dharrab A: Panoramic radiographic examination: a survey of 271 edentulous patients, *Int J Prosthodont* 24(1):55-57, 2011.


## Special Considerations for Implants

As noted earlier in this chapter, several clinical problems may arise related to implants and their attached prostheses. At each implant site, gingival contour, color and texture, presence of food impaction, black triangles, and the stability of the implant must be reassessed. At the recall visit, each implant should routinely be probed at the six sites, as with a natural tooth. To avoid scratching the implant, it is generally recommended that probing be implemented with a plastic probe.[1] In the presence of recession or advancing probing depths (attachment loss), suppuration, unexplained BoP (bleeding on probing), or implant mobility, a new radiograph

**TABLE 11-2 Conventional Dental Radiography Dose Calculations**

| Technique | Effective Dose in μSv | Dose as Multiple of Average* Panoramic Dose | Days of per Capita Background† | Probability of x in a Million Fatal Cancer‡ |
|---|---|---|---|---|
| FMX with PSP or F-speed film and rectangular collimation | 35.0 | 2.2 | 4.3 | 2.0 |
| FMX with PSP or F-speed film and round cone§ | 171.0 | 10.6 | 21.0 | 9.0 |
| FMX with D-speed film and round cone | 388.0 | 24.1 | 47.0 | 21.0 |
| Panoramic – CCD | 16.1 | 1.0 | 2.0 | 0.9 |
| AP cephalometric – PSP | 5.1 | 0.3 | 0.6 | 0.3 |
| Lateral cephalometric – PSP | 5.6 | 0.3 | 0.7 | 0.3 |

Courtesy Dr. John Ludlow, Chapel Hill, N.C.
(Based on International Commission on Radiological Protection 2007 Recommendations.)
AP, Anterior-posterior; CCD, charge couple device; FMX, full-mouth x-ray; PSP, photostimulable phosphor dental radiography.
Green highlight, 91% reduction possible switching from D-speed (Ultraspeed) to F-speed (Insight) and rectangular collimation
Yellow highlight, 56% reduction possible switching from D-speed (Ultraspeed) to F-speed (Insight) and round cone
*Average of five units: Sirone – Orthopos XG, Planmeca – ProMax, Kodak – 9000, SCANORA 3D, Instrumentation – OP 200V.
†3000 μSv NCRP Report No. 145.
‡Dose in μSv × $5.5 \times 10^{-2}$.
§Calculated as F-speed film value × 2.3.

**TABLE 11-3 Comparable Risk Table**

***Situation of a One-In-Million Risk of Dying***

| Risk | Quantity | Nature |
|---|---|---|
| **Life** | | |
| Living in stone building | 2 months | Natural radioactivity |
| Living in Denver, CO | 2 weeks | Cosmic radiation |
| **Travel** | | |
| Canoe | 6 minutes | Accident |
| Bicycle | 10 miles | Accident |
| Car | 300 miles | Accident |
| Airplane | 1000 miles | Accident |
| Airplane | 6000 miles | Cosmic radiation |
| **Work** | | |
| Typical factory | 10 days | Accident |
| **Miscellaneous** | | |
| Smoking | 1.4 cigarettes | Cardiovascular disease, cancer |
| Wine | 500 cc | Cirrhosis |

Cohen BL: Catalogue of risks extended and updated. *Health Phys* 61:317-335, 1991.

(or radiographs) is indicated. When calculus is detected, it may be prudent to remove it with plastic scaling instruments (rather than metal).[4,5]

## Special Considerations for Fixed Partial Dentures

Fixed partial dentures are susceptible to several common problems. These include debonding, recurrent caries, gingivitis, periodontal disease, pulpal necrosis and associated periapical disease, occlusal trauma, and fracture of the prosthesis (usually the porcelain) (Figure 11-10). Acid etch–retained

**FIG 11-10** Site of failed fixed partial denture. (Courtesy Dr. B.E. Kanoy, Chapel Hill, N.C.)

prostheses have a particularly high rate of debonding. Resin-bonded bridges present a particular concern if one retainer loosens and the other remains stable, in which case the abutment with the loose retainer is vulnerable to rapidly advancing caries. With these concerns in mind, it is mandatory that the fixed partial denture be thoroughly evaluated for mobility, fracture, occlusal trauma, pulpal health, soft tissue and periodontal response, presence of plaque, food impaction, caries, marginal integrity, function, and esthetic problems.

## Special Considerations for Removable Prostheses

Abutment teeth for a removable partial denture or a tooth borne overdenture are subject to the same problems as abutments with fixed partial dentures. Natural tooth overdenture

abutments are particularly susceptible to caries. Removable partial dentures may become loose or exhibit fracture of a clasp, the framework component (Figure 11-11), or the acrylic. Denture teeth are prone to occlusal wear, fracture, and detachment. Complete dentures are subject to midline fractures, flange fractures, and loss of retention. Any removable prosthesis may become stained or accumulate calculus. Implant-retained removable prostheses are susceptible to wear or dislodgement of the attachments.

With any removable prosthesis, the dentist may find it helpful to segment the evaluation into three components: (1) information derived by the dentist from the clinical examination, (2) information obtained from the patient, and (3) issues to be assessed by both patient and dentist.

1. Dentist-derived issues include an evaluation of the occlusion, stability, adaptation, integrity, and retention of the prosthesis; tissue response; and effectiveness of the patient's oral homecare.
2. Patient-derived issues include any patient reports of symptoms or problems with the fit or function of the prosthesis.
3. A third category includes those concerns that are important to both patient and practitioner, and for which each may have a different perspective. Esthetics provides a useful example. When opinions differ concerning an esthetic issue, the patient's perspective should usually prevail. However, the dentist must provide appropriate information so that the patient is able to make an informed decision. For example, if the patient thinks the teeth in the partial denture are "too short," the dentist's role is to explain why the teeth were selected, positioned, and shaped as they are (e.g., consistency with the form of adjacent teeth, available interarch space, occlusal wear) and describe available alternatives, including how such alternatives may affect esthetics and function, and at what cost. In this situation, assuming the request is reasonable and the patient has realistic expectations for the outcome, the ultimate decision to modify or remake the prosthesis is left to the patient.

**FIG 11-11** Worn removable partial denture. (Courtesy Dr. A. Guckes, Chapel Hill, N.C.)

## Therapy

A therapeutic component is almost always appropriate during the periodic visit, after completion of a thorough evaluation. If the patient's plan of care includes a disease control phase, then the periodic visit procedures will include a continuation of the disease control phase therapy. In any case, a well-written maintenance phase plan, or a disease control or definitive phase posttreatment assessment, will guide and shape what occurs at the initial periodic visit. Subsequent visits are shaped in turn by the findings at the previous visit, and the corresponding recommendations made and recorded in the progress notes.

Typical therapies provided at a periodic visit may include (but are not be limited to) the following:

- Responding to any general health/systemic phase issues (e.g., appropriate premedication).
- Oral prophylaxis.
- Oral homecare instructions (with particular emphasis on problem areas, orthodontic retainers, and any prostheses)
- Scaling and root planing.
- Any necessary disease control measures required for the elimination or prevention of caries or periodontal disease. This may include caries activity tests, dietary counseling, fluoride treatment and/or varnish, prescription of fluoride dentifrice, fluoride gel, trays or rinses, xylitol-based chewing gum, salivary substitutes, or antibiotics (locally applied, topical, or systemic).
- Recontouring, polishing, or providing simple adjustment to chipped teeth, stained composites, or ditched amalgams. This may include such procedures as elimination of easily accessible restoration overhangs or plunger cusps that contribute to food impaction.
- New or replacement restorations. Patients will typically need to return on a separate day with a designated appointment for restoration repair, placement, or replacement.
- Crown or fixed partial denture maintenance may require re-cementation, repair, or removal to investigate possible caries or pulpal disease. Root canal therapy, periodontal surgery, or replacement is prescribed as necessary.
- Denture maintenance typically includes ultrasonic cleaning. Adjustments to the denture such as tightening a clasp, replacement of a worn implant attachment, or relieving pressure spots, can usually be made on the day of the periodic visit. Repairs can be made on the same day, or rescheduled if

the complexity of the problem requires more time or laboratory support.

- Implant maintenance. Implants should be scaled with plastic instruments to prevent scarring or scratching the implant surface. If an implant-retained crown or retainer is loose, it may be possible to replace the retention screw and retorque and replace the access restoration (if screw retained) or re-cement the crown (if cement retained). The broken component of a fractured retention screw or abutment can be removed and replaced with a healing cap. Extensive repair or replacement of an abutment or crown will usually necessitate another visit.
- Occlusal guard maintenance. Patients who wear an occlusal guard may need an occlusal adjustment or, less commonly, a reline of the appliance. These procedures can normally be accommodated at the periodic visit if the patient brings the guard to the appointment. If an occlusal guard is completely fractured, it may be best to remake it rather than to try to repair it.

### Planning for Current and Future Needs

At the conclusion of the recall visit, the dental team will need to develop a plan for the next treatment and/or recall visit. Based on comprehensive knowledge of the patient's initial condition, current state of disease activity, assessed risk of future disease, and particular expectations and concerns, plans for the next visit should be recorded in the patient record. An immediate restorative need will normally be addressed at an appointment in the near future. If there are no immediate treatment needs, then specific items to be reassessed or addressed at the next recall visit should be recorded and the patient informed of the plan and any expectations that the dental team may have for that future visit.

### Progress Note

Documentation of the periodic visit should be recorded in the progress notes in the patient record (see eFigure 11-1 for a sample of a *Progress Note*).

The note should include the following information:

- General health status summary and recording of the vital signs (confirm that patient has taken premedication, if indicated).
- Summary of all positive, and significant negative, findings from the periodic examination.
- Diagnosis of all conditions that require recognition, management, or treatment.
- Description of all treatment rendered, including local anesthetic, materials used, medicaments applied, prescriptions written, and oral homecare instructions given to the patient.
- Notation of the patient's response to treatment.
- A written plan for the next visit. If the next visit is for a restorative procedure, the note should include the tooth numbers, surfaces, material and procedure planned, and evidence of patient consent. The time interval for the next maintenance visit should be specified.

**Box 11-2 Sample Template for Recall Visit Progress Note**

- Patient concerns (and history)
- Health history update and considerations
- Vital signs
- Radiographic images (type of images and date)
- Extraoral examination findings
- Intraoral examination findings
- Findings from examination of teeth/restorations/prosthesis/occlusion
- Gingival and periodontal findings
- Plaque index
- Bleeding index
- Oral homecare and prevention recommendations
- Treatment rendered
- Posttreatment instructions
- Return to clinic (immediate treatment needs)
- Recare plan (recall interval; goals and expectations for next recall visit)

Electronic patient records may include templates used for development of the progress notes. Various systems may have a skeleton outline, with narrative entries to be added. A template for such a system is illustrated in Box 11-2. An alternative approach is to have a rather complete and detailed narrative already included, with the provider filling in critical blanks with options from appropriate pull-down menus and editing the prepared text as appropriate.

## CONCLUSION

The maintenance phase of treatment establishes the platform for a mutually beneficial long-term relationship between the patient and dental team. Benefits to the patient include partnering with a dentist and practice that is invested in the betterment of their oral health and confidence that ongoing and future dental needs will be provided for in a timely and efficient manner for as long as he or she remains in the practice.

**IN CLINICAL PRACTICE**

**Tips for Developing an Effective Maintenance Care Program in Private Practice**

- Develop a philosophy for your maintenance program.
- Specify the component parts of the program and services to be performed.
- Develop standard documentation for each periodic visit and a plan for each subsequent visit, including the details of what will be done and when.
- Develop and delegate a list of responsibilities to staff.
- Formalize the program in an office manual.
- Periodically reevaluate the effectiveness of your system.

**SAMPLE Recall Visit PROGRESS NOTE:**

**Patient concerns (and history):** No new concerns on this date

**Health history update and considerations:** Patient reports no changes in general health and no change with medications

**Vital signs:** BP 160/ 80; Pulse 75

**Radiographic images (type of images and date):** FMX (mm/dd/yy); BW's (mm/dd/yy)

**Extraoral exam findings:** WNL (within normal limits); amalgam tattoo on edentulous ridge area of maxillary right first molar unchanged from previous visit

**Intraoral exam findings:** Two petechiae on left buccal mucosa (cheek chewing); otherwise WNL

**Findings from exam of teeth/ restorations/ prosthesis/ occlusion:** Secondary caries @ cervical facial composite maxillary right central incisor; otherwise WNL. No reported symptoms or functional problems; occlusal exam WNL

**Gingival and periodontal findings:** Isolated localized marginal gingivitis with moderate supragingival calculus lingual of lower anterior teeth. Plaque score= 10%; Bleeding score 5%. See charting for probing depths. Now 5mm probing depth with bleeding on probing mesial of maxillary left second molar (open contact with reported food impaction).

**Plaque Index:** 23%

**Bleeding Index:** 18%

**Oral homecare and prevention recommendations:** Modified bass brushing technique two times per day for two minutes; dispensed Proxabrush for use on maxillary left second molar (mesial embrasure) – instructed patient on rationale and use and patient demonstrated proper technique. Continue daily flossing as previously prescribed.

**Treatment rendered:** Scaled using universal standard ultrasonic scaler and hand instruments; polished with fine grit fluoride paste

**Return to Clinic (immediate treatment needs):** Composite restoration maxillary right central incisor

**Recall plan** (Recall interval; goals and expectations for next recall visit): 6 months; reevaluate cheek biting and periodontal status of maxillary left second molar (may need to replace DO restoration on maxillary left first molar)

**eFIG 11-1** Sample of a Progress Note.

## REVIEW QUESTIONS

- What are the benefits of a maintenance phase of care?
- What issues are typically addressed in the maintenance phase of care?
- What is a posttreatment assessment? What is its purpose? What are its elements?
- What services are provided to the patient at the periodic visit?
- How will you respond to a patient who declines having recommended radiographs?
- What assessments are needed at the periodic visit for a patient who wears a removable complete or partial denture?

## SUGGESTED PROJECTS

Develop a practice policy that covers all aspects of a periodic visit:

- What is to be done?
- What is the sequence of events?
- Who is responsible for each of the steps in the process?
- What information is communicated to the patient, and how?
- What arrangements will be made for follow-up or future care?
- How is the information to be recorded?

Create a simple form that will be used in your practice to document each periodic visit. Include all items that should be evaluated, treated, and/or reassessed at future visits.

## REFERENCES


1. Wilkins E: *Clinical practice of the dental hygienist*, ed 11, Philadelphia, 2013, Lippincott Williams & Wilkins.
2. Albrektsson T, Zarb G, Worthington, Eriksson A: The long-term efficacy of currently used dental implants: A review and proposed criteria for success, *Int J Oral Maxillofac Implants* 1(1):11–25, 1986.
3. American Dental Association, Council on Scientific Affairs, and U.S. Department of Health and Human Services, Public Health Service, Food and Drug Administration: *Dental radiographic examinations: recommendations for patient selection and limiting radiation exposure*, Rev. ed 2012. http://www.ada.org/~/media/ADA/Member%20Center/FIles/Dental_Radiographic_Examinations_2012.ashx/. Accessed February 24, 2015.
4. Homiak A, Cook P, DeBoer J: Effect of hygiene instrumentation on titanium abutments: A scanning electron microsopy study, *J Pros Dent* 67(3):364–369, 1992.
5. Louropoulou A, Slot DE, Van der Weijden FA: Titanium surface alterations following use of different mechanical instruments: a systematic review, *Clin Oral Implants Res* 23(6): 643–658, 2012.

SECTION 4

# Planning Treatment for Unique Patient Populations

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12

# Patients With Special Needs

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http://evolve.elsevier.com/Stefanac/diagnosis/

## OUTLINE

**Identifying the Patient With Special Needs**
**Role of the General Dentist in Management of the Patient With Special Needs**
**Access to Care**
- Transportation
- Residency
- Office Accommodations
- Funding Sources

**Planning for Specific Conditions**
- Patients With Developmental Delay or Cognitive Disorders
- Traumatic Brain Injury
- Severe Coagulopathies
- Acquired Immunodeficiency Syndrome
- Patients Under Hospice Care

**Patient Evaluation**
- Chief Concernand History of the Chief Concern
- General Health History and Review of Systems
- Oral Health History
- Personal History
- Functional History
- Obtaining Additional Information From Other Healthcare Providers
- Physical and Oral Examination in the Dental Office
- Imaging
- Special Diagnostic Tests and Procedures
- Diagnostic Casts

**Arriving at a Diagnosis**
**Treatment Planning for the Patient With Special Needs**
- Unique Aspects of Treatment Planning for the Special Care Patient
- Referral Options
- Phasing Treatment
- Informed Consent

**Delivery of Care**
- Appointment Scheduling
- Patient Positioning and Transfer
- Communication With Special Care Patients
- Role of Family
- Role of Patient's Caregiver
- Other Professional Resources

**Ethical and Legal Issues**
**Conclusion**

This chapter introduces Section IV of *Diagnosis and Treatment Planning in Dentistry.* The scope of this chapter is intentionally broad and will address the diagnosis, treatment planning, and management of a wide range of patient conditions that can be considered to reflect special needs.

The management of several important selected clinical needs is discussed in greater detail later in this text. Treatment planning for the substance-abusing individual, the anxious or phobic patient, patients with psychological problems, adolescents, older adults and patients who are motivationally compromised or financially limited is addressed in the other chapters of this section. This chapter serves as an overview and introduction to those chapters and, in addition, discusses a variety of special needs conditions not specifically addressed elsewhere in the book.

The U.S. government defines persons with disabilities as individuals with a physical or mental impairment that substantially limits one or more major activities of daily living (ADL). Census 2000 identified 49.7 million individuals in the United States with some type of long-lasting condition or disability. In developed countries, the elderly constitute an increasingly large component of the population, and it is now estimated that almost one-third of the population will be older than 60 years by 2050.[1]

This group is prone to health problems in general and to oral health problems in particular. Patients with disabilities, and especially elderly patients with disabilities, frequently reside in nursing homes. According to the National Nursing Home Survey in 2004, the United States had 16,000 nursing facilities with approximately 1.7 million beds. The average facility has 107 beds and an 86% occupancy rate.[2] Moreover, with the growing numbers of older adults worldwide, nursing homes will be expected to provide residence and care for a significant portion of this population.

A strong relationship between disability status and oral health status has been identified.[3-7] Individuals with special

needs are more likely to exhibit gingivitis or periodontitis and to have poor oral hygiene. Improvement of oral health in individuals with special needs can lead to improved quality of life. Unfortunately, however, many of these individuals have limited access to oral healthcare, and their oral health needs remain unmet.[8,9]

Patients with special needs may provide the dental team with unusual and interesting challenges in both planning and delivering dental treatment. Treatment modifications required may range from slight (e.g., giving the patient more time to communicate or providing physical support in the dental chair) to complex (providing treatment for a patient who is bedridden and requires full-time skilled nursing care). The range of oral health services runs the gamut from simple pain relief to complete oral rehabilitation. All patients seek high-quality treatment delivered with compassion, integrity, and safety, and the patient with special needs is no different. These patients will often be unusually appreciative of the time and effort that the dental team invests in their care.

The stated goal of special care dentistry is "to improve the oral health of individuals and groups in society who have a physical, sensory, intellectual, mental, medical, emotional, social impairment or disability, or, more often, a combination of a number of these factors."[10] The process of achieving that goal can be challenging, but it also presents unique opportunities and inestimable rewards for all the members of the dental team. The mission of the authors of this chapter is to help the reader develop both the skill set and comfort level to diagnose the problems of such a patient, devise a treatment plan that promotes oral and general health within the limits of the patient's circumstances and temperament, and deliver treatment in a manner that is safe, effective, compassionate, and affirming of the patient's sense of self. Most of these patients can be managed very successfully within the context of a general dentistry practice. Armed with this knowledge and with a willingness to try, providing care can be a rewarding opportunity for the dentist, and in some instances, a life-changing experience for the patient.

## IDENTIFYING THE PATIENT WITH SPECIAL NEEDS

The distinction between the patient designated as "special care" or "special needs" and the more typical dental patient who may need small accommodations to be comfortable or to facilitate efficient treatment may sometimes seem indistinct. Indeed, all patients deserve individualized and compassionate and, in a manner of speaking, "special care." Every patient has the right to be treated as a unique individual by the dental team. This may be manifested in small but significant ways, such as addressing the patient in a preferred manner, or using a mouth prop to reduce strain on a sensitive temporomandibular joint (TMJ). The patient with special needs, although typically seeking the same types of services and therapy, will require an even more intentional, strategic, and individualized approach to care. *Broadly speaking, patients with special clinical needs are those patients who live with significant mental, physical, psychological, or medical challenges and who, as a result, require significant modifications to treatment planning and delivery of oral healthcare.* The following list of physical or mental conditions can be categorized as "special care" or "special needs":

- Autism
- Mental retardation (Down syndrome)
- Traumatic brain injury
- Cerebral palsy
- Mental illnesses (psychoses or neuroses of various diagnoses)
- Medically compromised conditions (e.g., congestive heart failure, unstable angina, cancer, transplant, human immunodeficiency virus [HIV]-acquired immunodeficiency syndrome [AIDS])
- Severe dental anxiety or phobia
- Craniofacial abnormalities (craniofacial syndrome, Apert's syndrome, cleft palate)
- Certain congenital illnesses (e.g., hemophilia)
- Various dementias (Alzheimer's, Parkinson's, multi-infarct dementia)
- Severe depression or pseudodementia
- Physical disability, such as severe rheumatoid arthritis

Patients with special needs may require modifications in both the kind and scope of dental treatment. Certainly, specific physical, medical, psychological, or psychosocial problems will have a bearing on the kinds of modifications to the dental treatment plan that will be necessary. Equally important, the *severity* of the disorder will have an effect on what the necessary modifications will be. For example, an individual with mild autism who can cooperate during restorative procedures and is responsive to preventive therapy may be treated with minimal or no modification to treatment. At the other extreme, a patient in the late stages of Alzheimer's disease is a poor candidate for anything beyond basic preventive and acute care services.

## ROLE OF THE GENERAL DENTIST IN MANAGEMENT OF THE PATIENT WITH SPECIAL NEEDS

Recognizing, managing, and treating all oral healthcare problems presented by individuals with special needs is within the scope of general dentistry. The general dentist has several roles to play in the management of the patient with special needs:

- Recognize that a patient *has* special needs.
- Perform an initial oral examination, making adjustments to the process as appropriate.
- Consult with other oral healthcare providers as needed regarding the patient's condition and treatment.
- Referral to a hospital dentistry unit or an academic health center when indicated.
- Generate a plan of care for the patient, the complexity of which will depend on multiple factors, including (1) patient's dental needs, (2) anticipated level of cooperation, (3) patient's ability to carry out effective oral self-care, and (4) availability and extent of support from a caregiver.

- Engage the patient, and surrogates as indicated, to achieve informed consent.
- Educate the patient and caregivers in the importance of oral health and its relationship to systemic health; work with them to establish a daily oral care program.
- Execute the plan of care in a compassionate and professional manner.
- Provide long-term maintenance care.
- Engage and encourage the participation and support of caregivers during all steps of the therapeutic process: examination, treatment plan formulation, active treatment, and maintenance therapy.
- Respond to physician's requests regarding the following:
  - Oral health assessment
  - Clearance before medical surgery
  - Management or treatment of oral infections or other oral health problems

The dental team has the responsibility to help the patient with special needs maintain a functional, healthy oral condition. For such patients, this can necessitate considerable time, effort, and creativity. The ultimate goal is to help the patient achieve an optimal state of oral health consistent with what his or her mental and physical condition will permit.

## ACCESS TO CARE

Access to care is an important issue in the management of the patient with special needs. If the patient is homebound, can dental services be brought to that location? If the patient is living independently, does he or she have transportation to the dental office? Once brought to the dental office, are environmental modifications in place to accommodate his or her needs? If the patient lives in a residential facility, can dental services be provided on site, or should the patient be brought to the dental office? Four components of the access to care issue are considered in this section.

### Transportation

Many modes of transportation can be used to bring a patient to a dental appointment, including personal conveyance, public transportation (bus or taxi), ambulance, or van (sponsored by social services, government, transit authority, or private enterprise). Often a personal friend or relative will offer to bring the patient in the patient's or the friend's or relative's own vehicle. The mode of transportation may have an effect on the appointment scheduling for a patient. For instance, the dentist may try to provide more treatment or an extended appointment time for an individual conveyed by ambulance.

### Residency

Many patients with special needs live in facilities other than a private home, apartment, or condominium. Such facilities include rest homes, nursing homes, and continuing care retirement centers. Several approaches to delivering dental care to these individuals are available.

- **In-house dental unit.** The facility may have a fully equipped dedicated dental operatory permanently on site or may share a room equipped for dental care that is also used at other times by a hair stylist or podiatrist.
- **Comprehensive mobile dental operatory.** This can be a complete dental operatory with all the amenities, including a full-sized dental unit with wheels built into the chair base. All equipment, materials, and supplies are packaged and transported by truck. Typically, the mobile operatory is delivered to the facility and set up to be fully operational on the same day. This format allows the dentist to provide a complete range of oral healthcare services on site.
- **Portable units.** Portable dental units are easily transportable "fold-up" units stored in cases/containers and assembled on site by the dental team. These self-contained units typically include their own sources of water, suction, and compressed air. If electricity is not available, a portable generator can provide power. Designed primarily to serve in the mission field or at temporary military installations, this type of setup is adaptable to a wide variety of settings. Although in theory, a full range of services can be provided, the limited suction and air capacity, less ergonomic chair, and lack of many of the comforts and amenities of a fixed base setting make it difficult for the dentist and staff to carry out extended or complex procedures day after day.
- **Vans or buses with dental facilities on board.** In this type of installation, a complete dental operatory with dental chair, x-ray head, sources for compressed air and suction, and a complete array of dental equipment, instruments, and supplies is housed and ready for use in a fully functioning van or bus. Using this mode of operation, the dental team drives to a convenient parking area, hooks up to an existing electrical and water supply, if available, and is prepared to see patients who need only to be brought to the van to receive dental treatment.
- **Delivery to the dental office.** In some cases, patients living in nursing homes or continuing care facilities are transported to a dental care facility. Often it is a caregiver, family member, or friend who brings the patient in, or it may also be someone on the dental team.

Additional information on alternative modes of care delivery is provided in Chapter 17.

Some of the options described previously (portable units, dental van or bus, delivery to the dental office) can be implemented for the home-bound patient. In addition, the dental team may provide in-home rudimentary dental services, as described in Chapter 17.

### Office Accommodations

If the dental team elects to treat special needs patients in the dental office, the facility must be properly designed and equipped to deliver care in a manner that is comfortable and safe for the patient, and efficient for the dental team (Box 12-1). (See Video 12-1, Tour of an Operatory for Special Needs Patients on Evolve.)

American dental offices must comply with standards established in the Americans with Disabilities Act. Some state

**BOX 12-1 Suggested Environmental Features to Accommodate Patients With Special Needs**

- Handicapped parking clearly marked
- Ramps for wheelchair access
- Automatic doors (wide enough for wheelchair or gurney)
- Reception window accessible from a wheelchair
- Handicapped-accessible restrooms (automatic doors*)
- Operatory door wide enough for wheelchairs or gurney*
- Operatory size large enough to accommodate wheelchair, gurney,* staff, and dental equipment
- Extended tubing length on the dental unit
- Control of noise

*Higher-level accommodations that may not be practical or possible to retrofit in an existing office.

and local jurisdictions may also have laws or ordinances that are relevant. The dentist who anticipates seeing patients with disabilities should consult the document "Americans with Disability Act Standards for Accessible Design".[11]

## Funding Sources

As with all other patients, the dental team must establish with the patient and/or caregiver how dental treatment will be paid for. Several potential funding sources can be considered.

### Private Pay

Many special care patients have their own or family financial resources with which to pay for oral health services. If a designated power of attorney or legal guardian has taken over financial responsibilities, costs of treatment and financial resources will be discussed with this individual.

### Medicare[12–14]

In the United States, Medicare is a health insurance program for persons 65 years or older, some individuals with disabilities who are younger than age 65, and individuals with end-stage renal disease requiring dialysis or renal transplant. There are strict limitations as to the types of dental treatment covered by Medicare, however. For example, Medicare does not cover routine dental treatment, such as cleanings, restorative treatment, dentures, or extractions. However, Medicare Part A (hospital insurance) will pay for certain dental procedures performed while a patient is in the hospital. As of 2013, Medicare will pay for the following:

1. Comprehensive examination in a hospital inpatient setting preceding kidney transplantation or heart valve replacement.
2. Extractions in preparation for radiation treatment for oral cancer. (The patient is responsible for the cost of any prosthetics, however.)
3. Dental services that are an integral part of a medical procedure, such as reconstruction of the jaw after an accident or facial tumor removal.

It is important to note that, according to cms.gov, coverage of dental care is not determined by the necessity of the dental care but by the type of service provided and the anatomic structure involved in the procedure. Therefore it is important to verify with Medicare which dental procedures are covered before initiation of treatment.

### Medicaid

In the United States, Medicaid is the federally sponsored, state and/or county-administered insurance program for blind, disabled, and indigent individuals. Medicaid dental coverage for both adults and children varies from state to state. For the patient to benefit from this form of assistance, the dental team must be knowledgeable about and comply with all the rules and restrictions, as well as with the fee schedule for the Medicaid plan in the patient's jurisdiction.

### Other Sources

Other possible sources of financial support for the special care patient in the United States include Supplemental Security Income (SSI), pensions, and religious or other nonprofit groups. Social workers and case managers are well trained in optimizing federal, state, and community-based resources for clients under their care.

Throughout the world, there is great variability in the level of governmental support for oral healthcare. Western European countries have traditionally placed a high priority on the provision of basic dental services both to their general population and to special needs populations, such as the elderly, infirmed, and impaired. Programs and benefits are determined for the most part by national policy.

# PLANNING FOR SPECIFIC CONDITIONS

As noted earlier in this chapter, many conditions can be appropriately designated as "special needs." The following paragraphs discuss briefly six relatively common special needs conditions that are not addressed in depth elsewhere in this text.

## Patients With Developmental Delay or Cognitive Disorders

At the outset, the patient's level of cooperation must be diagnosed to help the dental team determine which treatments can be performed and in what setting. Prevention is of paramount importance. Oral home care coaching and dietary analysis and counseling are extremely important. The caregiver must be heavily involved in providing the patient's oral home care and maintenance of the patient's oral health. If the patient is fully cooperative, routine dental care can be provided in the office setting. If the patient is combative or uncooperative, however, the decision needs to be made as to the setting in which care will be provided. Alteration or modification of the treatment goals from the ideal is often necessary. If a complete examination, radiographs, and treatment are necessary, then general anesthesia is usually indicated. When the patient is partially cooperative, the decision becomes more difficult. If the patient is not both clinically and legally competent, then treatment goals, risks, benefits, and limitations of each mode of treatment must be explained fully to the caregiver.

## Traumatic Brain Injury

Patients with a history of traumatic brain injury may be treated similarly to individuals with cognitive disorders. The level of potential cooperation must be assessed as noted previously. Similar decisions regarding setting and extent of treatment will be made for patients with head injuries. It must be recognized, however, that the functionality of the patient with traumatic brain injury can change dramatically over time. The patient may progress from an uncooperative, combative individual to one who is fully cooperative. The dental treatment plan can be changed, sometimes drastically, with changes in the patient's physical ability and cognitive function. Although initially, dental treatment may be limited to palliative and acute care, with full recovery, the patient may become an ideal candidate for comprehensive definitive treatment. From the time of the injury and throughout the recovery phase, the caregivers often must be intensely involved in providing for the general and oral healthcare needs of these patients.

## Severe Coagulopathies

Hemophilias A and B and von Willebrand's disease are three well-known disease-induced coagulopathies requiring specific management plans. If invasive therapy is anticipated (including mandibular blocks), then factor replacement is necessary. Postoperatively, an antifibrinolytic agent may be prescribed to assist in stabilizing the initial clot. There are instances of hemophiliacs with inhibitor to the very factor they require for coagulation. For example, the hemophilia A patient with inhibitor will exhibit an immune response to the administered factor and will thus require a continuous infusion to clot properly. Discussion with the patient's hematologist, describing the nature of planned dental procedures, should take place before dental treatment. These patients often require infusion of coagulation factor before dental procedures.

Additionally, several anticoagulant medications that are frequently prescribed to prevent thrombi, strokes, coronary artery occlusions, and/or myocardial infarctions may have implications for the provision of some dental procedures. For example, patients who take warfarin (Coumadin) on a daily basis may need to discontinue or decrease the dose 2 to 3 days before invasive treatment. A current international normalized ratio (INR) value (preferable to a prothrombin time) is an important preoperative measure. The INR provides a standard measure of coagulability. However, the patient who requires oral surgery or any dental treatment likely to cause bleeding (including uncomplicated tooth extractions) typically does not require alteration of Coumadin dosage unless the individual's INR is greater than 3.5 to 4.0, provided that local hemostatic measures such as gel foam and primary closure are used. High-risk patients may need to be admitted and heparinized after discontinuing Coumadin. The heparin is then discontinued 4 to 5 hours preoperatively and resumed soon after surgery. The half-life of heparin is approximately 4 to 6 hours, and that of Coumadin is 3 to 4 days. Low-molecular-weight heparins can also be used to anticoagulate a patient and can be administered at home by the patient. This medication typically need not be discontinued before invasive treatment, because the half-life is approximately 24 hours. Discussion with the patient's physician, including a thorough explanation of the planned dental procedure, should take place before invasive dental treatment. Furthermore, risks and benefits to discontinuing or decreasing the dosage of Coumadin should be discussed.

Other oral anticoagulants, such as antiplatelet medications (e.g., dipyridamole, ticlopidine, aspirin, ibuprofen), direct thrombin inhibitors (dabigatran etexilate), or factor Xa inhibitors (rivaroxaban, apixaban, edoxaban, betrixaban, darexaban, eribaxaban, and idrabiotaparinux) may need to be discontinued or dosages decreased before surgery depending on anticipated blood loss and the planned extent of the surgery. Again, consultation with the patient's physician concerning the planned dental procedures should take place before any invasive dental treatment. Risks and benefits to discontinuing or decreasing dosage of these medications should be discussed.

## Acquired Immunodeficiency Syndrome

The dental team must be vigilant in recognition of the occurrence or progression of the oral manifestations of HIV/AIDS, including Kaposi's sarcoma, candidiasis, oral hairy leukoplakia, HIV-associated periodontal diseases, or other opportunistic infections. Good oral hygiene instruction and oral home care are critical to managing the oral health of the patient with AIDS. If invasive treatment is planned, a complete blood count (CBC) must be evaluated. The platelet count should be at least 50,000, and the absolute neutrophil count should be higher than 1000. If the absolute neutrophil count is lower than 1000, antibiotic premedication is required. Physician consultation is always advisable when invasive treatment is planned. Viral load and CD4 counts are indicators as to the level of control of the illness.

## Patients Under Hospice Care

By definition, the patient in hospice care has an anticipated life expectancy of 6 months or less. Frequently, it is much less than 6 months, because hospice care is often called late in the disease process. Palliative care and pain control are of great importance. If invasive treatment is planned, depending on the diagnosis, a CBC may be necessary. Any patient-requested dental treatment that is not life threatening should be provided if feasible. For example, if the patient desires a reconstruction, and the dental team is capable of providing this care, then it is justifiable to proceed. Informed consent must be obtained, listing diagnoses, alternatives, and costs. Code status should be designated (e.g., Do Not Resuscitate/Do Not Intubate/Full Code [see the *In Clinical Practice: Physician Orders Related to Resuscitation* box later in this chapter]). Occasionally, the dental team may be called on to evaluate a patient who is losing weight because of a refusal to eat. In this situation, it is appropriate for the dentist to do a limited evaluation to discern whether the refusal to eat results from oral pain or, for example, an ill-fitting denture. Here, a comprehensive

assessment is not necessary, and the dental treatment can be limited to strategic efforts to alleviate the pain or improve the functionality of the denture.

## PATIENT EVALUATION

Ideally, the patient with special needs will be identified at the time of the initial appointment through a matter-of-fact query by office staff: "Do you have any physical or other limitations that we can assist you with on your arrival?" If the patient answers affirmatively, he or she should first of all be assured of a welcome to the practice and that any necessary effort to provide accommodation will be made. The patient should be asked to bring any available medical records and names and contact information for other healthcare providers; a list of all medications; and any available dental images or records. An effort should be made to determine whether the patient has a guardian or caregiver. If such a person has been designated, that person should be invited to attend at least the initial visit. Some dental offices find it useful to develop a specific form or questionnaire for such patients that will characterize any special needs and individual expectations. On arrival, the patient should be greeted warmly and given an explanation of what to expect at this first visit. If the patient has brought any documentation, forms, questionnaires, or images, these should be received, recorded, and copied, and returned to the patient or caregiver as appropriate. If a caregiver or family member accompanies the patient, he or she should be recognized and thanked for assistance in providing care for the patient.

After introductions, the patient is escorted to the operatory, and the examination process begins. The patient may be more comfortable if the caregiver or family member is also present during the examination, and that should be encouraged. A patient with special care requirements is evaluated with the same basic approach as described in Chapter 1 of this text. Although an initial attempt should be made to complete a typical examination, depending on the level of the patient's ability to cooperate, parts of the examination may not be completed effectively. Strategies for managing such a situation will be described later in section, *Physical and Oral Examination*.

Initially, the patient may have difficulty becoming acclimated to the new and strange surroundings. The dental team must be flexible and accepting of the patient's behavior and limitations. As the team converses and interacts with the patient in a kind, gentle, and caring manner, the patient will often lower defenses and anxiety will abate. The patient may become sufficiently comfortable to allow at least a brief look, a moderately complete examination or, in a best-case scenario, a complete oral examination. If the examination is not completed at the initial visit, the dentist (in consultation with the caregiver) may reappoint the patient, with the goal of completing the examination at a future date when the patient is less stressed and more comfortable with the dental office setting. If the patient is physically unable or mentally incapable of cooperating for a comprehensive evaluation, some form of sedation or general anesthesia may be necessary.

### Chief Concern and History of the Chief Concern

To properly address specific needs that the patient or the caregiver perceives to be important, it is critical to evaluate the patient's chief complaints or concerns. Characterization of the chief concern often gives the dentist a sense of the patient's or caregiver's oral health philosophy and knowledge. If the patient is unable to articulate his or her wishes and concerns, the chief complaint can be derived from a variety of other sources, including family members, physician, caregiver, social worker, or case manager. If the dentist believes that addressing the chief concern is unrealistic or unreasonable, then the issues involved must be explained to the patient and caregivers or other individuals who may be involved in the decision making. For example, if the family of an individual with dementia desires complex restorative treatment, but the patient appears uncooperative and lacking in the capacity for preventive care, then the family must be informed as to why this option cannot be implemented. Addressing the chief concern is often the starting place for identification of issues central to the ultimate management of the patient and will provide a touchstone from which to begin the education of the patient and caregivers.

### General Health History and Review of Systems

Although important as a baseline of information for all patients, obtaining a thorough and complete health history for the special care patient can be of life-preserving significance. Answers to questions regarding hospitalizations, major illnesses, surgical procedures and complications, medications, and allergies are essential if the patient is to be treated safely and effectively. Because of the complex physical status of many of these patients, an exclusive use of only a standard health history form with close-ended questions will be inadequate.[15] Instead, an open-format mode of questioning, or a questionnaire supplemented with follow-up questions, is frequently necessary to provide a complete history. In addition to the patient interview, the history can be taken from a variety of other sources, including family members, caregivers, nurses, physicians, case managers, and the patient's medical records.

The phrasing of questions must be consistent with the patient's level of understanding and education. Layperson's terms and colloquialisms can appropriately be used to take a good history. Even with this open format, however, it is imperative that the dentist use a standardized and consistent "branching-tree" series of questions (Box 12-2).

The **review of systems (ROS)**, an integral part of the health history, consists of a sequential series of questions about each organ system. Inherent in this process are checks and balances that prompt the patient to remember aspects of his or her history that may have been missed in the questionnaire or in previously discussed sections of the history. Key topics to be listed in a typical review of systems are included in Box 12-3.

### Oral Health History

Many questions on the oral health history are the same as for all patients (for example, frequency of check-ups and oral

**BOX 12-2 Example of a "Branching-Tree" Questioning Process**

The branching-tree questioning process refers to a method in which, after an affirmative response to a general question, more-specific questions are asked to ascertain the dimensions of a particular condition, problem, or concern. For example, if the patient gives an affirmative answer to the question, "Do you suffer from angina pectoris?" the following questions are commonly asked:

- What is the frequency of the pain?
- When does the pain typically occur? (after meals, related to exertion, specific time of day)
- What is the duration of the pain?
- What is the character of the pain (sharp/dull/crushing)
- What is the severity of the pain? (mild/moderate/severe/intolerable)
- What exacerbates the pain? (exercise, position, or posture)
- What alleviates the pain? (rest, nitroglycerin)
- Does the pain radiate? If yes, where?
- Do you take antianginal mediation? (frequency, amount)
- Have you visited an emergency room for this condition? (frequency, treatment received)

**BOX 12-3 Common Issues Included in a Review of Systems**

Head, Eyes, Ears, Nose, Throat—hearing, vision, glaucoma, sinus/allergies, mouth ulcers, oral cancer
Neurologic—strokes, seizures, trauma, lightheadedness, Parkinson's disease
Neck—arthritis (spondylitis), trauma, subluxation, mobility, masses
Cardiovascular—myocardial infarction, angina pectoris, valvular disorders/murmurs (nature of, how diagnosed), atherosclerosis, hypertension, peripheral vascular disease
Pulmonary—tuberculosis exposure, asthma, smoking, emphysema, bronchitis
Gastrointestinal—polyps, ulcers, reflux, indigestion, liver/gallbladder disorders
Genitourinary—kidney/bladder disorders, incontinence, renal failure (dialysis and type)
Endocrine—adrenal gland, diabetes, thyroid disorders, pituitary
Hematologic—bleeding disorders, clotting problems, anemia (type)
Musculoskeletal—weaknesses, prosthetic joints, arthritis
Other—cancer, chemotherapy, radiation, metabolic disorders (for head and neck cancer, need dosages and portals of radiation, history of hyperbaric oxygen)

prophylaxis), but there are additional questions that have particular relevance and importance for the patient with special care requirements. It will be helpful to learn the setting for past dental care (i.e., general dental office, hospital-based clinic, operating room [OR], or other). Did the patient receive sedation or general anesthesia? It is also important to learn what type of specialty care the individual has received and the nature of the treatment. The dentist should inquire about each of the dental specialties in an effort to gain a comprehensive understanding of the patient's dental experience. The patient's specific daily oral care regimen should be ascertained. It may be necessary to ask caregivers to describe their routines for cleaning the patient's mouth. In fact, it is important to determine whether the patient's mouth *can* be cleaned, and whether he or she is cooperative with such care. Important questions to be asked of the patient or caregiver include the following:

- How often do you brush your teeth? What times during the day? How much time do you spend brushing? Do you use a mechanical or a manual toothbrush? What type of toothpaste do you use?
- Do you floss? How often and when? Do you use floss aids?
- Do you use other cleaning devices?
- Do you use mouth rinses? Gels? Other forms of fluoride?
- Do you have plaque or tartar buildup?

Caregivers should be asked whether a mouth prop is needed when assisting the patient with oral home care.

Also included in this section of the patient history is a dietary analysis. The patient or caregiver should be questioned about the following:

- How much table sugar do you use?
- Do you consume soft drinks or sodas? If so, how often? With meals? How quickly consumed (sip or gulp)?
- Do you consume two or more fruit drinks or juice per day?
- Do you eat hard candy or other sweets? If so, what type? How often?
- Do you ingest acidic foods or beverages (such as citrus fruits, vinegar, or artificially sweetened soft drink or soda) on a regular basis (especially between meals)?
- How often do you consume snacks or baked goods?

An understanding of the nutritional intake and dietary history is important for any patient but can be critical for the patient with special needs. Sugary "comfort foods" may be readily available and more appealing than healthier foods. Caregivers may use such foods to pacify their patients and reduce the required caregiving time or lessen caregiver stress. Especially when coupled with poor oral home care, such patients will often be afflicted with many active carious lesions and be at high risk for new caries development.

It is critically important to educate patients and caregivers about the hazards of a cariogenic diet and suboptimal oral home care.

Patients who are deemed to be at high risk for caries are good candidates for the use of a diet diary. Patients with active caries, for whom the cause of the dental caries is not clearly evident, can definitely benefit from the compilation of a comprehensive diet history. The diet diary can be used to identify hidden and overt sugar and acid sources and can serve as the basis for counseling relating to dietary habits and those food items detrimental to dental and oral health. The patient is usually instructed to keep a diet diary for 5 to 7 days, writing down *all* food items and beverages consumed (Box 12-4).

When the patient returns to the office, a member of the team reviews the diary in detail with the patient and caregiver when appropriate. It is often helpful to circle those food items

**BOX 12-4 Example of a Single Day From a Patient's Diet Diary**

**Breakfast**
Sugared cereal
Toast and grape jam
2 glasses of OJ
Cup of coffee with tablespoon of sugar and milk

**Lunch**
Meatloaf
Black beans
Fruit cup
Bread and butter
Candy bar
1 regular soda

**Dinner**
Hunan chicken and vegetables
Fried rice
Pecan pie
Fruit Loops and milk (during evening)

harmful to the patient's teeth. Dietary recommendations are then made to the patient and/or caregiver (Box 12-5). After this review, it is often helpful to compose a follow-up letter for the patient and caregiver reviewing relevant dietary and oral home care issues and formalizing the dental team's recommendations and goals for the patient (Box 12-6). Such a letter can be an important part of the process of educating, encouraging, and empowering the patient and/or caregiver.

## Personal History

A personal history, useful for any comprehensive care dental patient, often has particular relevance and importance for the patient with special care needs. Information about basic issues, such as the patient's ability to ambulate and get to the dental office, is essential to the effective provision of dental care. Does the patient need an accompanying person? Who will that be? Does the patient need transportation? If so, how will that be arranged? It should not be assumed that because a patient is elderly or handicapped, they are not employed. An understanding of the patient's past and present career and employment can have a bearing on the nature and extent of dental treatment that may be desired or appropriate, the timing of dental visits (to accommodate the patient's work schedule), and financial resources. An understanding of the patient's support system, schooling, and domiciliary arrangements can give the dentist an idea of how well the patient may be able to follow through with a preventive and restorative plan.

**BOX 12-5 Dietary Tips for Special Needs Patients and Their Caregivers**

- Limit consumption of refined sugars, especially between meals. Drinks such as pure fruit juice and fruit drinks, milk, and dietary supplements often contain large amounts of fermentable carbohydrates and can cause cavities—particularly in the absence of good plaque control.
- Limit consumption of acidic substances and beverages—especially between meals. Acidic substances, including carbonated beverages, can dissolve tooth structure and contribute to cavities. Diet sodas are particularly damaging.
- After consuming acidic or sugary between-meal snacks, rinse the mouth with water to flush away sugars and dilute acids in the mouth.
- Do not brush for at least 30 minutes after acid exposures.
- Fresh fruits, vegetables, meat products, whole grains, cheeses, and water are generally good foods for oral health.
- Fluoride use should be encouraged—fluoridated toothpaste, mouth rinse, gels, and varnish have all been shown to be helpful for patients who are at risk for cavities.

**BOX 12-6 Example of a Follow-Up Letter to a Patient Regarding His or Her Oral Health and Recommendations for Oral Disease Prevention**

May 1, 20__

Dear Mr. Smith,

My staff and I have appreciated the opportunity to work with you to improve your oral health during the past two appointments. I believe that we have made real progress in oral health promotion in preparation for restoring your dentition and getting you on the road to keeping your teeth for your entire lifetime! I hope that all your questions about brushing/flossing techniques and diet have been answered. If not, please do not hesitate to contact me or to bring them up at our next appointment.

As we discussed, several areas in your diet raise concerns relating to good oral health:

1. Fruit Loops and other sweet cereals are particularly devastating if oral hygiene procedures are not carried out soon after eating.
2. Sugar in coffee is acceptable, but again I recommend a quick brushing afterward.
3. Sodas are EXTREMELY detrimental to your dentition. It would be best to limit or discontinue their use. When you do consume them, be sure to rinse your mouth out with water and brush afterward.
4. Any consumption of sweets should be followed with oral hygiene procedures as soon after as feasible.
5. Considering your past caries activity, I recommend a thorough brushing and flossing two to three times a day. I also recommend use of an electric toothbrush.
6. Remember, preserving your teeth is primarily up to you with support from our dental team! I am very encouraged by your positive attitude and feel confident that you will follow through with our recommendations!

Thanks and please contact me if you have any questions or concerns. I know some of these changes may be difficult, but with you as a co-therapist, I think we can accomplish much.

Professionally,
Allen D. Samuelson, DDS
Clinical Associate Professor

Taking a good personal history also affirms the patient's humanity and integration into the family unit and society. Trust is gained from the patient and family by this affirmation. A thorough personal history will disclose relevant habits, including the use of alcohol, tobacco, and illicit drugs (discussed in in Chapters 1 and 13). Oral habits can be commonplace in special needs patients and may impede the success of preventive therapy and negatively affect the outcome of dental treatment. Some common deleterious habits include fingernail or object biting; "doodling" with needles, nails, and other objects; obsessive use of oral health aids; bruxism; and mouth breathing.

## Functional History

The functional history reviews the patient's past and present ability to live independently and function in society. Typically, this includes an analysis of the patient's capacity for the **ADLs**. Review of the ADLs is important because it allows the practitioner to evaluate the patient's physical and cognitive ability to follow through with a preventive, restorative, and maintenance plan of care. The patient's ability to perform ADLs is predictive of how effectively he or she will perform oral self-care. Furthermore, depending on the level of function exhibited by the patient, treatment planning may need to be altered. For example, if the patient has limited mobility (e.g., severe arthritis), getting to the bathroom to perform oral hygiene may be difficult. Modifications such as basins and towels brought to the bedside may be necessary to facilitate daily oral care.

ADLs are divided into two major groups: basic and instrumental (Box 12-7).

### BOX 12-7 Activities of Daily Living

A range of common activities whose performance is required for personal self-maintenance and independent community residence.

Physical ADLs (basic self-care activities)

1. Dressing
2. Toileting/continence
3. Transferring
4. Eating
5. Mobility
6. Bathing

Instrumental ADLs (complex abilities needed for independent living)

1. Shopping
2. Traveling/transportation
3. Using the telephone
4. Preparing meals
5. Housework/laundry
6. Taking medicine
7. Managing money

Depending on the level of function that the patient exhibits, treatment planning may need to be altered. An analysis of the patient's ability to perform ADLs is predictive of how well he or she may be able to perform oral hygiene. For instance, if the patient has limited mobility (e.g., severe arthritis), he or she may not be able to get to a lavatory to perform basic oral hygiene, and modifications, such as basins and towels brought to the bed, may be necessary to facilitate daily oral care.

## Obtaining Additional Information From Other Healthcare Providers

For the typical dental patient, the dentist completes all parts of the patient evaluation and, if warranted, obtains a physician consultation. In the case of patients with complex health concerns and multiple medications, however, this sequence may need to be modified. If the individual comes to the office unattended, he or she may have some difficulty communicating all the necessary health and drug information to the dental team. If the individual comes with an attendant or family member who is not the primary caregiver, the attendant may not have the necessary information either. If the patient lives in a residential care facility, the medical record (or a general health problem list and summary of current medications) can be requested and brought with the patient on the initial visit. It still may be necessary to consult with the patient's primary care physician, pharmacist, primary caregiver, close family member, or other responsible party who is knowledgeable about the details of the patient's general health. In many cases, it may be prudent to do this before initiating the invasive portions of the clinical examination. This is usually accomplished most effectively by making an immediate telephone contact. Where this is not possible, follow-up contact via phone, fax, or e-mail can be made (with the patient's permission) before the next visit. Otherwise, arrangements can be made to have other medical records or documentation brought to the next visit. A copy of a recent medical history and physical examination, any recent (less than 12 months ago) hospital discharge summaries, and laboratory reports, such as an electrocardiogram (ECG), chest x-ray (CXR), echocardiogram, and CBC with differential are examples of useful documentation.

Although in many cases a consultation with the patient's primary care health provider is warranted, it is usually not necessary that it occur before the clinical examination. Often, the dental team can complete those portions of the intraoral and extraoral examination and the noninvasive portions of the clinical examination that the patient is able to cooperate with, make a general determination of what dental treatments may be recommended to the patient, and *then* obtain a medical or other consultation. The procedure and documentation for a referral to a medical provider follow guidelines discussed in Chapters 1, 5, and 7. Specific cases in which a referral letter is warranted include the following:

1. A patient with special needs presents for dental treatment and has no established or current relationship with a physician.
2. The dental team believes that a complete or accurate health history has not been obtained.
3. The patient exhibits signs of an emerging health problem or signs that a preexisting condition is not under adequate control.

Generally, referral should be to a primary care physician or a specialist in internal medicine or geriatrics. The referral letter should include a brief explanation of planned treatment, anticipated blood loss and time in the chair, and medications to be used. The physician should be queried about the diagnosis and management of any health problems that are relevant to dental treatment. The physician can be expected to respond with recommendations and suggestions regarding how any health problems should be managed in the dental setting. The ultimate rationale behind a physician consultation is to gain a complete and accurate understanding of the patient's general health problems, conditions, and treatments so that dental care can be delivered as safely as possible. This should be explained to the patient or care provider before the referral.

## Physical and Oral Examination in the Dental Office

The objectives of the physical examination are no different for these patients, but the methodology and scope may need to be altered to accommodate the patient's limitations. The dental team must be prepared to receive patients who present to the appointment in a wheelchair, gurney, or geri-chairs. (Information on conveyance methods and transport techniques is presented later in this chapter.)

The physical examination should occur after the history has been obtained. Good lighting, magnification, positioning, and, in some cases, gentle restraint are important for an effective examination. The same instruments can be used as with the standard patient, but care must be taken to prevent the patient from biting down on metal instruments, damaging teeth or intraoral soft tissue. A mouth prop is useful to allow for better access. The "tell, show, do" approach is helpful for many patients because it promotes understanding and trust and can be effective in reducing the patient's anxiety and also helps the dentist to carry out the examination with greater ease and efficiency.

Important preliminary components of the physical examination include assessing general appearance, body build, facial appearance, and ability to ambulate and transfer. This process begins as the patient is escorted to the operatory. Such observations provide the dental team with a rapid assessment of the general disposition and behavior of the patient and suggest what accommodations may be necessary during the examination and at future visits.

The same structures and tissues are examined as with the more typical dental patient. Patients with special needs are more likely, however, to exhibit certain oral problems. For example, they may have limited opening and decreased range of motion, and often have difficulty following instructions regarding jaw movements. They may exhibit oral injuries, including oral ulcers and evidence of soft tissue trauma. They may present with substantial plaque and calculus deposits, gingivitis, periodontitis, gingival hyperplasia, gingival abscesses, severe tooth mobility, rampant caries, and attrition. Signs of general attrition and aberrant tooth wear caused by habits such as nail or object biting need to be diagnosed, because they have a potential effect on the restorative plan. For example, successful retention of a seemingly simple Class IV restoration on an anterior tooth may be significantly compromised if the patient has a severe nail biting or other parafunctional habit. The dental team should anticipate that the findings from the examination will vary substantially depending on the nature and scope of the patient's problem and the patient's individual circumstances.

Behavior exhibited at the initial examination is usually an indication of how cooperative the patient can be expected to be for other procedures. If it becomes apparent during the initial examination that the patient's level of cooperation will limit the nature and scope of dental treatment, then it is prudent to inform the patient and caregiver at that time. It is important to be aware, however, that the patient's level of cooperation may improve over time. With trust established, anxiety relieved, and comfort with the office setting and personnel achieved, the patient may become more engaged and cooperative. The following section describes management strategies related to the level of the patient's cooperation that can be developed at the initial examination visit.

### Actively Cooperative Patients

The actively cooperative patient is able to undergo all typical examination procedures. For those patients, the examination can be carried out in the same manner as for the typical adult patient (see Chapter 1).

### Passively Cooperative Patients

The passively cooperative patient is not resistive, but is unable to understand or respond appropriately to some or all directives (for example, a patient who opens his or her mouth, but doesn't cooperate with specific requests to move the lower jaw or close the mouth). Dental team members need to be calm, patient, and sensitive to the patient's needs. The examination will typically require extra time.

### Actively Uncooperative or Combative Patients

Patients with dementia, autism, severe phobias, or significant mental illness may be actively uncooperative for the examination and, in a small proportion of cases, combative. If the patient is uncooperative or unwilling to allow a detailed visual examination, it may be possible to perform a digital examination, palpating for gingival abscesses, broken teeth, or other gross pathology. In these situations, the caregiver must be informed that a complete examination is not possible at the present time and an accurate diagnosis cannot be obtained. A modified examination may be acceptable if it is evident from a brief look that reasonably good oral hygiene appears to be practiced and that there are no visible caries. The caregivers must be informed, however, that latent dental disease may be present, and the conversation must be documented. If, in the dentist's judgment, a more thorough examination is imperative, then some form of sedation or general anesthesia is warranted. The risks of the sedation/anesthesia must be weighed against the relative benefits of an improved diagnostic process. If broken teeth, abscesses, or gross visible caries are present, then an OR procedure under

general anesthesia is indicated. General anesthesia is certainly a means through which an ideal radiographic series can be taken and a comprehensive examination and comprehensive treatments can be performed.

#### Passively Uncooperative Patients

The passively uncooperative patient, although not actively avoiding examination or treatment, exhibits facial or body movements that make both examination and treatment delivery extremely difficult. An initial attempt should be made to examine and treat these patients on an outpatient basis. If successful, a variety of control phase procedures can be planned and executed. If not, treatment under general anesthesia may be required.

### Imaging

Imaging should occur after the physical and oral examination. Selection criteria for images are the same as those for normal dental patients (see Chapter 1). During the examination, the dentist can usually discern whether the patient can be expected to be cooperative for imaging. Guidelines for obtaining images for the patient with special care needs can be categorized based on the patient's level of cooperation:

- Cooperative and coordinated patients (actively cooperative)—standard techniques can be used.
- Cooperative but uncoordinated patients (passively cooperative; e.g., mild to moderate mental retardation)—a lead apron and glove can be worn by the dentist or assistant and the film held manually with a hemostat as the images are exposed. This is similar to the technique often used when generating intraoral images in the OR.
- Uncooperative or combative patients—it may not be possible to obtain images with an uncooperative patient in an outpatient setting. In such cases, the caregiver or family member must be informed, and a candid discussion of relevant options conducted. Generally, if the caregiver or family member is interested in having treatment performed, then he or she will agree to generating appropriate intraoral images in the OR while the patient is under general anesthesia.

### Special Diagnostic Tests and Procedures

The criteria for performing pulp vitality tests, laboratory tests, and other diagnostic studies for the special needs patient are no different from those for other patients. Caution must be exercised, however, so as not to alarm the patient by initiating procedures unexpectedly. The "tell, show, do" approach is helpful in allaying anxiety by giving the patient a realistic sense of what to expect. This is especially important when attempting any tests or procedures, such as electric pulp testing, that can be expected to cause discomfort. Because of cognitive changes in many patients, the findings from those tests that require patient interpretation and communication, such as pulp vitality tests, may be unclear or unreliable. In lieu of accurate clinical tests, a diagnosis can often be made after a careful interview of the caregiver. A caregiver who is aware of and monitors the patient's behavior on a regular basis is in an excellent position to provide an accurate and meaningful review of new or ongoing patient symptoms. Changed eating habits, grabbing at the face or mouth, or crying out may be indicative of infection or other forms of an acute oral problem. If testing is performed (cold pulpal testing, palpation, percussion), careful examination of the reaction of the eyes and/or wincing, grimacing, and withdrawal may be helpful in making a diagnosis.

As with other aspects of the patient evaluation, when compromises or departures from the regular diagnostic process must be made to accommodate the patient, it is essential to document the rationale for any deviations from the normal protocol. In all cases, the dental record must clearly document the rationale for using diagnostic procedures and treatments that do not fit norms for the typical dental patient. Failure to make such documentation may allow the later suspicion that the dentist did not use good clinical judgment or meet the standard of care.

### Diagnostic Casts

As with any patient, study casts are generally indicated if removable or extensive fixed prosthodontic care is planned. Other indications for obtaining study casts include the presence of occlusal symptoms, decreased vertical dimension of occlusion (VDO), the need for forensic records, and the fabrication of shims or other dental devices, such as orthotics. Gagging is a frequent problem with these patients. Most often, this is a gagging response, not a true gag reflex. In other words, the patient can place and hold food, cigarettes, lozenges, or other items in the mouth without difficulty, but dental treatment elicits a gagging response. Suggesting that the patient avoid food before the procedure and the use of a topical anesthetic may facilitate impression taking on a patient with a history of gagging. Sedatives may also diminish this response. For the patient who is uncooperative or who has severe coordination problems, it may not be possible to obtain study casts on an outpatient basis.

## ARRIVING AT A DIAGNOSIS

The dentist has the obligation to identify and document diagnoses for all comprehensive care patients, including those with special needs. Not surprisingly, patients with special needs tend to have more general health problems and more oral health problems. All diagnoses should be listed, including the following:

- Behavioral diagnoses
- Oral self-care/dietary/habit diagnoses
- Musculoskeletal diagnoses
- Oral/cutaneous pathology diagnoses
- Periodontal diagnoses
- Dental diagnoses
- Occlusal/functional diagnoses
- Other relevant information (e.g., financial, temporal, transportation)

This list becomes the foundation for the patient-specific plan of care and provides the justification for every item on the

treatment plan. Patients must be informed of the diagnoses. This discussion is an integral part of the process of developing informed consent for the plan of care. Patients should be included in this process to the maximum of their abilities. When the patient with significant cognitive disorders cannot participate in clinical decision making, the dentist must discuss dental and behavioral diagnoses with family members and/or a legal representative. It is critical that the proxy decision maker understand the diagnoses of the individual under his or her care so that informed consent can be given and an informed decision for treatment can be made by the caregivers.

Diagnoses commonly found in patients with special needs are listed in Box 12-8.

**BOX 12-8 Examples of Common Diagnoses for Patients With Special Needs**

- Minimal cognitive function or physical coordination, limiting ability to follow through on a preventive plan
- Minimal psychological motivation for a preventive plan (e.g., a mentally impaired patient)
- Combative patient not allowing examination or treatment in the clinical environment (as with a severely demented patient)
- Minimal neuromuscular coordination, limiting possibility of engineering a dental prosthesis (e.g., a mildly uncooperative but uncoordinated autistic patient)
- Absent/poor/fair/good/excellent oral home care—assessment dependent on level of plaque control and effectiveness of home care
- Dietary risk factors not under control—this may be surmised from either a written or verbal diet diary
- Head and neck finding—includes abnormalities of TMJ and neuromuscular complex, and various forms of orocutaneous pathology
- Missing teeth with edentulous spaces, signifying lack of arch integrity and the possible need for replacement
- Dysfunctional occlusion (subjectively and/or objectively), signifying the need for occlusal treatment and/or restorative dentistry
- Dentofacial/craniofacial deformity, signifying the need for multidisciplinary and interdisciplinary treatment
- Caries and caries risk, signifying the need for disease control and prevention before definitive restorative dentistry
- Recurrent caries (may indicate heightened caries risk or confirm that caries infection has never been under control)
- Defective restorations with clinical indications for replacement
- Esthetic concerns
- Periodontitis
- Gingivitis
- Aberrant tooth wear (attrition, abrasion, erosion)
- Mouth breathing
- Habits (continuing tobacco use—30 pack/year history)

## TREATMENT PLANNING FOR THE PATIENT WITH SPECIAL NEEDS

### Unique Aspects of Treatment Planning for the Special Care Patient

Throughout this text, the importance of the proper sequencing of events in the treatment planning and treatment delivery process is a consistent theme. Like successive rows of blocks in the foundation for a building, each layer or step in the sequence must be complete and solid to support the next-higher row. In simple terms, the sequence is as follows: comprehensive oral examination → diagnosis → framing of treatment objectives and options → development of a sequenced plan of care with informed consent → execution of the plan → maintenance therapy. Although this process is valid for the patient with special care needs, some distinct differences in emphasis can be noted. Sometimes subtle, these differences can be significant and can drastically alter treatment planning and management of therapy. Six focal differences are highlighted here: the importance of general health issues, the importance of functional and behavioral issues, levels of care, treatment plan content, sequencing of the plan, and preventive and maintenance services.

#### Importance of General Health Issues

Although recognition of general health issues is relevant to the dental treatment of any patient, for most, these issues are generally isolated and can be easily integrated into the systemic phase of care, which is discussed in Chapter 7. For the patient with special needs, however, physical health and psychological issues are not simply adjuncts to the dental plan of care, but frequently represent major life-altering conditions that must shape the dental treatment planning and may drastically limit the type of treatment that can be provided. For the dentist, in attempting to construct a treatment plan for a patient with special care needs, a fundamental and complete understanding of the patient's physical and psychological condition and the relationship of that condition to dental care delivery is critical. The following key questions will aid in this discovery process:

- What are the patient's general health problems? Psychological problems? Developmental problems?
- What medications is the patient taking? Do any of these medications have significant oral side effects or interact with local anesthetics or other agents used in dentistry?
- Is more information needed from other healthcare professionals?
- What effect will these issues have on the delivery of dental treatment?
- Can dental care be provided safely on an outpatient basis, or should the patient receive dental care in another setting?
- Are there limitations or contraindications to dental treatment? If so, what are they?

As these questions are explored, the dentist can begin to define the range of reasonable dental options that can be offered to the patient. This winnowing process is a sometimes challenging but critical task, with the goal of offering all reasonable options to the patient, caregiver, and family, while

excluding those that are not feasible given the patient's physical or psychological impairment. One unheralded benefit to this process is that patients (and their caregivers) are often more willing to accept limitations to the treatment plan offerings if those limitations are based on their general health, rather than on behavioral grounds or criteria relating specifically to the delivery of dental treatment.

### Importance of Functional and Behavioral Issues

Behavioral issues may be relevant in planning dental treatment for any patient. Patients who are not diligent with their oral self-care are more likely to experience the ravages of caries, periodontal disease, and other oral health problems. Patients who are motivationally compromised may require a wide array of special management techniques, as discussed in Chapter 18. For the patient with special needs, however, behavioral problems often go far beyond the challenge of finding a means to motivate the patient to be more diligent with oral home care. The patient with special needs may be unable to open his or her mouth, or respond to simple commands, or be oriented to person, place, and time. Behavioral issues, like issues related to general health, can have a major effect on the patient's ability to communicate, function in society, and perform the ADLs. Some important functional and behavioral questions that must be addressed in the process of developing the treatment plan include the following:

- Was the patient able to adequately cooperate for radiographic and clinical examinations?
- Will the patient allow caregivers to provide oral care?
- Can the patient physically tolerate the time in the chair necessary to complete treatment limited or complex restorative or surgical treatment?
- Will the patient follow through with a preventive regimen?
- Has a relationship been established with the patient and the caregiver? How knowledgeable is the caregiver about oral disease and its prevention? How interested is the caregiver in improving the oral health condition of the patient? How much support can the caregiver be expected to provide to the patient?

The special needs patient's functional and behavioral limitations, along with his or her general health issues, provide the basis for narrowing the range of treatment options. Behavioral issues can severely limit both the scope and nature of the treatment that can be provided on an outpatient basis. For example, engineering indirect restorations, such as crowns, bridges, or implant-supported prostheses, may not be feasible because of lack of neuromuscular coordination. Therefore it is important to take the time to explain such limitations to both the patient and the caregiver. These limitations should never be seen as a failure on the part of the patient, the caregiver, or the dentist. If the patient, either unassisted or with the help of a caregiver, is able to establish an effective level of oral home care, then the long-term prognosis for his or her oral condition is favorable.

The passively cooperative patient may be cooperative for some treatments but not for others. In most cases, however, simple extractions, nonsurgical periodontal therapy, and direct-fill restorative procedures can be completed with minimum difficulty, and the dental team can expect to bring a passively cooperative patient to a disease-free and functional state. Some procedures, such as complex fixed prosthodontics, may not be feasible or practical for the actively uncooperative or combative patient. The decision as to whether to use general anesthesia must be made with the informed consent of the patient, legal guardian, or responsible family member.

An important consideration when planning treatment for the special needs patient is whether the individual can respond to necessary requests. For example, if a single unit crown is placed, can the centric and functional aspects of the occlusion be evaluated? If such an evaluation cannot be achieved, then indirect restorations may not be feasible.

Furthermore, the patient whose exceptionally strong or active orofacial musculature makes examination of oral structures difficult or impossible may be otherwise generally cooperative (i.e., does not raise his or her hands or attempt to get out of the chair). Use of light sedation may be sufficient to allow completion of the examination, but if this option is not realistic and a comprehensive baseline is necessary, then general anesthesia may be warranted.

An essential assessment during treatment planning is determining whether the patient can be expected to cooperate for the dental treatment. Specifically, can comprehensive dental care be achieved in a dental office either with or without sedation? If the patient is uncooperative and cannot be managed in an outpatient setting, will general anesthesia be required? For example, if a patient is resistive and actively uncooperative, then it would be expected that only minimally invasive dental treatment and simple restorative procedures can be performed without sedation. If the patient is *passively* uncooperative, then it may be possible to provide a full range of treatment with only minimal oral sedation. Furthermore, if the patient is actively uncooperative and the treatment objectives include definitive restorative procedures that necessitate generating diagnostic casts and complete mouth radiographic images, then general anesthesia is usually warranted.

The patient's and caregiver's wishes and the dentist's comfort with various sedation techniques will also be the determinants of what, if any, technique will be used. Each technique has notable benefits and limitations. The following section briefly summarizes the indications for the various forms of sedation (see also Chapter 14 for more detail).

***Iatrosedation.*** The term **iatrosedation** has been applied to all nonpharmacologic modes of anxiety control and sedation. Although it may include behavioral therapies, such as desensitization therapy, relaxation therapy, or hypnosis, its essence is the "sedative" effect that is provided by the patient's trust and confidence in the dental team.[16] Often, this is all the "sedation" that is necessary to treat the patient effectively. However, if the patient remains uncooperative, other approaches can be tried. The efficiency of most forms of sedation is dependent on the level of iatrosedation experienced by the patient. If the patient trusts the dental team and feels

emotionally supported and listened to, other forms of sedation will work more efficiently.

***Nitrous oxide and oxygen analgesia.*** Nitrous oxide and oxygen is an efficient form of analgesia, but to be used successfully the patient must be able to breathe normally through the nose piece. If the patient is unable or unwilling to be cooperative, allowing nitrous oxide to escape around the mask, or if he or she persists in mouth breathing or talking, then the staff and dentist will be inhaling the nitrous oxide and the effectiveness on the patient will be greatly reduced. There are documented environmental risks for the dental team with this medication, most notably obstetric and reproductive complications.[17,18]

***Oral sedation.*** Oral sedation can be an effective and relatively inexpensive approach. Several protocols are available for the oral conscious sedation technique. These range from simple anxiolysis to incrementally administered oral sedatives to achieve a desired effect. Airway protection and management are of paramount importance with the use of any pharmacologic sedation. The patient's level of cooperation and the dentist's experience will determine when and how the oral sedative agents are to be used. In extremely fearful or agitated patients, the dosage required to provide effective sedation may be so high that anesthetic risks (unconsciousness or fatal overdose) become unacceptable.

***Intravenous sedation.*** Intravenous (IV) sedation is an efficient method of sedation but will necessitate additional cost to the patient. In many jurisdictions, use of IV sedation requires additional training and incurs additional malpractice liability and expense to the dental practice. The drugs can be easily titrated to effect and are very predictable. If general dentistry is planned, however, great caution must be observed to protect the airway from particulate matter. Also, completing all treatment in a timely and safe manner can be quite challenging with this modality if many teeth are to be restored, extracted, or treated endodontically.

***General anesthesia.*** The decision to place the patient under general anesthesia for general dental care takes into account both the preoperative diagnostic and treatment needs and the postoperative goals. If a comprehensive examination, scaling and root planing, restorations, and extractions, are planned for an uncooperative patient, then general anesthesia is warranted (Figure 12-1). A recent physical examination, consent (also called an *operative permit* in the hospital setting), and anesthesia consultation must occur preoperatively. The following procedures can typically be performed while the patient is under general anesthesia:

- Complete series of dental radiographs.
- Comprehensive examination.
- Deep scaling and root planing.
- Operative dentistry procedures.
- Oral surgery, including biopsy.
- Periodontal surgery.
- Crown and bridge procedures. This is more challenging, because more time is typically required than for the other procedures for preparation, impression taking, and fabrication of a provisional restoration. If the patient must also be sedated to *deliver* the prosthesis, then an additional trip to the OR for general anesthesia will be required. In general, if hygiene, diet, and physical coordination are inadequate, crowns are not indicated.
- Concurrent treatment procedures by other medical services in the hospital (e.g., gynecologic, ear-nose-throat [ENT], or ophthalmology examinations).

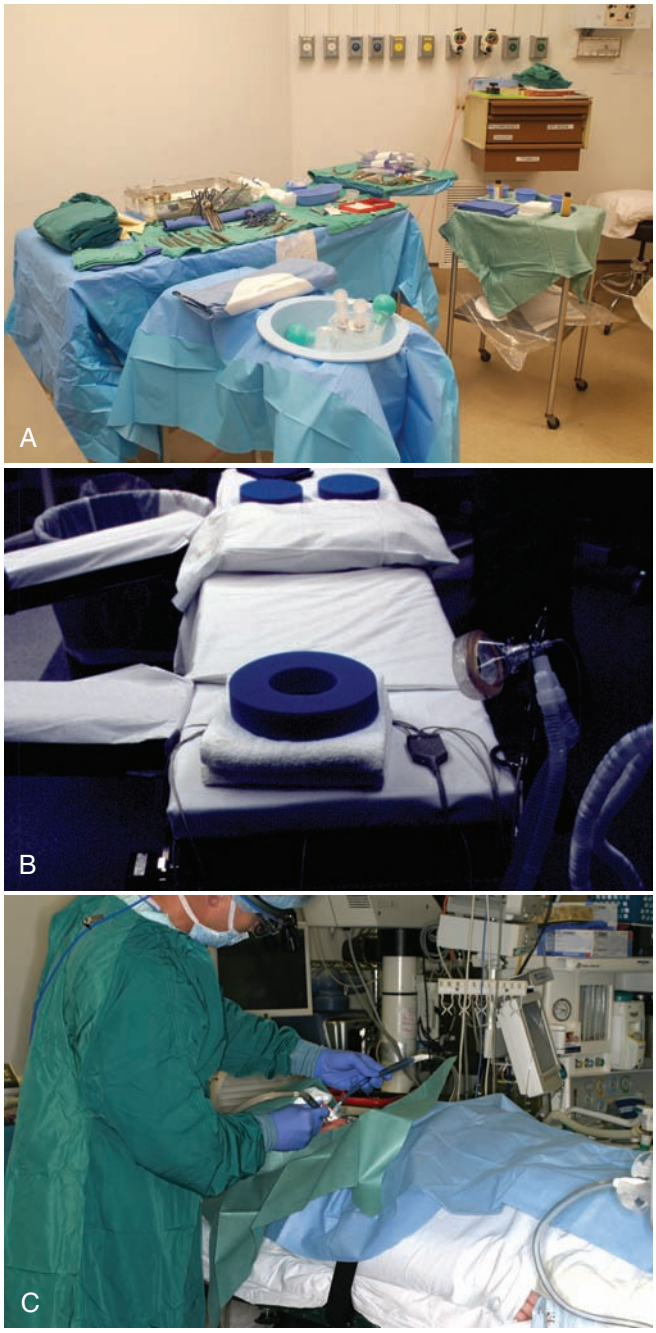


**FIG 12-1 A** and **B,** An operating room for delivery of dental treatment under general anesthesia **C,** Dental treatment being preformed in a hospital operating room. (**C,** Courtesy Dr. Allen Samuelson, Chapel Hill, N.C.)

Many options are available for the provision of sedation by the general practitioner. The dentist may administer the sedation, in which case the practitioner must be aware of and comply with all applicable rules and restrictions relating to

the use of sedation in an outpatient dental setting. The dentist may also have the patient admitted to the hospital and perform the treatment in an OR environment, in which an anesthesiologist or certified nurse anesthetist (CNA) performs the sedation. Occasionally, the dentist may hire an anesthesiologist or CNA to come into the dental office and perform sedation on site.

## Levels of Care

The range of feasible treatment options appropriate for the patient with special needs is considerably more diverse than for the typical dental patient. General health and behavioral issues may necessitate creative and unusual approaches to dental care delivery. Differing levels of care can be offered depending on the patient's intellectual capacity, physical status, level of cooperation and interest, and ability to tolerate the rigors of dental treatment. The range of treatment options for the patient with special needs is described here and summarized in the schematic diagram in Figure 12-2.

***Interview and patient education.*** If the patient is completely uncooperative or passively uncooperative, an interview with the caregivers may be all that is feasible. A discussion of proper diet and oral home care is always beneficial. Encouragement and empowerment of the caregiver will benefit the patient and help to promote trusting relationships among the three principals: dentist, patient, and caregiver. Affirmation of the humanity of the patient is also extremely important. Eliciting a brief life history is particularly apropos for a patient with dementia. Understanding the patient's past and present life circumstances can provide the dental team with valuable insights into goals and expectations that the patient, family, and/or caregiver may have for the patient's oral condition. This conversation also demonstrates to the caregiver that the dentist sees the patient as an individual, not simply as a source of income for the practice.

***Patient examination.*** Although many patients are able to comfortably undergo a complete examination, some can tolerate only a limited (digital only) or modified examination. The dentist should complete as many normal procedures in the initial oral examination as the patient can cooperate with and accept. Oral self-care instructions and dietary recommendations should be shared with caregivers. The focus at this point is to identify acute needs. It may be appropriate to prescribe antibiotics and/or analgesics, especially if the patient is uncooperative. Establishing an ongoing relationship with the caregiver is important to ensure that the dental team will be apprised of changes with the patient. Initially, the patient may not be cooperative or receptive to any restorative treatment, but if the patient's condition improves, even briefly, there may be a window of opportunity for intervention and provision of some restorative or other needed services.

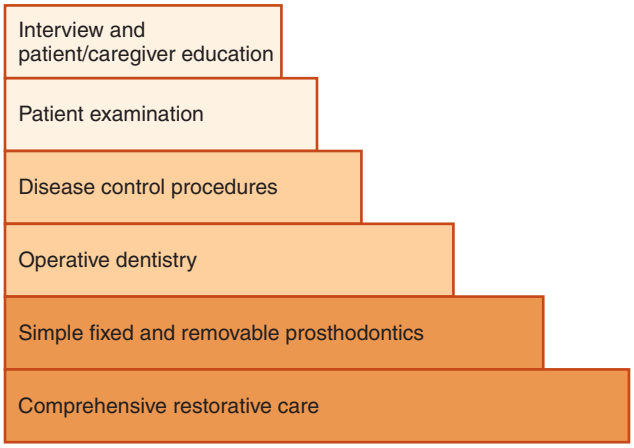


**FIG 12-2** Levels of care.

***Disease control procedures.*** The next level of intervention would include an oral prophylaxis, caries control procedures (including direct-fill sedative or provisional restorations as the patient will allow), scaling and root planing, supportive periodontal care, and elimination of sources of oral infection and disease (see Chapter 9).

***Operative dentistry.*** Operative dentistry in this context includes any definitive direct-fill restorations, such as amalgams, resins, or glass ionomers. Completion of the operative dentistry plan is predicated on the patient's ability to tolerate and cooperate with the treatment and his or her level of adherence to recommended preventive therapy.

***Limited fixed and removable prosthodontics.*** Some patients may be candidates for single-unit crowns and uncomplicated removable partial or complete dentures. These treatments must be reserved for those patients who are sufficiently coordinated to allow the dentist to engineer the prosthesis, and for whom there is a demonstrated ability to maintain the prostheses. Before such treatment is initiated, it is essential to establish that the preventive regimen recommended by the dental team is being adhered to. Patients who are unable to duplicate functional movements and cannot cooperate with taking occlusal records are not good candidates for prosthodontics.

***Comprehensive restorative care.*** Comprehensive occlusal and restorative reconstruction should be undertaken only if the patient is fully cooperative, appropriately coordinated, motivated, and fully able (with the assistance of a caregiver if necessary) to maintain a healthy oral condition. Treatment involving reconstruction in multiple quadrants, alteration of occlusal planes, or the establishment of anterior guidance should be reserved for only the highest-functioning patients.

## Treatment Plan Content

Because of significant health problems or limitations with the patient's cognition, compliance, cooperation, or function, it is often necessary to limit both the scope and complexity of the dental plan of care.

## Sequencing the Plan and the Timing of Treatment

As discussed throughout this text, sequencing for most dental patients is driven by patient priorities and the relative urgency of and need for each procedure in the plan of care. Sequencing of the plan for a patient with special care needs often must be based on entirely different criteria. The following are some issues that may affect the sequence of the plan of care and the timing of treatment for this patient.

***Transportation and availability.*** For patients with special needs, access to the dental office may depend on the availability of transportation and the schedules of caregivers. These factors may affect the timing, frequency, and length of appointments.

***Planning care to be performed under general anesthesia.*** If the patient needs general anesthesia for some but not all of the dental treatment, sequencing will be ordered according to which treatments must be performed in the OR. Given the costs, health risks, and logistical challenges of scheduling the patient for dental care in the OR under general anesthesia, it certainly makes sense to cluster all services that are to be delivered under general anesthesia, and to try to minimize the number of such visits.

***Support from caregivers.*** It may be necessary for caregivers to provide assistance to the patient in many ways, including transfer to and from the dental chair, facilitating communication between patient and dentist, provision of oral home care, dispensing medications, implementing postoperative instructions, and providing education and encouragement. If it is necessary for the caregiver to be present before, during, and/or after the visit, timing and sequencing of procedures will necessarily need to be made in conformity with the caregiver's schedule.

***Patient cooperation.*** As the treatment plan is developed, if there is uncertainty as to the level of the patient's cooperation, simple preventive and restorative procedures should be performed before more-demanding treatments, with time-consuming treatments deferred until an appropriate level of cooperation has been confirmed. If acute symptoms develop before patient cooperation has been established, it may be advisable to treat the problem with medication, with more definitive therapy to be provided after behavioral issues have been addressed.

***Patient endurance.*** Although sequencing by quadrant is normally the most efficient and productive way to manage restorative treatment, this may not be the best approach for the patient with special needs. Anxiety, difficulty in comprehending what is happening, and limited energy levels all may limit the patient's endurance and preclude performance of multiple restorations at a single visit. For such a patient, it may be most expedient to use the limited available working time to treat those teeth and situations in which the ability of the patient to maintain good oral hygiene is high and for which the long-term prognosis is most favorable. Extraction of teeth that cannot be maintained for the long term at a future dedicated appointment, and under general anesthesia if necessary, may be a better option.

### Preventive and Maintenance Services

The treatment plan for a typical dental patient may include a maintenance phase, with a brief reference to anticipated periodic visits. For most ordinary dental patients, maintenance needs and procedures will be determined at the completion of the definitive (restorative) therapy. This simply is not sufficient for patients with special care needs. Many will present initially in a precarious state of oral health and in a condition of serious disrepair with active disease. For many, the inability to understand the need for healthy lifestyle practices and the benefits of good oral health will be a major problem. Others may understand these issues but will be physically unable to perform basic oral self-care. In the absence of a competent, engaged caregiver, the outlook will indeed be bleak.

For these patients, preventive services become their lifeline—often the only thing that keeps at bay oral infection, pain, the inability to chew, and impaired oral function. Preventive and maintenance therapy for these patients must be the frontline of services provided, and it must be melded into each appointment and each stage of the treatment.

Various physical or emotional issues may interfere for extended periods or indefinitely with the patient's ability or willingness to return to the dental office. During times when active treatment is suspended, the ability of the patient and caregiver to carry on with basic oral self-care will have a significant bearing on whether the patient will be able to retain his or her teeth.

## Referral Options

In some situations, it is appropriate and necessary to refer the patient to a dental specialist or another dental practitioner. In some cases, the referral will be for a selected portion of the plan of care, and in others, it will be appropriate to refer the patient to another dental provider for total patient care. If the treatment plan includes specialty care that is not provided in the general dentist's practice (e.g., periodontal surgery or molar endodontics), then referral to an appropriate specialist is warranted. (See Chapter 5 for an example of a referral letter.)

The referral process should follow the guidelines described in Chapter 5. Additional time may be needed to ensure that the patient and caregiver clearly understand the reasons for the referral, the details of the appointment time and place, the kind of treatment that will be provided at that visit, and when the patient will be returning to the referring practice. Caution should be exercised, however, when the patient appears to need multiple specialty referrals. Bouncing from specialist to specialist, some of whom may make conflicting treatment suggestions and plans, can confuse, frustrate, and overwhelm the patient and often tends to fragment care. Given the choice between performance of a procedure, such as a root canal treatment, in the general dentist's office, with known surroundings and familiar staff, and referral to an endodontic practice, the patient may prefer the former, despite the greater experience and qualifications of the endodontist.

If the dentist determines that the patient's needs are too complex to be handled in a safe, professional manner in his or her practice, then it will be appropriate to refer the individual to another dentist for comprehensive care. Professionalism and common courtesy to the patient and caregiver require an examination and a proper referral with an accompanying letter. Hospitals, academic health centers, and dental offices specializing in the treatment of patients with complex needs are common referral sites.

Before dismissing a patient and making a referral to another dentist for total patient care, appropriate discussion with patient and caregiver about alternative treatment settings must occur. Patients with complex special needs and their caregivers may often feel ostracized and helpless. Isolated and handicapped by their physical and psychological problems, they sometimes have difficulty finding help and may have previously encountered rebuffs by unsympathetic healthcare providers. Referral to another dental practice may be perceived as just another rejection by a busy and detached dental team.

For these reasons, the dentist should carefully weigh the options before making such a referral. If the referral is truly warranted and in the best interests of the patient, then the dentist should personally explain the situation to the patient and caregiver, taking the time necessary to dispel any misunderstandings. An offer to provide additional assistance if the referral does not work out will ease the transition and help reaffirm the dentist's genuine concern to the patient and caregiver. If, after self-examination, the dentist determines that the referral is being made not because of patient safety or the dentist's level of expertise, but rather because of his or her own convenience or comfort, then the issue should be reconsidered.

Because most patients with special needs have rather basic dental treatment needs, their dental care is usually well within the scope of what the general dentist can provide. These patients and their caregivers, when informed, are usually understanding of the limitations of dental treatment and recognize the challenges that they present to the dental team. Most are not unusually demanding beyond the accommodations required by their disabilities. In many instances, they can be treated very effectively in a general dental practice setting, and this often will be their preference.

## Phasing Treatment

As described in Chapter 4, comprehensive care involves several phases of treatment that are important to the care of each dental patient. The following section highlights the importance and relevance of each phase of care for the patient with special needs.

### Systemic Phase

It can be anticipated that all special needs patients will require systemic phase management. For these patients, the focus will be to prevent medical emergencies in the dental office, provide dental care in a safe and efficient manner, and make appropriate accommodation for the patient's physical, mental, and/or behavioral limitations in the planning and delivery of dental care. Typical systemic phase issues include the following:

1. *Antibiotic prophylaxis* may be necessary for a variety of reasons, including patient risk for hematogenous total joint infection, risk of infective endocarditis, or the presence of renal, ventriculoperitoneal, or ventriculoatrial shunts.
2. *Anxiolytic premedication* may be needed for anxiety or behavioral control.
3. *Bleeding disorders:* Coagulation problems may be medication induced, as with Coumadin therapy, or disease related, as occurs with hemophilia A or von Willebrand's disease. At a minimum, these conditions will require presurgical coagulation studies. (See section *Severe Coagulopathies,* earlier in this chapter.)
4. *Hemodynamic instability* may be associated with hypertension, congestive heart failure, atherosclerosis, coronary artery disease, or other conditions. Vasoconstrictors should be used with caution and vital signs recorded preoperatively and at appropriate intervals during treatment. Significant hemodynamic instability may necessitate performing extensive or invasive procedures in a hospital setting.
5. *Endocrine disorders,* such as diabetes, hypoglycemia, hyperthyroidism, and (medication-induced) cushingoid condition, may require modification to the dental plan of care.

Guidelines for managing each of these conditions are discussed in Chapter 7.

### Acute Phase

Patients with special needs may have acute oral healthcare needs. The diagnostic process for these problems is similar to that for routine dental patients, but as discussed earlier in this chapter, accommodation may be needed to manage the patient's specific physical or cognitive limitations. The timing and setting for delivering urgent dental care may also vary. For example, if the severely demented patient with a facial swelling must be treated expeditiously, depending on the patient's level of cooperation, the appropriate setting may be a general dentistry practice, an oral and maxillofacial surgery office where IV sedation is administered, or a hospital OR under general anesthesia.

### Disease Control Phase

Many patients with special needs have active oral infection or disease and will benefit from disease control therapies. Such patients may be appropriate candidates for comprehensive disease control phase therapy (discussed in detail in Chapter 9). As with acute phase therapy, treatment may need to be delivered in varying settings, depending on the patient's condition and ability to cooperate.

### Holding Phase

The concept of a holding phase may have particular application and relevance in the management of the patient with special care needs. The purpose of the holding phase is to maintain a patient with recognized ongoing oral disease in a stable state, preventing further deterioration, until his or her overall physical condition allows further dental treatment to be provided. The holding phase involves recognition of the fact that although the patient's oral condition is not ideal, because of physical, behavioral, or health-related constraints, it will be impractical or impossible to correct all of the problems. The emphasis is on *managing* oral disease in a way that preserves function to the extent possible and prevents further

deterioration. Urgent care needs are addressed as they arise. Preventive and maintenance therapies are integral to the holding phase. This phase may have a duration of many months, or even several years.

Such a patient is advanced to the definitive phase only after the dental team is satisfied that physical, behavioral, or health-related constraints have been alleviated, and the patient is able to undergo needed comprehensive restorative procedures. After recovery from a stroke or traumatic brain injury, for instance, the patient may become a good candidate for definitive phase care. The dental team must recognize, however, that relapse may occur. The general health or psychological issues that originally defined the special needs condition may recur, and the patient may once again need to be managed in a holding phase—in some cases, for the duration of life.

### Definitive Phase

This phase of care is reserved for those patients who have excellent oral home care, who have balanced and optimal dietary patterns, and who are sufficiently cooperative for the delivery of comprehensive dental procedures. In exceptional instances, at the request of interested family members or caregivers, definitive phase treatment may be provided to patients who do not fit these criteria. An example might be the passively uncooperative patient who has been unable to maintain an acceptable level of oral home care. Before definitive therapy is undertaken for this patient, a diagnosis must be made and explained to the caregivers, and a documented informed consent discussion should occur. During this discussion, the problematic prognosis must be made clear to the guardian and/or caregivers, along with the potential negative outcomes of implementing treatment under the current adverse circumstances.

### Maintenance Phase

Preventive and oral health maintenance therapies are central components in the plan of care of any patient with special needs. The objectives of the maintenance phase of treatment for the special care patient are comparable to those for the able patient. Disease control and prevention of the occurrence of new disease are of paramount importance. The goal is to help the patient establish and maintain a pain-free, well-functioning, clean, and healthy oral condition in accordance with his or her wishes, circumstances, and abilities. In addition to providing preventive services, the dental team has the responsibility to inform and educate the patient and caregiver, providing realistic diagnostic and prognostic information.

Especially for the patient with special needs, this will be a dynamic process. Changes must be anticipated in the patient's physical or psychological condition, oral health, and level of cooperation and ability to perform oral home care procedures. As these changes occur—whether for better or worse—the dental team will need to adjust the approach and modify the preventive program accordingly.

Diligent and impeccable home oral healthcare can sometimes mitigate the ill effects of a cariogenic diet, but this is often difficult for the special needs patient to achieve. In many cases, the patient does not have the ability to carry out effective oral self-care procedures and is resistant to efforts by caregivers to assist. When a patient needs assistance with oral home care and is not responsible for his or her own dietary choices, it will be particularly important for the caregiver to modify a cariogenic diet Box 12-5 details dietary tips for patients and their caregivers. Serious efforts should be made daily to both reduce plaque and provide a non-cariogenic diet. But of the two, diet may actually be the more important variable in the long run.

It is worth noting that all education relative to diet, oral healthcare, and habits should be given with the realization that the caregiver may have already attempted multiple strategies relating to these issues. It will be important for dental team members to listen carefully to patient and caregiver stories and creatively design preventive strategies that take that information into account.

Maintenance intervals are established on the basis of the patient's oral health status, disease activity, and level of assistance from family and caregivers. Two- to three-month recall intervals are often appropriate for this type of patient. Guidelines on what should be addressed at the periodic visit are detailed in Chapter 11. Specific health or systemic problems, vulnerabilities to oral health problems, and susceptibility to specific oral diseases and problems will need the attention of the dental team at each periodic visit. Patients requiring special care are more likely to require reevaluation, management, or treatment of many different oral problems.

Specific maintenance phase procedures and processes are detailed in Chapter 11 of this text. Some techniques and methods of particular application to the special needs population are noted here. Electric toothbrushes, prescription-strength fluoride toothpaste, chlorhexidine rinses, stannous fluoride gels, and fluoride varnishes can be useful and effective adjuncts to the preventive plan. Finger brushes, interproximal (proxy) brushes, interdental stimulators, sulcular brushes, and floss aids should be prescribed when needed to assist with plaque control. Mints and gum with xylitol to replace cariogenic candies and sweets can be helpful in managing the patient with active caries.

As discussed earlier in this chapter, providing patient and caregiver education is also an important role for the dental team. A daily oral care plan should be developed by the dental team and communicated to caregivers to ensure optimization of the patient's oral health. Proper diet and oral home care are issues that must be reinforced at each periodic visit. In addition to verbal directions, it is helpful to provide written instructions regarding oral home care procedures, diet modification, and habit cessation to the patient and caregiver.

Caregivers are typically familiar with the physical limitations of the patient but may be less aware of how those limitations affect the patient's oral condition. It is important for the dental team to provide the caregivers with specific oral healthcare strategies and techniques that compensate for or overcome the patient's limitations. Mouth props, good lighting, and, sometimes, portable suctioning devices can be

prescribed to assist caregivers in the daily oral care of the patient. The caregiver should be informed as to the limits of the dental treatment that can be provided to the patient. At times, the patient may become frustrated that the dental team cannot do more to help. In those circumstances, the informed caregiver can be an effective ombudsman and educator on behalf of the dental team. Periodically, caregivers change. When this occurs, the new caregiver will need to be engaged and educated by the dental team.

Encouragement and emotional support provided to the patient and caregiver are crucial and often mean the difference between the success or failure of the maintenance program.

### Informed Consent

Acquiring informed consent is often challenging with patients who have special care needs. In the process of developing and establishing informed consent, the dental team must be prepared to interface with a variety of individuals, including family members, caregivers, legal representatives, physicians, and social workers. As with all patients, persons with special needs must have a complete understanding of the diagnoses and treatment alternatives, and their risks and benefits, as well as the costs in time, effort, and money for the proposed treatment. In some instances, however, the patient is legally competent but clinically unable to participate in a dental treatment decision—for example, the patient who is in an early stage of dementia. In such a circumstance, the primary caregiver, responsible family member, and/or legal representative must be brought into the discussion. All parties to the decision making should be informed of treatment risks, benefits, and alternatives and involved in the consent discussion. This may become problematic if different family members have varying ideas as to what dental treatment, if any, should be provided. The dentist may need to become both the patient's advocate and the mediator in this discussion.

In some situations, the caregiver or patient declines the recommended treatment. In other circumstances, the patient's physical or mental limitations may preclude provision of the treatment that the patient or caregiver requests. In either of these scenarios, the patient and caregiver must be informed of the potential risks of possible negative outcomes *in the absence* of treatment.

If a portion of the proposed treatment would involve referral to another dental professional, this information must be included in the consent discussion. Similarly, if the necessity for sedation or general anesthesia is anticipated, or if procedures must be performed in a hospital setting, a specific consent for these eventualities must be provided.

The consent process is dependent on the decision-making capacities and legal status of the patient. The decision-making capabilities of patients can be categorized under one of four descriptions. The dental team can expect to work with persons in each of these groups:

1. Legally competent with decision-making capacity
2. Legally competent with impaired decision-making capacity
3. Legally incompetent with decision-making capacity
4. Legally incompetent with impaired or no decision-making capacity

The individuals in categories 3 and 4 will usually have had a legal representative appointed (see *Ethical and Legal Issues,* later in this chapter), and the dental team must work with this individual to obtain informed consent.

A patient in category 2 may pose a particular challenge if he or she has not named a durable power of attorney for healthcare (HCPOA). The patient may have difficulty understanding treatment alternatives, and it may be unclear who should make treatment decisions on his or her behalf. Most often, clinicians turn to immediate family members to participate in decision making. Lack of agreement between family members can complicate the process of decision making. Often, an effective strategy will be to encourage the surrogate decision makers to focus on what they believe the patient would want, rather than what they would want for themselves. This process of substituted judgment may help to reduce conflicts between family members and help all parties to arrive at a mutually agreeable plan of care that is ultimately in the patient's best interest.

If the dental team is concerned that the patient is unable to render a decision about treatment, and family members continue to be in conflict about the decision making, then pursuing guardianship is a logical step. The process of obtaining guardianship, particularly by a family member, can be time consuming, costly, and stressful. Related legal issues are discussed in more detail in the section *Ethical and Legal Issues,* later in this chapter.

## DELIVERY OF CARE

### Appointment Scheduling

When scheduling appointments for the patient, the dental team should be as sensitive to the caregiver's schedule as is feasible, recognizing that times when it is convenient for the caregiver to bring the patient to the dental office may be limited. On the other hand, the caregiver should be advised as to the effect that any scheduling limitations may have on care. For example, if the caregiver for a severely retarded adult with many carious lesions requiring immediate attention can only bring the patient at sporadic intervals, it must be made clear that treatment outcome may not be as predictable or effective, and that the patient is at greater risk for acute oral problems and infection than if he or she could be seen in a more expeditious manner.

Many other factors may affect the scheduling, timing, and duration of the patient's appointments, including transportation availability, coordination with other healthcare providers, predictable times during the day when the patient is more cooperative, and the patient's stamina and endurance. Inevitably, appointments with special needs patients require more time.

### Patient Positioning and Transfer

#### Precautions With Transfers

*To prevent injury, each patient must be assessed individually before attempting a transfer.* Some physical considerations may make a transfer challenging. Urinary catheters must be handled gently and transferred before the patient or along with the

patient, or else the catheter may be displaced from its location. Sore joints and bandaged limbs, must be handled with great care so as not to further injure the patient during transfer.

If the dental team is performing or anticipates performing transfers, it may be beneficial to bring in a physical therapist to provide instruction in doing transfers safely, including ways of preventing and caring for back strains or injury should they arise.

### Patients Who Are Gurney-Bound

If possible, it is preferable to move the patient from the gurney to the dental chair. This can be accomplished with a self-transfer (and sliding board), one-person transfer, two-person transfer, or lift. Techniques are comparable with those described under *Patients Using Wheelchairs*. If necessary, most procedures can be provided with the patient on the gurney. The dental unit hoses must be long enough to accommodate over-the-gurney delivery. Ergonomics are not ideal, as the dentist and assistant will usually need to bend over to access the patient's oral cavity.

### Patients Using Wheelchairs

Many patients with special needs arrive in wheelchairs. (See Video 12-2 Anatomy of a Standard Wheelchair on Evolve.) The most convenient wheelchairs for dental treatment are those that are fully mechanized and tilt back into an ergonomically stable treatment position similar to the position of an inclined dental chair. Some wheelchairs can be tilted back manually or a wheelchair tilt device can be used. (See Video 12-3 Use of a Wheelchair Tilt Device on Evolve.) If the wheelchair does not have a headrest, the dentist may use a portable headrest to facilitate comfort and positioning. If the dental chair cannot be moved, then the hoses on the unit typically need to be lengthened to accommodate chair positioning (Figure 12-3).

***Transfers from a wheelchair to a dental chair.*** Some patients can self-transfer from the wheelchair to the dental chair independently or with assistance. If the patient is unable to self-transfer, several other options are available.

***One-Person Transfer.*** A single individual can transfer most patients. To use this technique, the patient must be able to support his or her own weight on at least one leg. The key to this technique is weight distribution and transfer. The wheelchair is parked at approximately a 45-degree angle to the dental chair, and the brakes are engaged. The patient is asked to move as far forward in the chair as possible. A transfer belt is placed around the patient, and the dentist braces the patient's knees against his or her own. On the count of three, the patient stands as the dentist pulls, using leg strength, and pivots the patient onto the dental chair. It is critically important for the dentist to use his or her weight to relocate the patient's weight in a controlled manner into the chair. Lightweight individuals can transfer very heavy patients using mechanical advantage and proper form. (See Video 12-1 Transferring a Patient Using the Single-Person Technique.)

***Two-Person Transfer.*** If the patient is unable to support any weight on his or her legs, a lift is ideally used, but, in the absence of a lift, a two-person transfer can be attempted. It is important to recognize that there are inherent risks in the two-person transfer. The possibility of back injury in susceptible individuals should be considered before attempting this transfer. With this technique, the dental chair and wheelchair are positioned so that both face the same direction, with the wheelchair parallel with and positioned as close to the dental chair as possible. The dental chair should be positioned slightly lower than the wheelchair to allow gravity to assist as the patient is transferred. The arm rails, footrests, and headrest of the dental chair should be removed to provide a clear path for transfer. The brakes on the wheelchair should be engaged. The individual standing behind the patient locks his or her arms under the arms of the patient, and the second individual cradles the knees. At the count of three, the patient is lifted and transferred to the dental chair. *(Please note that the patient's arthritis or other musculoskeletal disease may preclude being grasped as described, making this type of transfer infeasible.)* (See Video 12-2 Transferring a Patient Using the Two-Person Technique.)

**FIG 12-3 A,** The patient receiving treatment is seated in a fully mechanized wheelchair. Note: the doctor has pulled down his mask to facilitate communication with the patient to reduce his anxiety. **B,** A portable headrest can be attached to a wheelchair to facilitate treatment.

At the conclusion of the visit, the process is reversed, with the dental chair seat positioned slightly higher than the level of the wheelchair seat.

***Sliding Board.*** A sliding board may allow an individual to self-transfer to the dental chair. The dental chair is positioned and prepared similarly to preparations for a two-person transfer. A smooth wooden board is slid under the patient, and the patient then grasps a fixed object on the dental chair and pulls himself or herself onto the dental chair. (See Video 12-3 Transferring a Patient Using a Sliding Board.)

***Lifts.*** A lift is perhaps the best way to transfer the individual who cannot transfer with a one-person assist and is too heavy for a two-person transfer. A lift is also safer if the dental team members are not sure that they are physically strong enough to transfer a particular patient. A lift is a mechanically or electrically powered hoist that raises the patient completely out of the wheelchair (or gurney) to be reseated in the dental chair.

### Supports

Once the patient has been transferred, he or she may require supports under certain limbs or all limbs because of contractures or awkward postures caused by disease (e.g., kyphosis). Pillows or other supports can be placed under the knees, feet, arms, lower back, and neck, enabling the patient to remain comfortable for the lengthy periods of time required (Figure 12-4).

### Posture

A patient may be treated either seated or prone, depending on physical condition. Severe congestive heart failure or pulmonary disease often precludes a patient's lying flat, which places the lungs in a dependent position. Severe spinal arthritic disease (i.e., ankylosing spondylitis) may preclude a supine treatment position as well. An individual with lower back pain may need to be treated in a supine position.

### Restraints

If the patient is not cooperative, he or she may require restraint. Chemical or physical restraint may be used. Please note that it is extremely difficult to restrain some patients depending on strength, size, and general demeanor. Chemical restraints typically involve benzodiazepines or other sedative/hypnotics. Physical restraint ranges from manually restraining a patient to papoose boards. It is essential to inform family members or the legal guardian as to the kinds of restraint that are planned. Informed consent must be obtained.

**FIG 12-4** Cushions may be used to support the patient in a comfortable and safe position while treatment is performed.

## Communication With Special Care Patients

Some patients with special care needs may have difficulty communicating normally. The underlying problem may be a lack of comprehension, difficulty with sentence formulation, or impairment of the ability to articulate speech. Depending on the nature of the problem, signing, writing tablets, a computer, or communication boards can be used to converse with the patient. Maintaining eye contact with the patient is essential. Nonverbal communication can be a very effective tool in making the patient aware of your concern and attention. Moreover, a family member or caregiver can occasionally "translate" the patient's signs, voice inflections, or utterances. The caregiver can be of invaluable assistance in facilitating the communication process by helping the dental team understand the patient's concerns and questions and conveying or reinforcing information from the dental team to the patient.

## Role of the Family

Family members may be either a great asset or a great liability to the dentist-patient therapeutic relationship. Often, a family member is the primary caregiver for the patient, taking care of most, if not all, of the patient's physical and emotional needs. This dedication and perseverance in providing care to a loved one can monumentally improve the patient's health and quality of life, but can also be an emotionally draining and frustrating duty. It can be difficult, having known the family member intimately for many years and remembering what a productive and engaging person he or she may have been, and now having to watch and be intimately involved in the slow, continuing decline of a once-vibrant person. Fatigued, emotionally charged, and in some cases depressed, the family member may have difficulty participating in the decision making in a positive way and may not have the physical stamina to provide the needed oral home care for the patient. Despite these limitations, and often sustained by latent guilt or a passionate sense of duty, the family member may be unwilling to relinquish any part of the caregiver role.

Faced with this situation, the dental team may be able to fill a valuable role in helping the "burned out" family member to find some relief. Working with a social worker or other family members, or encouraging the family member and caregiver to temporarily hire a professional caregiver, may provide some much-needed recovery time. If the family member can be reenergized and reinvigorated in the caregiver role, then the benefit to the patient in improved oral and general health can be significant.

## Role of the Patient's Caregiver

As a result of their mental or physical disabilities, many patients with special needs cannot fully take care of themselves.

Unable to perform the ADLs, a decision is made by the patient, family, or social service agency to obtain assistance. A caregiver—who may be a parent, child, other family member, friend, nurse's aide, or other healthcare professional—is appointed, hired, or volunteers to fill this role. It is imperative that the dental team enlist the help of the patient's daily caregiver or caregivers. In many instances, the patient may become more cooperative if the caregiver is in the room or close by. The caregiver's voice alone may calm an apprehensive patient. A caregiver can assist with gentle restraint if necessary. As emphasized throughout this chapter, the dental team must educate the caregiver about the condition of the patient's mouth and how best to take care of the teeth, oral structures, and dental appliances. Caregivers play an essential role in implementing the daily oral care plan of those they care for.

Several points are worth considering when giving the caregiver instructions on how to provide oral home care for the patient. The dental team should not assume that the caregiver has a good grasp of oral home care techniques. Appropriate time should be taken to explain all the nuances and details. The caregiver should be encouraged in return to demonstrate each of the techniques to confirm that he or she understands and can successfully carry out the necessary procedures. The team should also make themselves available to the caregiver by phone in case there are questions. With such an opportunity for follow-up, the caregiver is more likely to pursue rather than abort home oral care efforts when challenges arise. Follow-up telephone conversations (or return office visits) can fill in knowledge gaps, such as when the caregiver nodded in agreement during the instructional session, but when at home "cannot quite remember how to do it." Telephone contact can also be beneficial when the caregiver, for whatever reason, has been reluctant to ask questions of the dental team in the patient's presence.

Involving the patient's caregiver in the treatment planning and decision making is also helpful. The caregiver may have insight into the practical aspects of how the treatment can be carried out and maintained. The caregiver is more likely to accept responsibility for the delivery of oral preventive care if he or she is involved at the initial decision-making stage and understands the negative outcomes that may result from the treatment or the decision to not treat. The caregiver must be apprised of limitations, risks, and alternatives for dental care. It is helpful for the caregiver to be alerted to any oral conditions that may need urgent treatment.

Included here is a simple classification system for assessing need for assistance that can be useful for caregivers and any healthcare providers who work with special needs patients. The dentist or hygienist classifies the patient based on the individual's cognitive and functional level. Note that this classification may change over time—for example, the patient with traumatic brain injury whose condition improves over time in rehabilitation.

The classes are as follows:

1. Requires no assistance with daily oral care, is cognitively and physically able to carry out a plan for daily oral care
2. Requires assistance, needs help with daily oral care, but can complete some care independently
3. Requires full assistance; is unable to carry out any oral self-care

The usefulness of this classification is in the specific delineation of the kinds of oral home care procedures that can be carried out by the patient or caregiver, or that will be shared. Once a designation of responsibilities is established, the dental team must be prepared to revisit the issue at subsequent appointments. As the patient's condition improves or deteriorates, the roles of patient and caregiver will need to change as well.

It is important to note that the stress of daily caregiving is generally high, and caregivers may develop health problems of their own. It is imperative that the dental team be aware of this potential problem and sensitive to the caregiver's attitudes and demeanor. The caregiver's role is critical to the oral health and well-being of the patient, so supporting and encouraging the caregiver becomes just as important as providing care directly to the patient.

The dental team also must be aware that, because of the high level of stress in the caregiver's role, elder abuse may occur. The dentist, hygienist, and all staff need to be cognizant of the indicators of elder abuse (Box 12-9). When the dental team becomes aware of signs or symptoms of elder abuse, the primary focus must be on the well-being of the patient. It is incumbent on the team to report such findings

**BOX 12-9 Signs of Elder Abuse**

- **Physical Abuse** occurs when an elder is injured, assaulted or threatened with a weapon, or inappropriately restrained.
- **Sexual Abuse or Abusive Sexual Contact** is any sexual contact against an elder's will. This includes acts in which the elder is unable to understand the act or is unable to communicate.
- **Psychological or Emotional Abuse** occurs when an elder experiences trauma after exposure to threatening acts or coercive tactics. Examples include humiliation or embarrassment; controlling behavior ; social isolation; disregarding or trivializing needs; or damaging or destroying property.
- **Neglect** is the failure or refusal of a caregiver or other responsible person to provide for an elder's basic physical, emotional, or social needs, or failure to protect them from harm.
- **Self-neglect** occurs when vulnerable elders fail or refuse to address their own basic physical, emotional, or social needs.
- **Abandonment** is the willful desertion of an elderly person by caregiver or other responsible person.
- **Financial Abuse or Exploitation** is the unauthorized or improper use of the resources of an elder for monetary or personal benefit, profit, or gain.

From Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Division of Violence Prevention. http://www.cdc.gov/violenceprevention/elderabuse/definitions.html. Accessed November 17, 2015.

to a local social services agency or law enforcement authorities.

## Other Professional Resources

Management of the patient with a high degree of impairment will often require a complex, multidimensional approach to oral and general healthcare. At times, the dental team will interface with allied health, social services, and pharmacy professionals. Professionals and paraprofessionals with whom the dental team may need to interact, and their respective roles, are described here and discussed in detail in Chapter 5.

### Social Workers

Sometimes referred to as a *case manager,* a social worker can often provide essential support to the patient/client, caregiver, and family. When the patient, the patient's family or friends, or the community at large becomes aware that an individual is no longer able to effectively provide for his or her own daily needs, a social worker is often called to assist. The social worker's role typically includes locating, activating, and facilitating the provision of medical care, social services, transportation, home care, and assisted living or nursing home care as needed for the patient. Such individuals are skilled in identifying funding sources, such as private insurance, public assistance, religious groups, nonprofit charitable organizations. In so doing, they help patients meet basic needs, improve quality of life, and identify resources to pay for oral and general healthcare. Social workers can also provide valuable medical, social, and financial information about the patient to the dental team.

### Physician Assistants

Physician assistants (PAs) are healthcare professionals licensed to practice medicine under the supervision of a physician. PAs (usually medical, not surgical, PAs) frequently provide direct patient care in facilities such as nursing homes or group homes. They can provide detailed medical information and may write medical orders for their patients.

### Registered Nurses

Registered nurses (RNs) work closely with physicians and can provide valuable medical information. The director of nursing (DON) and the assistant director of nursing (ADON) are often the primary medical contacts for physicians and dentists providing care in nursing home facilities.

### Licensed Practical Nurses

A licensed practical nurse (LPN) is a nurse who has been trained to provide home health or nursing care under the supervision of a nurse with a higher level certification (RN) or a medical doctor. These individuals, along with nurse's aides, provide direct patient care, such as oral cleansing.

### Nurse's Aides/Assistants

Nursing assistants work directly with patients, providing assistance with activities of daily living, including oral home care.

### Pharmacists

Pharmacists can provide valuable information on drug interactions and contraindications. The dental team can contact the patient's pharmacist to obtain a listing of the individual's medications. Pharmacists can also be an excellent resource, suggesting strategies for improving the patient's compliance in taking the medications and improving the drug efficacy. Some pharmacists can also compound drugs as prescribed by the dentist when commercial drugs are not available or when custom formulations will better suit the patient's needs.

### Audiologists/Speech and Language Pathologists

Patients with a suspected hearing deficit can often benefit from the services of an audiologist. Patients who have had a stroke or suffered head trauma may commonly have speech difficulties that may be improved, mitigated, or corrected by working with a speech pathologist. An improved ability to communicate with the patient can have multiple benefits for the dental team and will make the provision of oral healthcare services both more efficient and more effective.

# ETHICAL AND LEGAL ISSUES

Several important legal issues are associated with the delivery of care to special needs patients. In most instances, informed consent can be obtained only from an individual who is at least 18 years of age, has the capacity for decision making, and is informed about the proposed treatment. The consent to treatment must be voluntary. As discussed previously, a variety of conditions may result in an individual's being unable to make rational decisions on his or her own behalf. In an ideal situation, the person will have previously contemplated the possibility of becoming incapacitated and formalized his or her wishes for future healthcare in one or more documents known as **advance directives**. Advance directives are legally recognized documents containing instructions as to how an individual wishes his or her medical and health decisions to be handled in the event that he or she becomes incapacitated. In the United States, advance directives can be generated by any individual older than 18 years with the mental capacity to do so. It is certainly preferable to have such intentions documented before admission to a hospital. If the patient becomes mentally incapacitated, as in a motor vehicle accident, and is hospitalized without having written advance directives, the patient's wishes may not be discernable—or family members may have varying perceptions about those wishes—leaving caregivers, family, and medical personnel in a moral or ethical quandary. Patients with degenerative or chronic illnesses are strongly encouraged to implement advance directives.

The **living will** is one form of an advance directive. A typical living will describes the specific types of care the person wishes to receive in the event that he or she becomes permanently or irreversibly unconscious or is considered terminally or irreversibly ill. Often, the living will specifies what type of life support (oxygen, respirator, feeding tube), resuscitative efforts, or pain control is desired or not desired.

Although most advance directives do not contemplate dental care, the patient's preferences for treatment or nontreatment can become relevant to the delivery of dental care if a patient suffers a stroke, cardiac arrest, or other life-threatening event while undergoing dental treatment in a hospital setting. If such a medical emergency arises during the course of dental treatment in a general dental practice setting, the patient is typically transported to the hospital, and the advance directives would not become relevant until the patient transfer is complete.

After discussion with the patient and/or family, doctor's orders can be written for the patient that govern how the medical and dental staff will handle certain prespecified health-related conditions and circumstances. Examples of such doctors' orders are as follows:

- **Do not intubate (DNI)** directs that the patient will not have any breathing apparatus inserted into the trachea to control breathing should respiratory arrest occur.
- **Do not resuscitate (DNR)** means that no advanced cardiac life support or basic cardiopulmonary resuscitation (CPR) will be rendered in the event of cardiopulmonary arrest.
- **Full code** means that the patient desires advanced life support in addition to basic life support in the event of cardiopulmonary arrest.

A DNR order could become relevant during a medical emergency in a dental office. (See the related *In Clinical Practice: Physician Orders Related to Resuscitation* box.)

As described in Chapter 6, once a patient has named a designated guardian or a sanctioned and active durable HCPOA, then that person (or agency) named in that document must approve the dental plan of care and provide consent for future dental treatment.

## IN CLINICAL PRACTICE

### Physician Orders Related to Resuscitation

Nursing home residents and other patients may have a physician's order stating DNR/DNI or Do Not Resuscitate and Do Not Intubate. This order needs to be respected, and a copy of the DNR/DNI sheet needs to be in the dental chart. A DNR/DNI order signifies that CPR should not be instituted in case of cardiac arrest. This decision is generally made by the patient or the patient's legal representatives (e.g., HCPOA, legal guardian).

Consent forms for dental and medical treatment, particularly in the hospital setting, may ask the patient or legal representative to mark whether to suspend or continue the DNR/DNI, depending on the setting in which the care is provided and the particular treatment the patient is receiving.

A discussion with the patient, the patient's physician, and the patient's family, where appropriate, should occur before treatment to make certain all involved are clear about what to do in case of an emergency in the treatment setting that might require CPR. Also, the DNR/DNI order sheet MUST be present at any appointment. A simple order in a chart is NOT the same as a DNR/DNI order sheet (Figure 12-5).

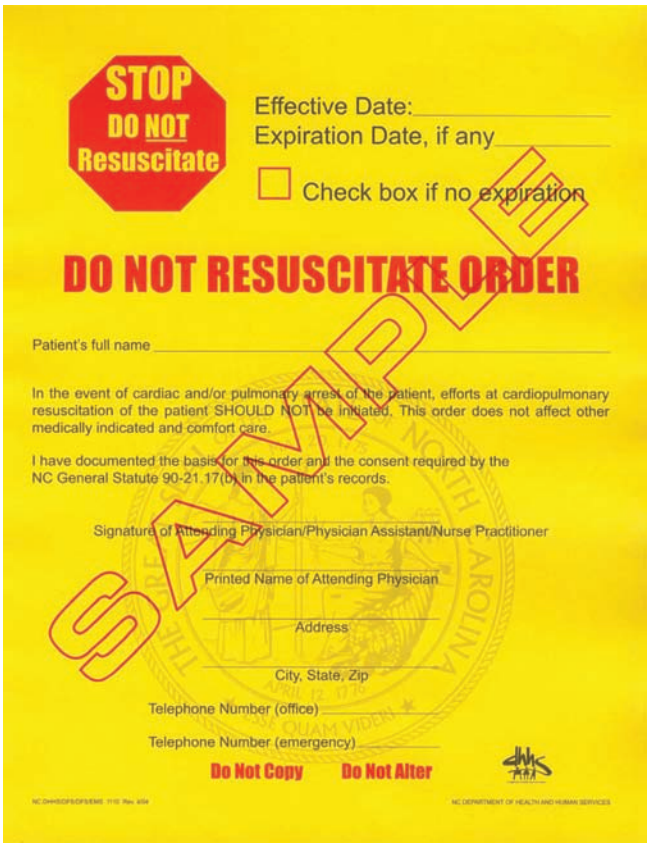


**FIG 12-5** Example of a *do not resuscitate* order form. (Courtesy U.S. Department of Health & Human Services.)

There are two special circumstances in which the dental team (with the caregiver) can make independent decisions on behalf of a patient who is legally incompetent. These relate to a situation in which the patient requires urgent dental treatment for a potentially life-threatening problem (such as an acute dental abscess or infection of a facial space) and either (1) the patient does not have a surrogate decision maker or (2) the surrogate decision maker cannot be contacted. In either case, the *best-interest standard* or *substituted-judgment standard* can be used to make a treatment decision. The decision must also be made in terms of any advance directives the patient may have in place (see Chapters 6 and 17 for further discussion).

## CONCLUSION

When treating patients with special needs, it is important to develop a caring, strategic, and professional approach that is both realistic and flexible. This population has a diverse set of oral and general health needs. The assessment, diagnosis, treatment planning, and delivery of dental treatment for these patients will necessitate the use of special resources, techniques, and strategies on the part of the dental team. Although the team may be challenged to identify creative and individual solutions for the patient's unique needs and problems, the provision of oral healthcare in a compassionate and professional manner

will have inestimable benefit to the patient, the patient's family, and caregivers. It can also be rewarding for dental team members. The benefits of such care go far beyond the dental team's primary goal of improving the patient's oral condition. High-quality oral healthcare delivered in a compassionate manner affirms the patient's humanity and can provide some peace of mind to those who care for the patient day by day.

## REVIEW QUESTIONS

- Who are dental patients with special needs?
- What is the role of the general dentist in the diagnosis, management, and treatment of the patient with special needs?
- How does patient evaluation differ between the patient with special needs and the "typical" dental patient?
- What are some unique aspects to treatment planning for dental patients with special needs?
- Describe management strategies when treating patients with:
  Developmental delay
  Traumatic brain injury
  Terminal cancer (hospice)
  AIDS
  Severe coagulopathies
- What is the role of the patient's family in the management of a dental patient with special needs?
- What is the role of the caregiver in the delivery of dental care to a patient with special needs?
- Demonstrate a one-person and a two-person wheelchair-to-dental-chair transfer.
- What ethical and legal issues must be considered when treating a dental patient with special needs?

## SUGGESTED PROJECT

Develop a practice plan for managing patients with special needs in your office (include criteria for whom you will treat and when and where to refer; management strategies for typical conditions; staff roles and functions; office, operatory, and equipment modifications; and special accommodations in materials and techniques).

## REFERENCES


1. Katz, PR: An international perspective on long term care: focus on nursing homes, *J Am Med Dir Assoc* 12:487–492, 2011.
2. Jones AL, Dwyer LL, Bercovitz AR, Strahan GW: The National Nursing Home Survey: 2004 overview. *Vital Health Stat* 13(167):1–155, 2009.
3. Anders, PL, Davis EL: Oral health of patients with intellectual disabilities: a systematic review, *Spec Care Dentist* 30:110–117, 2010.
4. Kumar M, Chandu GN, Shafiulla MD: Oral health status and treatment needs in institutionalized psychiatric patients: One year descriptive cross sectional study, *Indian J Dent Res* 17(4):171–177, 2006.
5. Seidel-Bittke D: Oral healthcare for patients with disabilities, *Dent Today,* 24(3):56-59, 2005.
6. Mitsea AG, Karidis AG, Donta-Bakoyianni C, Spyropoulos ND: Oral health status in Greek children and teenagers, with disabilities, *J Ped Dent* 26(1):111–118, 2001.
7. Gordon SM, Dionne RA, Snyder J: Dental fear and anxiety as a barrier to accessing oral health care among patients with special health care needs, *Spec Care Dent* 18:88–92, 1998.
8. Stiefel DJ: Dental care considerations for disabled adults, *Spec Care Dent* 22(3 Suppl): S26–S39, 2002.
9. Dolan T, Atchison K, et al: Access to dental care among older adults in the United States, *J Dent Educ* 69(9):961–975, 2005.
10. Specialist Advisory Committee for Special Care Dentistry: *Faculty of Dental Surgery. The Royal College of Surgeons of England. Specialty Training Curriculum, 2012.* http://www.gdc-uk.org/Dentalprofessionals/Specialistlist/Documents/SpecialCareDentistryCurriculum2012.pdf/. Accessed February 24, 2015.
11. Americans with Disabilities Act Standards for Accessible Design. http://www.usdoj.gov/crt/ada/adastd94.pdf. Accessed June 25, 2015.
12. Center for Medicaid and Medicare Services: *Medicare dental coverage.* http://www.cms.gov/Medicare/Coverage/MedicareDentalCoverage/index.html?redirect/MedicareDentalCoverage/. Accessed December 30, 2013.
13. Official U.S. Government Site for Medicare: *Your medical coverage: dental services.* http://www.medicare.gov/coverage/dental-services.html/. Accessed December 30, 2013.
14. American Dental Association. http://www.ada.org/368.aspx/. Accessed December 30, 2013.
15. Klasser G, Leeuw R: Self-report health questionnaire: a necessary and reliable tool in dentistry, *Gen Dent* 53(5):348-354, 2005.
16. Malamed S: *Sedation: a guide to patient management*, ed 5, St Louis, 2009, Mosby.
17. Rowland AS, Baird DD, et al: Nitrous oxide and spontaneous abortion in female dental assistants, *Am J Epidemiol* 141(6): 531–538, 1995.
18. Szymanska J: Environmental health risk of chronic exposure to nitrous oxide in dental practice, *Ann Agric Environ Med* 8:119–122, 2001.


## SUGGESTED READINGS


Americans with Disabilities Act Standards for Accessible Design. http://www.usdoj.gov/crt/ada/adastd94.pdf. Accessed September 11, 2015.

Centers for Medicare and Medicaid services. http://www.cms.hhs.gov/. Accessed September 11, 2015.

Hooyman NR, Kiyak HA: Social gerontology: a multidisciplinary perspective, ed 9, Boston, 2011, Allyn and Bacon.

Little JW, Miller, C, Rhodus, NL, Falace, D: Dental management of the medically compromised patient, ed 8, St Louis, 2013, Mosby.

Sapira JD: The art and science of bedside diagnosis, Baltimore, 1990, Williams & Wilkins.

Saunders MJ, Martin WE: Developing a dental program for the nursing home facility: a manual for dental office staff, ed 3, American Society for Geriatric Dentistry and SWAP-C/STGEC at UTHSCSA, 2005, Texas.

13

# Patients Who Are Substance Dependent

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## OUTLINE

**Challenges to the Dentist**
- Recognition of Patient Substance Abuse
- Delivery of Dental Care
- Behavioral/Compliance Issues

**Patient Assessment (Signs and Symptoms of Substance Abuse)**
- Obtaining the Patient's Health History
- Head, Face, and Neck—Intraoral/Extraoral Examination
- Effects of Inappropriate Drug Use and Their Implications

**Physician Consultation and Laboratory Testing**
**Confronting the Substance Abuse Issue with the Patient**
**Assisting the Patient in Managing the Addiction**
**Practice Management Issues**
- The Dental Office as a Source for Drug Procurement
- Theft/Burglary
- Nitrous Oxide Abuse/Theft
- Embezzlement
- Substance Abuse by a Member of the Office Team

**Conclusion**

The patient who abuses alcohol or other substances presents significant problems to the practitioner as well as to society. These problems are found in many countries worldwide.[1] Substance abuse–related disorders are common and cause significant social, psychological, and health problems among users and those around them. The substance-abusing patient is more likely to suffer from a variety of oral problems and to present unique challenges that will call on skills and sensitivities that are not typically required of the dental team in the practice of general dentistry.

The focus of this chapter is to discuss ways in which the general dentist and dental team can recognize alcohol and substance abuse in patients, how they can contribute to addiction management support in those patients, and how they can plan and safely carry out the treatment needed to rehabilitate and maintain the oral health of the patient who is actively using, as well as those who are in recovery.

## CHALLENGES TO THE DENTIST

The dental practitioner will face many frustrations in the management of the patient who abuses alcohol or other substances. Both the active and the recovering user typically bring many fears and some measure of guilt to the dental setting. The recovering user may fear uncontrolled pain or exhibit an underlying anxiety of relapse into substance abuse. The individual may be concerned that he or she will be differently treated and that the dentist will be judgmental about the addiction, as well as about the individual patient's appearance, oral condition, and/or lack of home care. The active substance user may contrive elaborate fabrications to explain his or her neglected oral health or chronic lateness or missed dental appointments. Such a patient will often deny responsibility for his or her poor oral health and may exhibit argumentative behavior, have difficulty sitting still, and need frequent "bathroom breaks" (behavior exhibited as a cover for drug use during the dental appointment).

### Recognition of Patient Substance Abuse

Early identification of substance abuse is important to reduce patient morbidity and, in some cases, mortality. Dentists may see these patients before any other healthcare professionals and thus have an excellent opportunity to assist them in recognizing and confronting a substance abuse problem—but this is no easy task. In such a situation, the dentist can provide substance abuse prevention information, or direct the patient to a substance abuse assessment and treatment center or substance abuse professional. The dental team can also screen for potential liver disease, prolonged bleeding, delayed wound healing, or other systemic conditions potentially harmful to these patients. Dentists can inform patients about tobacco cessation programs and other preventive measures to help reduce the risk of developing oral cancer. These are important opportunities, but they are also a challenge, particularly in the context of a busy dental practice.

The substance-abusing patient, particularly an active user, may not be forthcoming about his or her medical and drug history. It is not unusual for these patients to be defensive, evasive, and untruthful in communicating health-related information to the dentist. If the individual has a history of substance abuse, he or she may be reluctant to divulge the information for fear of loss of medical benefits or insurance coverage, or loss of social position, job, or self-esteem. Some individuals may be in denial and may not recognize or be willing to admit to a having a problem. Others may be well aware of the addiction, but as part of the pattern have adopted an "addiction preservation" mentality and will go to great lengths to hide, rationalize, explain away, or minimize the import of the chemical dependence. Unfortunately, some dentists may also be reluctant to delve into the issue of a patient's substance abuse, because it may seem too intrusive or because they view the disorder as a moral shortcoming rather than a valid psychiatric disorder. It is imperative that this reluctance and fear on the part of both patient and provider be overcome.

### Delivery of Dental Care

Patients receiving dental treatment while under the influence of alcohol or drugs present an unsafe and difficult working environment for the dental team and can place themselves at high risk for a medical emergency while in the dental office. Patients under the influence of some drugs are difficult to communicate with, may be uncooperative, and often do not follow prescribed therapeutic regimes. Typically, they have poor oral hygiene. They often lack an interest in oral health and are not motivated to receive regular dental care, seeking only relief of pain or infection.

Others may exhibit initial overt enthusiasm for high-quality dental care but soon lose that enthusiasm and fail to follow through with treatment that they have committed to. It is not uncommon for the abusing patient to cancel or break dental appointments or to be frequently tardy. Similarly, such individuals may be erratic or late in paying for dental services. They may present to the dental visit while under the influence—needing to "mellow out" or "get fortified" in preparation for the anxiety-evoking dental visit. Special precautions must be taken when prescribing medications for postsurgical procedures. Analgesics, sedatives, or antibiotics that are likely to cause adverse reactions with alcohol or psychiatric medications should be avoided.

There are inherent dangers when patients mix alcohol with other central nervous system (CNS) depressants, such as narcotics, sedatives, or benzodiazepines. Taken together, these substances have an additive effect that may have lethal consequences. The dentist must caution their patients against taking these medications together.

### Behavioral/Compliance Issues

Behavioral problems exhibited by the abusing patient (aggressiveness, belligerence, melancholia, euphoria) can arise because of one or more possible causes or may be a direct effect, side effect, or residual effect of the substance being ingested. Some antisocial behaviors may be a manifestation of a delayed effect, rebound, flashbacks, or withdrawal symptoms. Some defensive, secretive, manipulative, or excusatory behavior may be part of a conscious or unconscious effort at self-rationalization or self-denial. Some patients also become remarkably adept at becoming the "con artist" in a dual effort to hide the addiction and simultaneously maintain the appearance of a normal lifestyle with the accompanying benefits of social acceptance and the appearance of success.

Behavioral problems in the office can be a major disruption. Patients may have untoward reactions to treatment or become belligerent. Less dramatic, but just as detrimental, is the abusing patient who becomes distant, remote, unemotional, and disengaged. This behavior can be a direct effect of the abused substance, a side effect of therapeutic medications, or an otherwise induced mental depression—a secondary effect of the substance abuse.[2]

Many behavioral changes can be evoked by substance use, and these may become apparent at any time during the course of treatment. The dentist should be alert to the possibility of behavioral anomalies at any initial examination visit. Patients who regularly ingest ethanol and other mind-altering substances, either alone or in combination, may exhibit the following:

- Denial, avoidance behaviors (cancel, break appointments, be frequently tardy)
- Noncompliance with oral hygiene measures and other instructions
- Lowered pain threshold and increased dental, gingival, and oral sensitivity
- Anxiety, fidgeting, excitation, nervousness
- CNS depression, lethargy, altered affect, and loss of motivation
- Gagging and inappropriate behaviors in the operatory
- Unrealistic expectations about the nature and extent of treatment
- Diminished ability to tolerate and/or willingness to pay for treatment

## PATIENT ASSESSMENT (SIGNS AND SYMPTOMS OF SUBSTANCE ABUSE)

### Obtaining the Patient's Health History

Obtaining a thorough medical and oral health history is an essential first step before initiating comprehensive dental treatment for any patient. The history has particular relevance and importance for the substance-abusing patient. The history is essential in eliciting information about any associated health problems that the patient might have—problems that leave the patient susceptible to a host of different medical emergency problems. Evaluation of the health history can help divulge psychosocial complications of the addiction, any or all of which may require modifications to dental treatment. The history can also help the dental team to identify any comorbid conditions, side effects of the abused substances, or any potential adverse drug interactions.

The importance of establishing a trusting relationship with the patient, and doing so as quickly as possible, cannot be overemphasized. The stigma associated with alcoholism and other forms of substance abuse may cause the patient to fail to disclose a history of substance use and abuse. For the abuser, it is easy to find reasons to deny the abuse patterns, and, in the mind of the abuser, there are potential risks associated with divulging such a condition. It is important for the practitioner to reaffirm to the patient the confidentiality of the interview and of the findings. Similarly, it is important to explain to the patient why questions related to substance use and abuse are relevant and necessary to the practice of dentistry. In an environment of mutual trust and confidentiality, most substance using and abusing patients will be forthcoming. The goal is to obtain complete and accurate information so that dental care can be delivered in a safe manner and in a way that is in the patient's best short- and long-term interests.

The methods for obtaining an oral and medical health history are similar to those used with other adult comprehensive care patients (see Chapter 1). The patient should be treated with respect, and questions should be expressed in an objective, nonjudgmental manner. The patient should be sitting upright facing the interviewer. Making eye contact is important to reinforce the idea that the dentist is primarily interested in the patient's oral health and overall well-being. The dentist should be aware of the patient's demeanor and body language throughout the interview process. When asked a difficult question, the patient may exhibit diminished eye contact and/or a defensive posture, possibly signaling an avoidance response. If the patient's answers are vague or an effort seems to be being made to circumvent answering the questions, it may be a sign of denial of a substance abuse problem. The practitioner must also be aware that an anxious patient, or a patient with psychological problems and/or who feels falsely accused, may appear to be similarly defensive and less than forthcoming with historical information.

The patient should be asked about the type, frequency, and amount of alcohol consumption or recreational drugs, and the use of any prescription or nonprescription pharmaceuticals. Particular notice should be taken of any off-label drug uses—and an evaluation made as to whether those uses are medically plausible. If in doubt, the dentist should consult with the patient's physician or pharmacist. The dentist should also be alert to what would seem to be unusually high dosages of any mind-altering substances. At this point, the dentist cannot assume that the patient is a substance abuser simply because he or she is using a medication for an atypical reason or taking a higher-than-normal amount of a mind-altering drug. For example, many individuals who suffer from chronic, acutely painful conditions use high doses of morphine or methadone for legitimate and medically appropriate reasons. Any current or past history of tobacco use should also be recorded. For individuals who have smoked cigarettes, a pack-year history is a useful way to capture and record that information (see Chapter 1).

A positive response to any of the initial substance-related queries on the health history questionnaire (or to any related initial trigger questions on the open-ended medical history) should be pursued with additional open-ended questions to determine whether an abuse problem exists, whether consultation with another healthcare provider is warranted, and/or whether any modification to the dental plan of care is needed. If not initially reported, the dentist should clarify the type of drug, quantity, frequency, most recent time of use, and pattern of use. Follow-up questions relating to a family history of substance abuse and the consequences of that abuse may be appropriate as well. With the patient's permission, additional useful information about types of substance abuse, amount of use, and the behavioral effects and level of control of the addiction can often be obtained from family members, loved ones, and friends.

A careful review of the patient's health history may reveal risk indicators or conditions associated with the development of alcoholism or other forms of substance abuse. Signs that may indicate a problem include chronic headaches, history of low pain threshold, seizures, insomnia, anxiety, irritability, stomach problems, repeated motor vehicle accidents, and unexplained injuries or visits to hospital emergency rooms. There are also several medical conditions which, if reported on the patient's health history, may suggest substance abuse—particularly alcoholism. Although these conditions are not pathognomonic, taken collectively and in light of positive responses to some of the previous questions, they should raise questions as to a significant substance abuse problem. These conditions are

- Prolonged bleeding (normal values for bleeding time is usually between 1 and 9 minutes; in most cases of wisdom teeth extraction, bleeding usually stops after 6 to 12 hours).[3,4]
- Bruising
- Anemia
- Altered immune response
- Hypertension

The following findings from the oral health history may also be indicative of a substance abuse problem:

- Recurring episodes of ill-diagnosed oral pain
- Asking for specific (narcotic) analgesics
- Patient's requesting sedation before the dentist has even examined the patient
- History of recurrent decay due lack of proper brushing and flossing
- Disaffection and poor experience with multiple care providers

Some other behaviors indicative of substance abuse may be revealed in the history or may become apparent at subsequent appointments:

- Noncompliance with prescribed therapy
- Tardiness or failure to show for appointments
- Emotional fluctuations
- Constant excessive movement or inability to sit still, crying without reason, or other behavior that cannot be explained by other causes (such as psychological disorders, as discussed in Chapter 15)

## Head, Face, and Neck—Intraoral/Extraoral Examination

Although the process of performing an extraoral and intraoral soft tissue examination on the patient with known, suspected, or potential substance abuse is the same as for any other patient, this portion of the examination often provides valuable clues for the dental team as to whether there is an abuse problem and the nature and severity of the problem, as well as the specific oral pathologies that will need to be addressed in the course of dental treatment (Table 13-1). Some of these clues may be evident when the patient first enters the operatory, or they may emerge (or reemerge) at subsequent visits. Does the individual exhibit a staggering or halting gait? Slurred speech? Does the individual make eye contact? Does he or she have a wasted appearance? Is he or she lethargic, with unclean clothing and hair, and exhibiting body and breath odors?

During the extraoral examination, the dentist should look for dermatologic conditions, palmar or facial erythema, spider angiomas, or peripheral edema. Is the patient's skin, mucosa, or the sclera of the eyes jaundiced? Are there any inflammatory nasal mucosal changes, such as chronic rhinitis, nasal septal defects (powder cocaine), facial or lip burns (crack cocaine), dilated or constricted pupils, red eyes, venipuncture sites (needle tracks), stained fingers (marijuana and tobacco users), excessive thirst, or unusual decay patterns? Other important findings include hypertension, tachycardia, or other cardiovascular disorders. Relevant extraoral findings may include hand tremor, bloated appearance, baggy eyes or puffy facial features, excessive perspiration, bilateral swelling of parotid glands (Figure 13-1), red or ruddy complexion, and telangiectasias.

Common intraoral findings include dry lips, angular cheilitis, persistent oral ulceration or infection, enlarged salivary glands (sialadenosis), dry mouth, or candidiasis. The mucosa may exhibit an anemic pallor. Intraoral signs of an associated coagulopathy often include petechiae, purpura, and ecchymosis. Mucosal bruising, erosion, and ulceration are not uncommon. The patient may exhibit glossitis, or gingival bleeding. Many substance-abusing patients exhibit signs of poor oral hygiene with accompanying gingivitis, periodontitis, and root caries. The teeth may show evidence of erosion, bruxism, cervical notching, and/or attrition.[5]

Substance users often also use tobacco. With tobacco use, there may be nicotine patches, smoker's keratosis, snuff pouch, or nicotine stomatitis. Alcohol and tobacco are major contributing factors in the pathogenesis of oral cancer. Consequently, it is imperative that thorough intraoral examinations are conducted in these patients for the detection of premalignant or malignant lesions. While carrying out the examination, the dentist has an opportunity to inform the patient about the effects of alcohol, tobacco, and other substances on the oral cavity, and do some further investigative work in oral cancer prevention. If the patient exhibits signs of tobacco use, it is incumbent on the dentist to educate the individual about the health risks of tobacco, including its harmful effects on the oral structures and its relationship to heart disease, hypertension, and lung cancer.[6,7]

**FIG 13-1** Swelling of the salivary glands in an alcoholic patient. (From Neville BW, Damm DD, Allen CM, et al: *Oral and maxillofacial pathology,* ed 4, St. Louis, Saunders, 2016.)

**TABLE 13-1 Potential Findings in Patients Who Abuse Alcohol and Other Mind-Altering Substances**

| Clinical Finding | Associated Substance |
|---|---|
| Jaundice of skin, mucosa, sclera | Alcohol |
| Chronic rhinitis | Powder cocaine |
| Nasal septal defects | Powder cocaine |
| Facial/lip burns | Crack cocaine/methamphetamine |
| Dilated pupils | Stimulants/hallucinogens/inhalants |
| Constricted pupils | Narcotics/opiates |
| Venipuncture sites/needle tracks | Heroin |
| Stained fingers | Marijuana/tobacco |
| Excessive thirst | Methamphetamine |
| Unusual dental decay patterns | Methamphetamine |

## Effects of Inappropriate Drug Use and Their Implications

### Unpredictable Drug Metabolism

Patients may have unpredictable drug metabolism, so an understanding of all medications and their interactions is

imperative. In mild to moderate alcoholic liver disease, significant enzyme action results in increased tolerance of local anesthetics, sedative and hypnotic drugs, and general anesthesia. Larger than normal doses of medications may be required to achieve the desired results. In individuals with significant liver damage, drug metabolism will be markedly diminished. For those patients who are more likely to take larger doses of medication to achieve the desired effect, this can result in the ingestion of a potentially lethal dose of the drug.[6]

Often patients will use combinations of tobacco products, alcohol, prescription drugs, and other mind-altering substances. These may have simultaneously additive, synergistic, or conflicting pharmacologic effects. Unpredictable and variable euphoric, depressive, hallucinogenic, and sedative effects may result. Even more disturbing for the dentist or healthcare worker is the potential for highly unpredictable and extremely variable systemic effects. Many combinations of licit and illicit substances result in a dangerous cocktail that, when ingested, will be difficult for medical personnel to treat effectively, and that may have potentially life-threatening consequences.[7]

If alcoholic hepatitis or cirrhosis is present, the dentist should generally reduce normal dosages of all drugs that are metabolized in the liver or avoid their use altogether. Aspirin should be avoided before any surgical procedures in patients with liver dysfunction or thrombocytopenia because of the potential for bleeding. Acetaminophen should be used with caution in patients with impaired liver function, because granulocytopenia and anemia may be intensified. If acetaminophen is used in conjunction with alcohol, severe hepatocellular disease with potentially fatal consequences may occur.[8]

Ketoconazole should not be prescribed if patients are taking antacids, phenytoin, cimetidine, or rifampin, as it can be synergistic with other hepatotoxins.[8] When ingested with alcohol, this reaction mimics the effect of disulfiram (Antabuse). When both alcohol and disulfiram are present in the circulation at the same time, the normal metabolic pathway of ethanol is disrupted by inhibiting aldehyde dehydrogenase. This action results in increased blood levels of acetaldehyde, a toxic substance that makes the patient violently ill, usually causing nausea, vomiting, sweating, and diarrhea.[9,10]

## Infectious Diseases, Infective Endocarditis, and Nutritional Deficiencies

Patients who have a history of intravenous (IV) drug use are at risk for infectious diseases, such as hepatitis B or C, human immunodeficiency virus (HIV) infections, and infective endocarditis. Patients who are known to be IV drug users and who have not had a cardiac evaluation should be referred to a physician for an evaluation and echocardiogram, with the objective of determining their risk status for endocarditis. If the patient is determined to be at risk for endocarditis, then it is appropriate to provide prophylaxis with antibiotics before dental treatment if significant bleeding is anticipated.

Substance-abusing patients are vulnerable to sexually transmitted diseases (STDs) because of both their altered immune response and their high-risk behaviors. Patients with alcohol and other substance abuse problems often sacrifice balanced nutritional intake for the sake of maintaining their addictions. Craving to feed their "habit," limited discretionary money (beyond the cost of the habit), and altered mental judgment all contribute to poor nutrition. Folic acid and thiamine deficiencies are common. As a result of poor dietary habits, anemia and malnutrition may occur with the attendant problems of a depressed immune response; poor wound healing, and persistent local or systemic infection.

Substance-abusing patients in general and patients with alcoholism in particular are also more prone to develop fulminant systemic infection. It has been recognized that bacterial infections are more serious in patients with alcoholic liver disease—sometimes with fatal consequences. The dentist must be cognizant of the fact that oral surgical procedures, sites of oral infection or trauma, and periodontal diseases may all function as a nidus of infection and possible source of septicemia. The use of topical antimicrobials before oral surgery, scaling, or other invasive procedures is prudent in the substance-dependent patient. For high-risk patients—for example, those with confirmed compromised immune systems—systemic antibiotics may also be warranted. In general, however, in the absence of ongoing infection, studies have not shown that systemic antibiotic prophylaxis is warranted before invasive dental procedures.[11]

## Psychological Issues

Substance-abusing patients may develop profound psychological effects, including cognitive impairment, anxiety disorders, antisocial behavior, and affective disorders. In severe cases, permanent neurologic damage may occur, and these patients may develop alcohol amnestic disorder, rendering them unable to recall previously known material or learn new material. Patients may also have alcohol-related blackouts, and some individuals may develop dementia and/or severe personality changes. In such cases, professional psychiatric support is required and the dental treatment plan may need to be significantly curtailed.[9]

## Alcohol Abuse–Related Disorders

Alcohol, when consumed in moderation, is recognized to have cardiovascular and other health benefits. Light to moderate alcohol consumption (one drink daily for women and one or two drinks daily for men) is associated with cardioprotective benefits.[12-15] The concentration of alcohol in a beverage is usually stated as the percentage of alcohol by volume (ABV; the number of milliliters of pure ethanol in 100 mL of beverage) or as *proof*. In the United States, a standard drink contains 0.6 ounces (18 mL) of alcohol. This is approximately the amount of alcohol in a 12-ounce (350 mL) glass of beer (5% ABV), a 5-ounce (150 mL) glass of wine (12% ABV), or a 1.5-ounce (44 mL) glass of a 40% ABV (80 proof) "hard" liquor or spirits. In the United States, proof is

twice the percentage of alcohol by volume at 60 degrees Fahrenheit (e.g., 80 proof = 40% ABV).[15]

Research[15] shows that individuals who drink moderately may be less likely to develop an alcohol use disorder (AUD). The definition of "moderate" differs for men and women. Moderate alcohol consumption for men has been defined as no more than four drinks on any single day and no more than 14 drinks per week. For women, no more than three drinks on any single day and no more than seven drinks per week is held to be moderate consumption. To stay at low risk for AUDs, individuals must keep within both the single-day and weekly limits.[15]

An individual who has consumed one or two alcoholic drinks often feels more energetic and outgoing. This stimulating effect is actually a disinhibiting of personality. Instead of functioning as a stimulant, alcohol is actually a CNS depressant. Alcohol consumption slows normal brain function, with the sedating effect increasing with increasing amounts of alcohol. In higher doses, alcohol can become a general anesthetic. Tranquilizers and sedatives are also CNS depressants.[15]

A healthy dental patient who consumes a limited amount of alcohol typically presents no limitation or contraindications to dental treatment. Patients who use alcohol to excess, or patients who often use mind-altering substances, however, may have problems accepting, receiving, or completing dental treatment. Significant behavioral and medical issues can arise with the substance-abusing patient and may necessitate significant modification to the dental treatment plan. In some cases, treatment may need to be deferred, limited in complexity, or sequenced differently than for the normal patient.[15]

***Prevalence of alcohol abuse.*** Excessive use of alcohol (defined as use that causes damage to health) results in the death of 2.5 million people annually worldwide, causes illness and injury to millions more, and increasingly affects younger generations of drinkers in developing countries.[16] In the United States, alcohol is the most commonly used addictive substance, and its abuse has been identified as the number-one drug problem.[16-18] It is estimated that 17.6 million people, or one in every 12 adults, meet the diagnostic criteria for AUD. Several million more engage in risky drinking patterns that could lead to alcohol problems.

The National Institute on Alcohol Abuse and Alcoholism reports that more than one-half of all adults have a family history of alcoholism or problem drinking, and that more than seven million children live in a household in which at least one parent is dependent or has abused alcohol.[18] AUD can be found in individuals of any race, gender, age, or socioeconomic group.[16,18] Approximately 88,000 deaths are attributable to excessive alcohol use each year in the United States, making excessive alcohol use the third-leading lifestyle-related cause of death.[19,20] Excessive alcohol use may reduce an individual's life expectancy by up to 30 years.[19] In 2006, more than 1.2 million emergency room visits and 2.7 million physician office visits in the United States were attributed to excessive drinking.[21] In total, alcohol alone or in combination with other drugs, such as benzodiazepines, is estimated to be responsible for more overdose deaths in the United States than any other agent.[22] Alcohol is the world's third-largest risk factor for disease burden; it is the leading risk factor in the Western Pacific and the Americas and the second largest in Europe.[23]

Approximately one-half of all individuals who are diagnosed with alcohol abuse or dependence have additional psychiatric illnesses. These patients are said to have a "dual diagnosis." Additional illnesses may include anxiety, bipolar, antisocial personality, or major depressive disorders. Although these patients are treated for and receive psychiatric medications for their diagnoses, they are unlikely to abstain from alcohol use and are at greater risk for experiencing alcohol-associated morbidity and mortality. It is common for alcoholics to have multiple addictions, which may include abuse of, or dependence on, other substances such as cocaine and nicotine.[24-26]

AUD is often associated with problems similar to those associated with other abused substances (e.g., cannabis, cocaine, heroin, amphetamines, sedatives, hypnotics, or anxiolytics). Alcohol may be used to alleviate the unwanted effects of other abused substances or to substitute for them when they are not available. Symptoms such as behavior problems, depression, anxiety, and insomnia frequently accompany heavy drinking and sometimes precede it.[27-30] Once a pattern of repetitive and intense use develops, individuals with AUD may devote substantial periods of time to obtaining and consuming alcoholic beverages.[17]

Owing to the extremely unpleasant symptoms experienced during withdrawal, individuals may continue to consume alcohol despite adverse consequences, simply to avoid or relieve withdrawal symptoms. Some withdrawal symptoms (e.g., sleep problems) can persist at lower intensities for months and may contribute to relapse. See *Diagnostic Criteria for Alcohol-Related Disorders*.

***Pathophysiology of high alcohol use.*** Repeated intake of high doses of alcohol may affect nearly every organ system and, in particular, the gastrointestinal tract, cardiovascular system, and central and peripheral nervous systems. Gastrointestinal effects include gastritis, stomach or duodenal ulcers, and, in approximately 15% of individuals who use alcohol heavily, cirrhosis and/or pancreatitis. Alcohol abusers experience an increased rate of cancer of the esophagus, stomach, and other parts of the gastrointestinal tract.[27-31]

Excessive alcohol ingestion may also damage cardiac muscle tissue, affecting myocardial contractility with resulting cardiomyopathy and congestive heart failure. These factors, along with marked increases in levels of triglycerides and low-density lipoprotein cholesterol, contribute to an elevated risk of heart disease. A common problem is development of low-grade hypertension that, in combination with increased levels of cholesterol,

fosters an elevated risk of cerebrovascular and coronary artery disease.[17]

Peripheral neuropathy may also be seen in individuals who use alcohol heavily as evidenced by muscular weakness, paresthesias, and decreased peripheral sensation. More persistent CNS effects include degenerative changes in the cerebellum, cognitive deficits, and severe memory impairment. These effects are related to the direct effects of alcohol or associated trauma and to vitamin deficiencies, particularly the B vitamins, including thiamine.[17]

Alcohol abuse frequently results in inadequate nutritional intake. Because alcohol ingestion often accounts for one-half of the daily caloric intake, it displaces dietary proteins, minerals, and trace elements such as magnesium and zinc. To compound this problem, chronic alcohol ingestion also causes malabsorption of folic acid, B-complex vitamins; thiamine (B1), riboflavin (B2), pyridoxine (B6), extrinsic factor (B12), and vitamins D, E, and K.[32-34]

Alcohol abuse has a deleterious effect on neural development. Acetylcholine and dopamine receptors are damaged, leading to motor and sensory disturbances. In the CNS, neuronal cell death and atrophy of several regions of the brain occur. Clinically, these anatomic changes correlate with deficits in judgment and decision-making ability, reduced attention span, short-term memory loss, reduced emotional stability, and impaired coordination.[35-37]

Any alcohol-dependent individual may develop these psychological conditions, along with concomitant cognitive impairment. In severe cases, neurologic damage may be permanent, predisposing the individual to alcohol amnestic disorder, which prevents the recall of previously known material and impairs the ability to learn and process new information. Alcoholic individuals have a propensity to develop depression due to the CNS effects from long-term alcohol abuse and may have alcohol-related blackouts or develop dementia and severe personality changes.

Other adverse effects of long-term alcohol abuse include impairment of the liver's ability to produce coagulation factors and metabolize medications, impairment of white blood cells' chemotactic abilities, and impairment of the bone marrow's production of platelets. The first changes in alcoholic liver disease are fatty infiltration of hepatocytes. The hepatocytes become engorged with fatty lobules, creating enlargement of the liver. This process is usually reversible.[38,39] Prolonged alcohol abuse leads to fatty liver, alcoholic hepatitis, and cirrhosis.

Alcoholic hepatitis, a more serious form of liver disease, is characterized by a widespread inflammatory condition and cellular destruction. This condition may be irreversible, leading to necrosis, sometimes resulting in death if the damage is widespread. The clinical presentation of alcoholic hepatitis includes nausea, vomiting, anorexia, malaise, weight loss, and fever.[38,39] The serious form of liver disease is cirrhosis, the tenth-leading cause of death among adults in the United States. This condition is considered irreversible and is characterized by progressive fibrosis of the liver tissue and loss of excretory and metabolic function, leading to hepatic failure and associated morbidity. With alcoholic cirrhosis, the liver has a diminished ability to detoxify drugs and may develop bleeding problems secondary to the inadequate formation of prothrombin and fibrinogen, as well as a result of eventual toxic effects on bone marrow. Individuals with cirrhosis are prone to anemia, hypoglycemia, hematemesis, melena, and lung abscesses. In advanced cases, cirrhosis can lead to hepatocellular carcinoma and ultimately death.[38,39]

## Other Abused Substances

***Caffeine.*** Caffeine is the most widely used behaviorally active drug in the world and is found in variety of products, including coffee, tea, soda, weight-loss aids, cold remedies, over-the-counter analgesics, dietary supplements, and chocolate. Caffeine can also be found as additives to vitamins and food products.[17,40,41]

In the United States, the prevalence of caffeine intoxication in the general population is unclear. Some caffeine users may display symptoms consistent with problematic use, including tolerance and withdrawal.[17,40,41]

Dentists must be aware of potential problems when treating patients who have ingested excessive quantities of caffeine before treatment. High-dose caffeine use may cause patients to exhibit symptoms such as nervousness, flushed face, overexcitement, gastrointestinal disturbance, diuresis, muscle twitching, tachycardia, or cardiac arrhythmia. In some patients, physical symptoms can mimic other stimulants when caffeine is used in higher doses.[17,42,43]

Headache is the hallmark feature of caffeine withdrawal. In the United States, it has been reported that headache may occur in approximately 50% of cases of caffeine abstinence.[17,44] Individual symptoms vary from mild to extreme and may be gradual in development, throbbing, severe, widespread, and sensitive to movement. Cognitive and physical impairment may also occur.[40,44]

Heavy caffeine use has been observed among individuals with mental disorders, including those with eating disorders, smokers, prisoners, and drug and alcohol abusers. Thus these individuals could be at higher risk for caffeine withdrawal on acute caffeine abstinence.[40,44] Care must be taken by the dentist to distinguish caffeine withdrawal from other headache disorders, viral illnesses, sinus conditions, medication side effects, or other drug withdrawal states (e.g., from amphetamines, cocaine). A challenge dose of caffeine followed by symptom remission may be used to confirm the diagnosis.[42]

***Tobacco.*** Nicotine delivery from tobacco carries a significant number of chemical poisons, toxins, and cancer-producing substances. Some 600 ingredients (additives) are used in the manufacture of American cigarettes. Some of these additives help to improve the taste of the tobacco. Ammonia is added to facilitate absorption of the vapor into the lungs so the brain can get a higher dose of nicotine with each puff.[45,46] Although some of these ingredients are approved as additives for foods, they have not been tested for their effect when

inhaled as part of cigarette smoke. When these substances are ignited (i.e., lighting a cigarette) their properties are altered, usually for the worse.[45,46]

Cigarette smoke contains more than 4000 chemicals, including 69 known carcinogenic compounds and 400 other toxins. Cigarette ingredients include nicotine, tar, carbon monoxide, formaldehyde, ammonia, hydrogen cyanide, arsenic, and dichlorodiphenyltrichloroethane (DDT). Although many of these chemicals are also found in other consumer products and have warning labels, there is no such warning for the toxins in tobacco smoke.[45,46]

Nicotine in small doses acts as a stimulant to the brain. In high concentration, it is a lethal poison that can affect the heart, blood vessels, and hormones. Nicotine in the bloodstream acts on nicotinic acetylcholine receptors to release neurotransmitters such as dopamine, glutamate, and gamma-aminobutyric acid, which have a calming effect on the smoker. The release of dopamine in the brain may affect the neuroendocrine system in a manner similar to cocaine, heroin, or other addictive drugs.[47]

Nicotine acts quickly; once smoke is inhaled into the lungs, the nicotine reaches the brain in just 6 seconds. Addiction to nicotine poses serious health consequences. The addiction is so powerful that many individuals habituated to nicotine will continue to smoke in spite of serious tobacco-related physical symptoms or diseases, such as oral, throat and lung cancer, chronic obstructive pulmonary disease (COPD), and heart disease.[45,46] Both smoked and smokeless tobacco can affect the oral tissues (Figure 13-2).

Nicotine also generates tolerance and withdrawal symptoms, and may serve as the initial drug of abuse in addiction-prone individuals.[45,46] Common nicotine withdrawal symptoms include intense cravings for nicotine, irritability, anxiety, depression, restlessness, difficulty concentrating, difficulty sleeping, and increased appetite. Physical withdrawal symptoms usually peak within 24 to 72 hours after quitting, then decline over the next several weeks. However, some smokers may experience withdrawal symptoms for several months.[48] Professional smoking cessation support methods usually address both nicotine addiction and nicotine withdrawal symptoms.[47,49,50]

Tobacco use disorder frequently occurs among individuals who smoke cigarettes or use smokeless tobacco or other tobacco-containing products daily.[51,52] Cessation of tobacco use can produce a well-defined withdrawal syndrome after several hours.[51,53,54] It is common for individuals with tobacco use disorder to use tobacco to relieve or avoid withdrawal symptoms (e.g., after being in a situation in which use is restricted). It is not unusual for individuals to report a craving when they do not smoke for several hours. Some individuals will give up important social, occupational, or recreational activities if the event will occur in tobacco use–restricted areas.[49,50,53-55]

***Marijuana (Cannabis sativa).*** Marijuana is known by many street names: pot, dro, ganja, weed, grass, bud, chronic, tree, herb, hash, Mary Jane, and reefer. In 2012, marijuana was the most widely used and readily available illicit drug in the United States.[56-58] More than 95 million Americans older than age 12 have tried marijuana at least once, and it is estimated that approximately one-half of U.S. teenagers will try marijuana before finishing high school.[56-58] Between 2007 and 2012, the number of marijuana users increased from 14.5 million to 18.9 million, although the average age at first use is declining.[58]

The marijuana plant is composed of more than 460 chemical compounds; at least 80 of these are cannabinoids that interact with cannabinoid receptors in the brain.[59-61] All

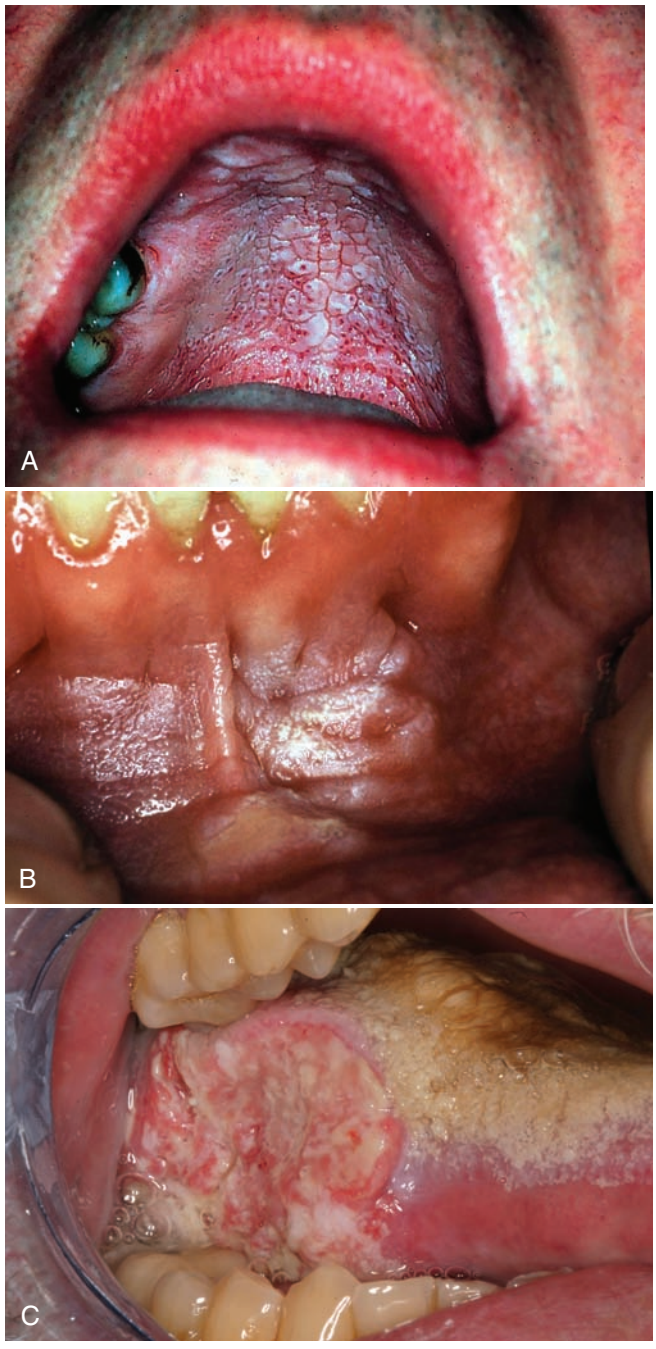


**FIG 13-2 A,** Nicotine stomatitis on the palate of a pipe smoker. **B,** Snuff dipper's pouch hyperkeratosis. **C,** Large squamous cell carcinoma on the lateral border of the tongue of a cigarette smoker.

forms of *C. sativa* are psychoactive (mind-altering) drugs. The most psychoactive cannabinoid is delta-9-tetrahydrocannabinol, commonly known as tetrahydrocannabinol, or THC. Other cannabinoids include delta-8-tetrahydrocannabinol, cannabidiol (CBD), cannabinol (CBN), cannabicyclol (CBL), cannabichromene (CBC), and cannabigerol (CBG). These chemicals exert less psychotropic effect than THC but are thought to play a role in the overall effect of the drug.[62-66]

Neuroimaging studies have been performed to evaluate the effects of marijuana on brain structure and function. Marijuana affects the thought processes, mood, senses, and emotions of the user. Individuals using marijuana may experience dizziness or tachycardia, have trouble walking, seem silly and giggle for no reason, exhibit increased appetite, have red, bloodshot eyes, and have a difficult time remembering things that have just happened. There is an initial sense of well-being or euphoria in some individuals and enhanced physical, and emotional sensitivity, such as heightened feelings of interpersonal closeness, may be experienced.[65]

Numerous effects on the nervous system result in an impaired ability to carry out simple motor tasks, as well as complex psychomotor and cognitive tasks. The individual may experience distorted perceptions of sights, sounds, time, and touch. Some users claim to have acute visual and auditory perceptions and perceive that time seems to pass more slowly. Users may also exhibit loss of hand-eye coordination and delayed reaction times, as well as errors in judgment, increasing the risk of motor vehicle accidents. Over a few hours, these early effects fade and the user usually becomes sleepy and lethargic. Users may also be withdrawn and depressed, feel fatigued, and, at times, behave in a hostile manner.[62-66]

Amotivational syndrome is frequently seen in chronic marijuana users. This condition is characterized by a loss of interest in and desire to study or work, decreased energy or productivity, and generalized apathy, sullenness, moodiness, and inability to concentrate. Chronic users may exhibit an unkempt appearance and adopt a lifestyle that revolves around procurement of the drug.[67]

Short-term effects of marijuana use include memory and learning problems, distorted perception, and difficulty thinking and solving problems. Some research has suggested that long-term marijuana use may create changes in the brain that cause the individual to be at higher risk for addiction to other drugs, such as alcohol or cocaine.[68,69]

**Marijuana as a medication.** A long history, dating back thousands of years and across many different cultures, concerns the medicinal properties of marijuana.[64] Medical marijuana use refers to the use of *C. sativa* and its constituent cannabinoids, primarily THC and CBD, as therapy for disease or to alleviate symptoms. Cannabinoid receptors are mainly expressed on T-cells, macrophages, B-cells, and in hematopoietic cells. They are also expressed on peripheral nerve terminals, where they play a role in antinociception, or the relief of pain.[63,64,70-72]

Researchers[63,64,70-73] have pinpointed two main cannabinoids responsible for marijuana's effect: THC, the primary active ingredient, and CBD. THC is responsible for the "buzz" or "high" individuals experience under its influence. CBD works primarily on peripheral nerve receptors for pain relief. It has been observed that CBD does not produce the same high.[63,64,70-73]

Researchers[74,75] have suggested that cannabis may aid in the treatment of a wide range of clinical applications. These include conditions ranging from insomnia, premenstrual syndrome (PMS), chemotherapy-induced nausea and vomiting, pain relief, glaucoma, and movement disorders. Marijuana is also a powerful appetite stimulant, and emerging research suggests that marijuana's medicinal properties may protect the body against some types of malignant tumors and are neuroprotective. More recently, cannabinoids have been shown to be effective in alleviating motor disturbances in patients with multiple sclerosis. This latter finding points to a potential use of medicinal marijuana as a treatment for movement problems in Huntington's disease.[74,75]

Cannabis can be administered using a variety of methods, including smoking, eating extracts, using oral sprays, and swallowing capsules. Smoking is the most prevalent Cannabis delivery method, followed by ingesting various foods prepared with the cannabis added (e.g., cookies, brownies). Synthetic cannabinoids (THC) are available as prescription drugs in some countries. Dronabinol (Marinol) is available in the United States and Canada. Nabilone (Cesamet) is available in the United States, Canada, Mexico, and the United Kingdom.[74]

***Prescription medication abuse.*** Some prescription drugs can alter brain activity and lead to dependence when abused. Commonly abused classes of prescription drugs include opioids (prescribed to treat pain), CNS depressants (often prescribed to treat anxiety and sleep disorders), and stimulants (prescribed to treat narcolepsy, attention deficit hyperactivity disorder [ADHD], and obesity). Commonly used opioids include hydrocodone (Vicodin), meperidine (Demerol), oxycodone (OxyContin, Percodan, Tylox), and hydromorphone (Dilaudid). Common CNS depressants include barbiturates such as pentobarbital sodium (Nembutal), and benzodiazepines such as diazepam (Valium) and alprazolam (Xanax). Stimulants include dextroamphetamine (Dexedrine) and methylphenidate (Ritalin).[76]

Rates of prescription opioid addiction have soared across the United States and Canada. Eighty percent of the world's opioids are consumed in North America. In the United States, among high school seniors, hydrocodone is the drug most commonly abused, second only to marijuana. According to the U.S. Food and Drug Administration, opiate overdose is now the second-largest cause of unintentional death after motor vehicle accidents.[76]

Drug overdose death rates from prescription painkillers in the United States have more than tripled since 1990 and have never been higher. In 2008, more than 36,000 people died from drug overdoses; most of these deaths were caused by prescription drugs.[77] Deaths from drug overdose have been

rising steadily over the past two decades and have become the leading cause of injury death in the United States.[78-80] Every day in the United States, 105 people die as a result of drug overdose, and another 6748 are treated in emergency departments for the misuse or abuse of prescription drugs.[81] The number of overdose deaths is now greater than deaths from heroin and cocaine combined.[78]

An important aspect of the problem is the nonmedical use of prescription painkillers, using drugs without a prescription, or using drugs just for the "high" they cause. In 2010, approximately 12 million Americans (age 12 or older) reported nonmedical use of prescription painkillers in the past year.[78]

In a Canadian study,[82] every city across that country except Vancouver and Montreal reported prescription opioid use was more prevalent than heroin use. From 2002 to 2005, use of prescription opiates among street drug users jumped 24%.[82] Consumption of prescription opioids has tripled over the past decade, and Canada is now the second-largest consumer in the world.[83]

If misused, prescription drugs can be as dangerous as street drugs. In the United States and Canada, purchase of opioids, anxiolytics, and stimulants requires a prescription from a physician, because they are powerful substances with a high potential for abuse and must be regulated and used under a physician's care.[16]

Taking more than the recommended dosage of a prescribed medication is dangerous. Medical supervision is also necessary to avoid dangerous drug interactions, as well as potentially serious side effects, including accidental overdose. Another issue with any prescription medication is the potential for addiction. There has been a dramatic increase in treatment admissions owing to abuse of prescription pain relievers. This increase is seen among all ages and ethnic groups.[16]

The personality profile and dental experience of patients who abuse prescription medications frequently differs from that of illicit substance abusers. They are more apt to be employed and often appear normal and highly functional. They are likely to be motivated dental patients who seek elective dental treatment and maintenance therapy. In contrast, many users of illicit substances often present only when in pain. Most states in the United States have online databases that permit health professionals to see the controlled substance prescription history for individual patients.

***Heroin.*** Heroin is known by many street names: smack, H, ska, junk, and horse. Heroin is a highly addictive drug with a very high abuse potential. Heroin use is a serious problem in North America, particularly since changes in U.S. federal and state laws have reduced the availability of prescription opiates. In 2012, the National Survey on Drug Use (NSDUH) estimated that 3.7 million Americans have or will have used heroin during their lifetimes.[58] In 2012, 315,000 Americans reported using heroin.[58] The demographic group with the highest numbers of users includes individuals who are 26 years of age and older (NSDUH).[58] In 2012, 57% of past heroin users were classified as dependent on or abusing heroin.[58] In December 2013, the Community Epidemiology Work Group reported the identification of heroin as the primary drug of abuse for people in drug abuse treatment centers in major U.S. cities.[2,84]

Recent studies suggest a shift from injecting heroin to snorting or smoking it because of increased purity and the misconception that these methods of drug delivery are safer.[2,84] Heroin is processed from morphine, a naturally occurring substance extracted from the seedpod of the Asian poppy plant, and usually appears as a white or brown powder. The Drug Abuse Warning Network lists heroin and morphine among the four most frequently mentioned drugs reported in drug-related deaths in 2011.[81] In the United States, hospital emergency room admissions because of heroin overdoses have increased by 35% since 2005.[81]

After injecting heroin, the user reports a surge of euphoria, commonly referred to as a "rush." This is accompanied by warm flushing of the skin, dry mouth, and heavy-feeling extremities. After this initial euphoria, the user alternates between a drowsy and wakeful state. Mental functioning slows owing to depression of the CNS. These effects usually last for a few hours. Long-term effects of heroin appear after repeated use of the drug. Chronic users often develop collapsed veins, abscesses, cellulitis, liver disease, and infections of the heart lining and valves. Because heroin is a CNS depressant, it may affect respiration. Heroin abusers frequently have pulmonary complications, including various types of pneumonia. Heroin abuse has been associated with fatal overdose, spontaneous abortion, and, particularly in users who inject the drug, infectious diseases, including hepatitis and HIV/AIDS.[2,84]

As the heroin user develops tolerance with regular use, more of the drug is needed to achieve the same intensity of effect, and physical dependence and addiction develop. Withdrawal typically begins a few hours after the last drug administration, with the individual experiencing a number of physical side effects including drug craving, restlessness, muscle and bone pain, diarrhea and vomiting, cold flashes with goose bumps ("cold turkey"), kicking movements ("kicking the habit"), insomnia, and other symptoms. Major withdrawal symptoms peak between 48 and 72 hours after the last dose and subside after about a week. In heavily dependent users who are in poor health, sudden withdrawal is occasionally fatal, although heroin withdrawal is considered less dangerous than that associated with alcohol, barbiturate, or benzodiazepine withdrawal.[2,84]

***Cocaine.*** Cocaine is known by the street names coke, C, snow, flake, and blow. Cocaine abuse and addiction are major health problems in North America. In 2012, an estimated 1.5 million Americans were classified as dependent on or having abused cocaine during the past 12 months, according to the NSDUH.[58] The same survey estimates that there are two million current users (i.e., have used cocaine during the past month), and the number of current crack users is estimated to be approximately 567,000. Adults ages 18 to 25 years have the highest rate of cocaine use, compared with other age groups.[58]

Cocaine is a powerfully addictive drug that can be snorted, sniffed, injected, or smoked. The substance used is an extract

from the leaf of the *Erythroxylon coca* bush, primarily grown in Bolivia and Peru, and is generally available as hydrochloride salt (powdered) or freebase (rock). The powdered form of cocaine readily dissolves in water and can be administered intravenously or intranasally. Freebase is a processed form of cocaine that has not been neutralized by an acid to make the hydrochloride salt; this form of cocaine can be smoked. The term "crack" refers to the crackling sound heard when the mixture is smoked. The cocaine user feels euphoric and energetic, although consumption of large amounts can cause bizarre and violent behavior.[58]

Several potentially severe medical complications are associated with cocaine use. Among the most frequent complications are cardiovascular effects, including disturbances in heart rhythms (ventricular fibrillation), heart attacks, strokes, and hypertension. Cocaine abuse may cause chest pain and respiratory failure, headaches, seizures, and gastrointestinal problems, including abdominal pain and nausea.[58]

Different routes of cocaine use can produce varying adverse effects. Persons who inject cocaine will exhibit needle tracks (venipuncture sites) on various parts of the body, most commonly on the forearm. Intravenous cocaine users may experience allergic reactions, either to the drug or some additive in street cocaine. In severe cases, such reactions can result in death. IV drug users are also susceptible to subacute bacterial endocarditis (SBE) and should take prophylactic antibiotics as a precautionary measure.[58]

Long-term effects of snorting cocaine include nosebleeds, problems with swallowing, hoarseness, loss of sense of smell, and an overall irritation of the nasal mucosa, which can lead to a chronically inflamed, runny nose. Chronic cocaine users should not be given local anesthesia containing epinephrine because the vasoconstrictive effects of epinephrine may lead to an acute hypertensive crisis. It is of paramount importance that the dentist be informed if the patient has used cocaine before the dental appointment. Although most cardiovascular effects of cocaine diminish a few hours after use, the blood pressure can remain elevated. Even if the patient states that he or she has stopped using the drug, it is imperative to check the blood pressure before initiating treatment.[2,58,84]

Because cocaine has a tendency to cause loss of appetite with resulting decreased food intake, many chronic cocaine users experience significant weight loss and malnourishment. In addition, there is a potentially dangerous interaction between cocaine and alcohol. When taken in combination, the body converts the two drugs to cocaethylene, which has a longer duration of action in the brain and is more toxic than either drug alone. The mixture of cocaine and alcohol is a common two-drug combination cause of drug-related death.[2,84]

***Methamphetamine.*** Methamphetamine is known by the street names meth, speed, chalk, ice, crystal, glass, or crank.

Drugs in this category are amphetamine or amphetamine-like derivatives. Methamphetamine, a powerfully addictive drug with an extremely high potential for abuse, is a white, odorless, bitter-tasting crystalline powder that dissolves easily in water or alcohol.[2,84] The abuse of methamphetamine, a potent psychostimulant, is a serious and rapidly growing problem. According to the 2012 NSDUH, more than 12 million Americans age 12 or older have tried methamphetamine at least once in their lifetimes.[58]

In 2013, approximately 1.2 million Americans age 12 or older reported using methamphetamine, including 133,000 who were new users. The average age of new methamphetamine users in 2013 was 19.7 years.[84]

Methamphetamine hydrochloride was first synthesized in 1919.[85-87] During World War II, amphetamine and methamphetamine were used extensively by the armed forces of the United States, Great Britain, Japan, and Germany for its performance-enhancing stimulant effects and extended wakefulness.[85,87-89] In the 1950s and 1960s, methamphetamine (Obetrol) was widely used as a treatment for obesity.[85,90]

As the addictive properties of the drug became known, the U.S. government began to have more stringent regulations over the production and distribution of methamphetamine.[85,87] In the early 1970s, methamphetamine became a schedule II controlled substance under the Controlled Substances Act.[85,91] In the 1980s, "ice," a form of methamphetamine that can be smoked, came into use. Ice is a large, usually clear crystal of high purity that is smoked in a glass pipe like crack cocaine. The smoke is odorless, leaves a residue that can be resmoked, and produces effects that may continue for 12 hours or more.[85] Currently, methamphetamine is sold under the trade name Desoxyn and has been placed in schedule II of the United Nations Convention on Psychotropic Substances.[85,92,93]

Although methamphetamine's chemical structure is similar to that of amphetamine, it has more pronounced neurotoxic effects on the CNS. Like amphetamine, it causes increased wakefulness and physical activity, decreased appetite, and a general sense of well-being. After the initial "rush," there is typically a state of high agitation that in many individuals may lead to violent behavior. The effects may persist for 6 to 8 hours. Chronic, long-term use may lead to psychotic behavior, hallucinations, and stroke.[94]

Methamphetamine is found in many forms and can be smoked, snorted, orally ingested, or injected. The drug alters moods in varying ways, depending on the form. Immediately after smoking or injecting the drug, the user experiences an intense rush or "flash" that lasts only a few minutes and is described as extremely pleasurable. Snorting or oral ingestion produces euphoria—a high, but not an intense rush. Snorting produces effects within 3 to 5 minutes, oral ingestion within 15 to 20 minutes. Methamphetamine is most often used in a "binge and crash" pattern. Tolerance for methamphetamine occurs within minutes, meaning that the pleasurable effects disappear even before the drug concentration in the blood falls significantly, so users try to maintain the high by binging on the drug.[85]

Methamphetamine can cause a variety of cardiovascular problems, including inflammation of the heart lining, rapid heart rate, irregular heartbeat, increased blood pressure, and irreversible, stroke-producing damage to small blood vessels

in the brain. Hyperthermia (elevated body temperature) and convulsions occur with methamphetamine overdoses, and if not treated immediately, can result in death. Methamphetamine abusers may have episodes of violent behavior, paranoia, anxiety, confusion, and insomnia. Heavy users also exhibit progressive social and occupational deterioration. Psychotic symptoms can sometimes persist for months or years after use has ceased.[2,94]

**Oral signs of methamphetamine use.** Of great importance to dentists is the increasing number of methamphetamine-addicted patients who exhibit the oral manifestations of "meth mouth," which is characterized by dry mouth, gingivitis, periodontal disease, cracked teeth, and severe dental caries (Figure 13-3).

The xerostomia seen in these patients is caused by methamphetamine's inhibitory effect on the salivary glands. Diminished salivary flow contributes to gingivitis, stomatitis, and dental caries. Methamphetamine also affects the microvasculature, with resultant impeding of blood supply to the periodontal tissues. Typically, superimposed on these physiologic problems are the ill effects of unhealthy life style choices made by the methamphetamine user, including poor oral and general healthcare, poor nutritional intake, and episodes of intoxication and loss of consciousness that may lead to antisocial or criminal behavior and/or traumatic injury. In addition, poor oral self-care and frequent or binge consumption of large volumes of highly sweetened carbonated drinks are frequently part of the pattern of drug abuse, as the individual tries to ameliorate dry mouth with sugary soda. Generally, caffeinated beverages are preferred, as they are also more likely to sustain the meth high between ingestion episodes. Collectively, these issues can have devastating consequences in the oral cavity—particularly with the development of rampant caries.[95-97]

"Meth mouth" typically begins with yellowing of the user's teeth, gingival inflammation and bleeding, rapidly deteriorating flaking enamel, loosening of the teeth, bleeding gingival tissues with swelling, and sometimes acute periapical or periodontal infection, eventually leaving the teeth looking grayish-brown or black-stained, decayed to the gum line, and often unrestorable. Often, essentially only blackened "tooth stubs" remain. Cases of "meth mouth" can advance so rapidly that patients in their late teens and early twenties sometimes require full-mouth extractions.[95-97]

The typical decay pattern for methamphetamine users starts at the gum line and eventually spreads over the entire tooth surface, demineralizing large swaths of enamel. The rapid destruction of tooth enamel is thought to be a result of toxic chemicals produced in the associated vapor from smoking methamphetamine. Flaking of the enamel, fracturing of cusps and whole tooth fractures are also common features—in many cases initiated by caries, but also aggravated by severe clenching and bruxing patterns secondary to the user's intense feelings of anxiety and paranoia while under the influence of the drug. The destruction caused by these processes is often irreversible.[95-97]

**FIG 13-3** Examples of a patient with "meth mouth."

## PHYSICIAN CONSULTATION AND LABORATORY TESTING

Consultation with the patient's physician (or other designated healthcare provider or medical clinic if the patient is not under the care of a doctor) is typically warranted when

- There is suspicion of substance abuse, but the patient is not forthcoming about his or her use/abuse history.
- The patient acknowledges substance use or abuse, or presents with a history of or signs or symptoms of systemic disease that have not been addressed, or for which the

patient is unable to supply sufficient information for the dentist to provide treatment safely.
- Clarification is necessary on the ways in which the patient's substance use/abuse and/or systemic problems may have an effect on the selection of dental treatment options, or the way in which that treatment can be delivered.
- A concern arises during the course of dental treatment as to whether treatment can be delivered without jeopardizing the patient's health (prevention of a medical emergency).
- When the addiction or attendant medical or psychiatric problems do not appear to be well controlled.

Consultation with a physician regarding patient care should be implemented with the patient's knowledge and consent. It is incumbent on the dentist to ensure that proposed dental treatment is carried out in a manner that will not jeopardize the health of the patient. If the patient refuses to allow the dentist to consult with his or her physician, then it may be necessary for the dentist to decline to provide treatment. Before refusing to treat the patient, however, there needs to be an open and honest conversation with the patient, and it is presupposed that there must be a clear and genuine need on the part of the dentist to obtain the consultation. It is unprofessional and unethical for a dentist who may have personal moral repugnance concerning substance use or abuse to use "refusal for physician consultation" as a ruse to arbitrarily dismiss a patient from the practice.

Any such request for a physician consult must be implemented with tact, compassion, and preservation of the patient's dignity. It is incumbent on the dentist to make it clear to the patient why such a referral is necessary and what specific information will be asked of the physician. Patients must be assured that the conversation and information from the conversation will be kept confidential. Every effort should be made to explain to the patient that the sole motive in seeking medical consultation is the best interests and the welfare of the patient, and that the primary goal is to provide the best oral healthcare in a manner that is both safe and effective for the patient. The one circumstance in which it may be necessary and appropriate to obtain a physician's consultation without the patient's permission would be if, during the delivery of treatment, the patient has a potentially life-threatening medical emergency. In that circumstance, the dentist has the right and the obligation to do anything necessary to preserve the life and ensure the health of the patient under his or her care.

The composition of the referral letter/fax/e-mail message is similar for the substance-using patient as for others (see Chapter 7). The nature of the medical concerns, however, is somewhat different from the typical dental patient. The effects of substance use are more far reaching, raising concerns about addiction management, concurrent and synergistic psychiatric problems, effective and productive social interactions, and drug interactions, in addition to many possible systemic (medical) disorders. The complexity of the issues that may have an effect on the dental treatment plan make it particularly important the dentist is thoughtful and organized in composing the referral letter or conversation. Vague questions to the physician such as, "Does the patient have a drug problem?" and "Should I be concerned?" are likely to elicit a similarly vague and generally unproductive response. The dentist needs to be specific about his or her concerns regarding the type of substance abuse, the level of control, any potential for medical complications, any necessary modifications in the complexity or the delivery of dental care or the manner of dental care delivery, drug interactions to avoid, whether local anesthetics can be used safely, and what analgesics can be used. The physician should be asked to include diagnoses (if possible) of the patient's medical and psychiatric (e.g., depression, schizophrenia, anxiety) problems. The physician may be asked to verify that the medications are consistent with diagnoses. If the dentist has concern about how well the medical and/or psychiatric conditions are being controlled, then that concern needs to be addressed as well.

In some cases, the physician may not be able to answer all of the questions. Questions regarding progress with the addiction management should appropriately be deferred to the psychologist or counselor who is working with the patient. The dentist should also expect that the consultation will not be a single event but rather anticipate that it may become an ongoing dialogue. The therapeutic relationships between the patient and the dentist, patient and physician, and patient and therapist are all, in most cases, ongoing and dynamic. As these three relationships evolve, the nature of the dental treatment, and counseling services and medical care that are provided, often will change—and all three healthcare providers (as well as the patient) will benefit from professional interaction. If there is ongoing open communication between all the care providers, there is far greater likelihood that the patient will be treated comprehensively, efficiently, and effectively. Consultation with other healthcare providers is definitely indicated when the addiction (or any attendant medical or psychiatric problems) does not appear to be well controlled.

Laboratory testing has particular relevance for the substance-using/abusing patient. Given the risk for bleeding disorders, malnutrition, anemia, liver dysfunction, infection, and immune compromise in this group of patients, it is often recommended that laboratory testing be done. The physician or the dentist may order the tests. A complete blood count (CBC), prothrombin time (PT), partial thromboplastin time (PTT), international normalized ratio (INR), and liver function panels are some of the more commonly prescribed tests. Box 13-1 summarizes commonly ordered tests, their purpose and use, normal values, and their relevance in dental practice.

## CONFRONTING THE SUBSTANCE ABUSE ISSUE WITH THE PATIENT

After completing the patient evaluation, the dentist will address the findings with the patient. For the patient who admits to a chemical dependence problem, this conversation can flow naturally into the medical and dental implications of the diagnosis, and the effect that the patient's condition has on dental treatment and the dental treatment plan. For

### BOX 13–1 Commonly Used Laboratory Tests for Patients Who Use Alcohol and Other Substances

**Platelets**

When vessels are damaged, the platelets become sticky and aggregate, forming a mechanical plug. They then release serotonin, which causes vessel constriction, and phospholipids, which are necessary for coagulation. Platelets fail if they are too few or if they do not become sticky. Aspirin destroys the stickiness of platelets.

Normal values: 150,000-450,000/$mm^3$

**Bleeding Time**

This tests platelet function. Using Ivy's method, the forearm is punctured. The cut is blotted with filter paper every 30 seconds until the bleeding has stopped.

Normal bleeding time: 1-6 minutes

**Coagulation (Fibrin Clot Formation) Two Pathways**

Prothrombin time (PT) tests the extrinsic pathway, used to test patients on Coumadin.

Partial thromboplastin time (PTT) tests the intrinsic pathway.

Normal values:

| | |
|---|---|
| PT (extrinsic system Factor VII) | 11-15 seconds |
| PTT (intrinsic) | 25-35 seconds |

Long PT and normal PTT: defect in extrinsic pathway.

Long PTT and normal PT: defect in intrinsic pathway.

**International Normalized Ratio (INR)**

Test for patients on Coumadin therapy, determines effects of oral anticoagulants.

Patients on Coumadin therapy usually have an INR of 2.5-3.0.

For dental therapy to be safe, the INR should be 1.5-2.5.

the active user who denies a dependency problem, the dentist will have no choice but to confront the patient about the addiction. Admittedly, this will not be an easy conversation for either party. The risk is that the patient will take offense at the intrusion into his or her privacy and simply get up and leave. At that point, the patient is usually angry and may be hostile. It is possible that the patient may become aggressive and security assistance may need to be called. Even if the patient remains calm, however, parting on bad terms is not a pleasant experience for anyone involved. The alternative of ignoring the problem and heeding the patient's request of "treating me like everyone else," however, would be a poor professional decision and may have dire consequences for the patient's health.

In the best-case scenario, the dentist convinces the patient of the relevance and necessity of dealing with the dependence problem—in the interests of the patient's oral, psychological, and medical health. Sometimes the impending prospect of being unable to get needed dental treatment (e.g., for pain relief or to repair an unsightly tooth) can persuade the patient to confront his or her alcohol or drug problem. Some of the same patients who earlier "left in a huff" may return months or years later to reengage in comprehensive dental treatment.

The key to success in all these endeavors is for the dentist and the rest of the dental team to remain calm, professional, understanding, and rational. As difficult as it may be, if the dental team can collectively deal with the patient in a humane and dispassionate manner, the probability is remarkably good that he or she may later recall the event in favorable terms and return to the dental office with a respectful (if not apologetic) demeanor. Keeping in mind that the outward behavior is a reflection of the addiction and not a measure of the patient's "inner self" can be a useful way for the members of the dental team to depersonalize the situation and deal with the behavior rather than the person. If the team can remain calm themselves, then they will think more clearly and deal more effectively with the situation, and a better long-term outcome is more likely. When managed successfully, this confrontation may lead to the patient's managing his or her addiction more effectively, and the dental team's being enabled to provide comprehensive dental care safely and efficiently, moving toward establishing and maintaining optimal oral health for the individual.

## ASSISTING THE PATIENT IN MANAGING THE ADDICTION

The role of the dentist in the management of a patient's alcohol or substance abuse problem is first and foremost to recognize that there is a problem and to refer the patient for professional therapy. With the patient who refuses to admit to a substance abuse problem or recognizes that there is a problem but refuses to seek professional help, the dentist is faced with a difficult choice. The patient cannot be forced to engage in therapy unless there is evidence that the person is a danger to self or others. If the patient demonstrates suicidal ideation, or if he or she demonstrates hostile or criminal behavior, then it is appropriate to notify appropriate mental health or legal authorities.

To make an appropriate referral of a consenting patient for substance abuse counseling, the dentist should be well informed as to all available local resources. Many county mental health units can provide alcohol and drug counseling, and most can provide excellent referrals as well. Many communities have private practitioners and/or facilities that specialize in drug rehabilitation. Many academic health centers, hospitals, and community-based health clinics provide these services as well. Some conversation with the patient about previous therapy experiences, available options, and financial resources can help focus the list to a few of the most appropriate options. In many cases, a letter of introduction or referral from a healthcare professional (dentist or physician) is helpful or even mandatory. The management and treatment of the addiction should be left to a trained professional. It is generally helpful for the dentist to have an ongoing relationship with a reliable, competent substance abuse facility. Not only does this make the initial referral easier, it

also makes ongoing communication much more efficient. It is important for the substance abuse specialist and dentist to maintain contact as the behavioral and dental therapies unfold concurrently.

Many forms of therapy for alcohol and substance abuse are available. It is generally recognized that it is difficult for the chemically dependent individual to control his or her addiction without help. Traditional and long-standing twelve-step programs have varying success rates**.** Alcoholics Anonymous (AA) and Narcotics Anonymous (NA) programs share the goal of total abstinence. Both are based on the premise that the addict client seeks guidance from a higher power and that the individual gains strength from a sense of community with other alcoholics and/or drug addicts. In some communities, AA and NA groups meet together, whereas in other communities, they meet separately and have their own separate identities. Because of the propensity for an abuser of one substance (e.g., alcohol) to be susceptible to other forms of substance abuse (e.g., barbiturates), many substance abuse therapists will insist that the addict refrain from indulging in *any* form of substance abuse.

## IN CLINICAL PRACTICE

**Providing Preventive Therapy for the Chemically Dependent Patient**

The alcoholic or chemically dependent patient may require substantially more help with preventive services and oral healthcare instruction. Alcoholic patients with severe liver disease tend to have more gingival inflammation, plaque, and calculus than other patients. Contributing factors include metabolic and immune deficiencies, as well as neglect of general and oral self-care. Such individuals will often need more frequent periodic visits and will benefit from additional oral self-care instruction, focusing on specific problem areas and issues. These patients may need more treatment time, an increased amount of local anesthesia, and additional anxiolytics. It is often appropriate to delay extensive dental care until the patient can demonstrate the ability to establish and maintain a healthy oral condition.

Patients who smoke tobacco, marijuana, methamphetamine (and, to a lesser extent, crack cocaine), tend to have heavily stained teeth. These patients require substantially more chair time, create more work for the hygienist, and need more frequent oral prophylaxis. These visits do offer excellent opportunities for encouraging patients addicted to tobacco to enroll in a tobacco cessation program.

Methamphetamine users also are likely to have much higher-than-normal caries activity and to be at increased risk for enamel, cusp, and whole-tooth fractures. Such patients will particularly benefit from dietary counseling, as they commonly consume large volumes of carbonated beverages (sodas, soda pop, soft drinks). They, too, are likely to exhibit significant tooth enamel extrinsic stains and calculus deposits. Patients who abuse amphetamine, methamphetamine, or cocaine tend to be more anxious and fearful of dental treatment than other patients and to have difficulty remaining still in the dental chair for extended periods of time, necessitating more frequent and shorter appointments.

## PRACTICE MANAGEMENT ISSUES

To handle the substance-abusing patient effectively in a contemporary dental practice, some consideration should be given to office policies and procedures involving issues that go beyond the direct delivery of dental treatment. The abusing patient may challenge the staff in ways that other patients will not. Circumstances and issues may arise that fall outside the norms of office management, and the entire office team should have these eventualities in mind and be prepared to deal with them. The following discussion calls attention to a few of the more troublesome scenarios that may occur. Several overarching principles apply to the ways in which the dental team must deal with a substance using/abusing patient:

- Patient rights and autonomy must be protected.
- Confidentiality must be protected.
- Insofar as it is possible, the patient must be protected from harming him-/herself.
- Individual staff members in the dental office similarly have the right to safety and security.
- Furthermore, the dental team has the logical right to protect the integrity of the practice from security breach and from being falsely impugned.

The practice is insured against malpractice claims but also must endeavor to conduct its business and professional activities in such a way as to reduce legal risk. At times, these concerns may be in apparent conflict, which can create ethical (and professional) dilemmas (See Ethics in Dentistry box). In general, the axioms of "do no harm" and "do what is in the best interest of the patient" will serve both the dentist and the practice well.

### The Dental Office as a Source for Drug Procurement

Historically, some addicts have found dental offices to be an easy target for narcotic analgesics and antibiotics (the latter can sometimes be sold on the street for their cash value). It is relatively easy to feign dental pain and enter a busy practice at an inopportune time, requesting specific painkillers "to get by till I can get to my regular dentist." Similarly, the addict may call the dentist at home, seeking a telephone prescription for narcotic medications. In general, these ploys can be thwarted by insisting that the source of the pain be evaluated and treated and not simply managed with analgesics. Long-duration local anesthesia (bupivacaine) can be used to provide pain relief in lieu of prescribing narcotic drugs. If an analgesic is professionally determined to be indicated, then it is wise to prescribe only nonnarcotic analgesics.

Refusing to call in prescriptions for patients who are not currently active in the practice is professionally prudent and consistent with the expectations of many state dental practice acts. Networking with pharmacists, physicians, dentists and other healthcare providers to identify drug seekers is also effective in many cases. Typically, a "patient" will attempt this ploy with multiple dental offices in the same area until the ruse is uncovered, at which point the individual moves on to

## ETHICS IN DENTISTRY

### Treating Family, Friends, and Coworkers

Patients with a history of active or past alcohol or substance abuse illustrate one potential difficulty that can arise when dentists elect to treat friends, employees, or family members. Dentists who elect to provide direct patient care to relatives, friends, and/or coworkers should be aware that these individuals may be reluctant to disclose sensitive information that is relevant to their care. For example, children of employees may not want the dentist to know of their alcohol dependence, substance abuse, or pregnancy. Patients who share a social or employment-based relationship with the dentist may also be reluctant to ask questions, complain of pain, or seek a second opinion. Therefore, a risk of mixing a social relationship with a dentist-patient relationship is that fundamental clinical obligations, such as informed consent, may not be met.

For physicians, the risks inherent in treating family members, such as role conflict and loss of objectivity, along with the difficulty of obtaining an accurate and complete health history from the patient, are explicitly discouraged in the American College of Physicians Ethics Manual, 2012.[1] These concerns apply equally to dentists. Although there are no clear prohibitions against dentists treating family members, the American Dental Association (ADA) Code of Ethics states that "dentists should avoid interpersonal relationships that could impair their professional judgment or risk the possibility of exploiting the confidence placed in them by a patient."[2]

Some dentists may adopt a policy of not accepting friends, family members, or employees into the practice, whereas others may elect to treat such patients. Some dentists, particularly those who practice in smaller communities, may not be able to exclude all such patients from their practices without denying necessary treatment or causing significant inconvenience to the prospective patient.

If a dentist treats family members, friends, employees, or family of employees, he or she should acknowledge the potential for role conflict directly with the patient.[3] Explicit assurances regarding confidentiality are worthwhile, along with a discussion of the limitations of protecting access to dental records within the practice. Patients should be encouraged to ask questions, and all requirements for informed consent should be met for each procedure. Dentists who treat friends and family should maintain clinical records, keep careful documentation, and adhere to standard clinical procedures just as they would with any other patient.[4]

#### References


1. American College of Physicians Ethics Manual: Sixth edition, *Ann Intern Med* 156:73–104, 2012.
2. American Dental Association: Principles of ethics and code of professional conduct, 2012. http://www.ada.org/en/about-the-ada/principles-of-ethics-code-of-professional-conduct/. Accessed September 09, 2014.
3. Hasegawa TK, Matthews M, Grogan DM: Ethical dilemma #47: Friend or patient...or both? *Texas Dent J* 121(4): 329–331, 2004.
4. Maitland RI, Duthie RC: The separation of dentistry and family, *NY State Dent* 62(7):30–32, 1996.


another area. Dentists should be careful with drug samples kept in the office, making sure the samples are securely locked away where they cannot be taken by staff or after-hours maintenance people, such as janitors and maids. With controlled substances, the samples must be monitored with a perpetual inventory.

### Theft/Burglary

Although the dental office is often regarded by the dentist and his or her office staff as an unlikely target for burglary and vandalism, in fact, cash, cancelled checks, syringes, prescription pads, and medications—anything that can be used as drug paraphernalia or can be used by an abuser, or turned into cash on the street—constitutes a prime target. Dental offices that are known to have drug samples on the premises are more often broken into. The necessity for keeping the office secure is obvious. It is important to keep supplies of drugs, syringes, and prescription pads out of the view of patients. When treating an individual who is a suspected substance abuser, it is prudent to take inventory of operatory before and after each patient visit.

### Nitrous Oxide Abuse/Theft

Dental offices have been broken into when they are a known source of nitrous oxide. Sometimes this is the focus of an impromptu party on the premises. In other cases, the nitrous bottles are removed for later use or sold on the street. The need for security and monitoring of inventory is self-evident.

### Embezzlement

Although embezzlement is rare, it can be a notable and potentially devastating occurrence in the dental office. Certainly embezzlement can occur with any employee, but the possibility increases significantly if an employee is a substance abuser. Bonding all employees who handle money, implementing double counts of all deposits by varying staff members, and external audits are common strategies to prevent such crimes. The best insurance, however, is for the dentist to closely monitor the daily ledger and financial records personally.

### Substance Abuse by a Member of the Office Team or Other Dental Healthcare Professional

Management of this issue goes beyond the scope of this text, and the reader is encouraged to review the resource list at the end of the chapter. Unfortunately, this is a significant problem in our profession. Most state dental boards, in cooperation with local and state dental societies, have now developed responsible and humane "Caring Provider Programs" that in most cases are effective in helping the abusing professional to recover and continue to practice in the profession.

## CONCLUSION

Dental management and treatment of the chemically dependent patient presents both unique challenges and rewards for the dental team. The patient who abuses alcohol or other

substances is likely to have significant health and psychosocial problems, which will have an effect on dental treatment and treatment planning. Unlike most health problems, this patient may have a vested interest in not disclosing his or her addiction and will go to great lengths to mask the signs and symptoms of the addiction. This can be troublesome, as the unwary dentist may initiate dental treatment that will be ineffective or potentially harmful to the patient. In a worst-case scenario, the dentist may precipitate a difficult-to-control hemorrhagic episode or potentially fatal cardiac event. If an addiction is recognized or suspected by the dental team, the necessity to confront the patient is clear, although it may inevitably also be a potentially charged and unpleasant encounter. The chemically dependent patient is prone to the development of many forms of oral pathology, all of which the dental team must strive to prevent and eradicate. Referral of the patient to specialists for consultation, management of medical issues, and control of the dependency problem are all important aspects of the dentist's role.

As with any patient, the goal of the dental team is to provide the chemically dependent patient with safe, effective dental care that is compassionately delivered in a way that demonstrates respect for the individuality of the patient. The medical and comorbid psychological problems of such patients, as well as their resistive behavior, often make this a much greater-than-normal challenge. The rewards, however, of assisting a dependent patient in their recovery, and helping them achieve an optimal state of oral health in a safe, efficient, and humane manner are extremely gratifying.

## REVIEW QUESTIONS

- What are the health consequences of excessive alcohol use? Does alcohol affect women differently from men? If so, how?
- Name some commonly abused substances and describe how their use can affect the general and oral health of patients.
- Describe (or name) some forms of therapy used to treat patients with alcohol or substance abuse problems.
- What types of behavior might a patient exhibit that could suggest alcohol or substance abuse?
- What findings from a patient's medical and oral health histories can be indicative of a substance abuse problem?
- What modifications may be necessary when planning or executing treatment for a patient who is abusing alcohol or other substances? Would any of these modifications apply to the recovering patient?
- How might a dental office become a source of drugs for addicted individuals?

## REFERENCES


1. Degenhardt L, Dierker L, Chiu WT, et al: Evaluating the drug use "gateway" theory using cross-national data: consistency and associations of the order of initiation of drug use among participants in the WHO World Mental Health Surveys, *Drug Alcohol Depend* 108(1-2):84–97, Apr 1, 2010.
2. Community Epidemiology Work Group 2013: Epidemiologic trends in drug abuse, proceedings of the Community Epidemiology Work Group, Vol 1, 2013. http://www.drugabuse.gov/sites/default/files/files/June_2013_Vol1_508.pdf. Accessed February 2, 2015.
3. Medscape: *Bleeding time reference range, normal values*. http://emedicine.medscape.com/article/2085022-overview/. Accessed February 18, 2015.
4. Seaforth Oral Surgery: Wisdom teeth removal. http://www.seaforthoralsurgery.com/surgical-instructions/wisdom-teeth-removal/. Accessed February 18, 2015.
5. Martin M: Personal communication, 2005.
6. O'Conner PG, Schottenfeld RS: Patients with alcohol problems, *N Engl Med* 338:592–602, 1998.
7. McQuade WH, Levy SM, Yanek LR, et al: Detecting symptoms of alcohol abuse in primary care setting, *Arch Fam Med* 9:814–821, 2000.
8. Seeff LB, Cuccherini BA, Zimmerman HJ, et al: Acetaminophen hepatotoxicity in alcoholics: a therapeutic misadventure, *Ann Intern Med* 104:399–404, 1986.
9. Friedlander AH, Marder SR, Pisegna JR, Yagiela JA: Alcohol use and dependence: psychopathology medical management, and dental implications, *JADA* 134:731–740, 2003.
10. Schuckit MA, Daeppen JB, Tipp JE, et al: The clinical course of alcohol-related problems in alcohol dependent and non-alcohol dependent drinking women and men, *J Stud Alcohol* 59:581–590, 1998.
11. Leonard R: Alcohol, alcoholism, and dental treatment, *Compendium* 12(4):274–283, 1991.
12. O'Keefe JH, Bybee KA, Lavie CJ: Alcohol and cardiovascular health, *J Am Coll Cardiol* 50(11):1009–1014, 2007.
13. Krenz M, Korthuis RJ: Moderate ethanol ingestion and cardiovascular protection: from epidemiologic associations to cellular mechanisms, *J Mol Cell Cardiol* 52(1):93–104, Jan 2012.
14. Agarwal DP: Cardioprotective effects of light–moderate consumption of alcohol: a review of putative mechanisms, *Alcohol Alcohol* 37(5):409–415, 2002.
15. National Institute on Alcohol Abuse and Alcoholism: *Drinking levels defined*. http://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/moderate-binge-drinking/. Accessed February 18, 2015.
16. National Council on Alcoholism an Drug Dependence, Inc: *Alcohol & drug information*. http://ncadd.org/for-the-media/alcohol-a-drug-information. Accessed February 18, 2015.
17. American Psychiatric Association: *Substance-related and addictive disorders, DSM-V, diagnostic and statistical manual of mental disorders*, ed 5, Arlington, VA, 2014, American Psychiatric Publishing Inc.
18. National Institute on Alcohol Abuse and Alcoholism: *Alcohol use disorder*. http://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/alcohol-use-disorders/. Accessed February 18, 2015.

19. Centers for Disease Control and Prevention (CDC): *Alcohol-Related Disease Impact (ARDI)*. http://www.cdc.gov/alcohol/onlinetools.htm. Accessed February 18, 2015.
20. Mokdad AH, Marks JS, Stroup DF, Gerberding JL: Actual causes of death in the United States, 2000, *JAMA* 291(10): 1238–1245, 2004.
21. Bouchery EE, Harwood HJ, Sacks JJ, et al: Economic costs of excessive alcohol consumption in the United States, *Am J Prev Med* 41:516–524, 2006.
22. Schuckit MA, et al: The clinical course of alcohol-related problems in alcohol dependent and non-alcohol dependent drinking women and men, *J Stud Alcohol* 59(5):581–590, 1998.
23. Learn-about-alcoholism.com: http://www.learn-aboutalcoholism.com/statistics-on-alcohol-abuse.html. Accessed February 18, 2015.
24. Daeppen JB, Smith TL, Danko GP, et al: Clinical correlates of cigarette smoking and nicotine dependence in alcohol-dependent men and women, *Alcohol Alcohol* 35:171–175, 2000.
25. Kessler RC, Nelson CB, McGonagle KA, et al: The epidemiology of co-occurring addictive and mental disorders: implications for prevention and service utilization, *Am J Orthopsychiatry* 66:17–31, 1996.
26. Thase ME, Salloum IM, Cornelius JD: Comorbid alcoholism and depression: treatment issues, *J Clin Psychiatry* 62(Suppl 20):32–41, 2001.
27. Schuckit MA: *Drug and alcohol abuse: a clinical guide to diagnosis and treatment*, ed 6, New York, 2006, Springer.
28. Schuckit MA, Smith TL: Onset and course of alcoholism over 25 years in middle class men, *Drug Alcohol Depend* 113(1): 21–28, 2011.
29. Schuckit MA, Smith TL, Heron J, et al: Testing a level of response to alcohol-based model of heavy drinking and alcohol problems in 1,905 17-year-olds, *Alcohol Clin Exp Res* 35(10):1897–1904, 2011.
30. Schuckit MA: Ethanol and methanol. In Brunton L, Chabner B, Knollmann BC, editors: *Goodman and Gilman's the pharmacological basis of therapeutics*, ed 12, New York, 2011, McGraw-Hill Professional.
31. Falck-Ytter Y, McCullough AJ: Nutrition effects of alcoholism, *Curr Gastroenterol Rep* 2:331–336, 2000.
32. Nicolás JM, Fernández-Solá J, Fatjó F, et al: Increased circulating leptin levels in chronic alcoholism, *Alcohol Clin Exp Res* 25:83–88, 2001.
33. Cravo ML, Camilo ME: Hyperhomocysteinemia and chronic alcoholism: relations to folic acid and vitamins B6 and B12 status, *Nutrition* 16:296–302, 2000.
34. Markowitz JS, McRae AL, Sonne SC: Oral nutritional supplementation for the alcoholic patient: a brief overview, *Ann Clin Psychiatry* 12:153–158, 2000.
35. Bleich S, Spilker K, Kurth C, et al: Oxidative stress and altered methionine metabolism in alcoholism, *Neurosci Lett* 293: 171–174, 2000.
36. Pfefferbaum A, Sullivan EV, Hedehus M, et al: In vivo detection and functional correlates of white matter microstructural disruption in chronic alcoholism, *Alcohol Clin Exp Res* 24: 1214–1221, 2000.
37. Sullivan EV, Deshmukh A, Desmond JE, et al: Cerebellar volume decline in normal aging, alcoholism, and Korsakoff's syndrome: relation to ataxia, *Neuropsychology* 14:341–352, 2000.
38. Little J, Falace D, Miller C, Rhodus N: *Dental management of the medically compromised patient*, ed 8, St. Louis, 2013, Mosby.
39. Podolsky DK, Isselbacher KJ: Cirrhosis of the liver. In Wilson JD, et al, editors: *Harrison's principles of internal medicine*, ed 12, New York, 1991, McGraw-Hill.
40. Juliano LM, Griffiths RR: Caffeine-related disorders, In Sadock BJ, Sadock VA, Ruiz P, editors: *Kaplan and Sadock's comprehensive textbook of psychiatry*, ed 9, Philadelphia, 2009, Lippincott Williams & Wilkins.
41. Reissig CJ, Strain EC, Griffiths RR: Caffeinated energy drinks–a growing problem, *Drug Alcohol Depend* 99(1–3):1–10, 2009.
42. Kendler KS, Myers J, Gardner C: Caffeine intake, toxicity and dependence and lifetime risk for psychiatric and substance use disorders: an epidemiologic and co-twin control analysis, *Psychol Med* 36(12):1717–1725, 2006.
43. Lai MW, Klein-Schwartz W, Rodgers GC, et al: 2005 Annual Report of the American Association of Poison Control Centers' national poisoning and exposure database, *Clin Toxicol* 44 (6–7):803–932, 2006.
44. Juliano LM, Griffiths RR: A critical review of caffeine withdrawal: empirical validation of symptoms and signs, incidence, severity, and associated features, *Psychopharmacology (Berl)* 176(1):1–29, 2004.
45. Tri-County Cessation Center: *Cigarette ingredients*. http://www.tricountycessation.org/tobaccofacts/Cigarette-Ingredients.html#list.Accessed February 18, 2015.
46. QuitSmokingSupport.com: *Have you ever wondered what's in a cigarette?* http://www.quitsmokingsupport.com/whatsinit.htm. Accessed February 18, 2015.
47. Benowitz NL: Nicotine addiction, *N Engl J Med* 362(24): 2295–2303, 2010.
48. Habitrol: http://www.habitrol.com/. Accessed February 18, 2015.
49. Healthlink BC British Columbia: *Quit smoking*. http://www.healthlinkbc.ca/healthfeatures/smoking-cessation.html/. Accessed February 18, 2015.
50. Healthlink BC British Columbia: *BC smoking cessation program*. http://www.health.gov.bc.ca/pharmacare/stop-smoking/. Accessed February 18, 2015.
51. Hughes JR, Helzer JE, Lindberg SA: Prevalence of DSM/ICD-defined nicotine dependence, *Drug Alcohol Depend* 85(2): 91–102, 2006.
52. Shiffman S, Hughes JR, Pillitteri JL, Burton SL: Persistent use of nicotine replacement therapy: an analysis of actual purchase patterns in a population-based sample, *Tob Control* 12(3): 310–316, 2003.
53. Hughes JR, et al: Antidepressants for smoking cessation, *Cochrane Database Syst Rev* 1:CD000031, 2014.
54. Shmulewitz D, Keyes KM, Wall MM, et al: Nicotine dependence, abuse and craving: dimensionality in an Israeli sample, *Addiction* 106(9):1675–1686, 2011.
55. Chapman S, MacKenzie R: The global research neglect of unassisted smoking cessation: causes and consequences, *PLoS Medicine (Public Library of Science)* http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1000216/. Accessed February 18, 2015.
56. University of Michigan News and Information Services: *Drug use among American teens shows signs of leveling after a long rise*, December 18, 1997.
57. DrugWarFacts.org: *Get the Facts*. http://www.drugwarfacts.org/cms/Drug_Usage#Cannabis. Accessed February 18, 2015.
58. U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality: *Results from the 2012 national survey on drug use and health: summary of national*

*findings*. http://www.samhsa.gov/data/NSDUH/2012SummNatFindDetTables/NationalFindings/NSDUHresults2012.htm#ch7.3.1/. Accessed February 18, 2015.
59. Downer EJ, Campbell VA: Phytocannabinoids, CNS cells and development: a dead issue? *Drug Alcohol Rev* 29(1):91–98, 2010.
60. Burns TL, Ineck JR: Cannabinoid analgesia as a potential new therapeutic option in the treatment of chronic pain, *Ann Pharmacother* 40(2):251–260, 2006.
61. Borgelt LM, Franson KL, Nussbaum AM, Wang GS: The pharmacologic and clinical effects of medical cannabis, *Pharmacotherapy*, 33(2):195–209, 2013. http://www.ncbi.nlm.nih.gov/pubmed/23386598.
62. Ben Amar M: Cannabinoids in medicine: a review of their therapeutic potential (PDF), *J Ethnopharmacol* 105(1-2):1–25, 2006.
63. Cascini F, Aiello C, Di Tanna G: Increasing delta-9-tetrahydrocannabinol (Δ-9-THC) content in herbal cannabis over time: systematic review and meta-analysis, *Curr Drug Abuse Rev Mar* 5(1):32–40, 2012.
64. McLaren J, Swift W, Dillon P, Allsop S: Cannabis potency and contamination: a review of the literature, *Addiction* 103(7):1100–1109, 2008.
65. Tzilos G, Cintron C, Wood J, et al: Lack of hippocampal volume change in long-term heavy cannabis users, *Am J Addict* 14:64–72, 2005.
66. University of Washington Alcohol and Drug Abuse Institute: *Potency of marijuana*. http://adai.uw.edu/marijuana/factsheets/potency.htm. Accessed February 18, 2015.
67. Sammon P: Personal communication, 2005.
68. Rodriguez de Fonseca F, Carrera MRA, Navarro M, Koob GF, Weiss F: Activation of corticotropin-releasing factor in the limbic system during cannabinoid withdrawal, *Science* 276(5321):2050–2054, 1997.
69. Pope HG, Yurgelun-Todd D: The residual cognitive effects of heavy marijuana use in college students, *JAMA* 275(7), 1996.
70. Mehmedic Z, Chandra S, Slade D, et al: Potency trends of Δ9-THC and other cannabinoids in confiscated cannabis preparations from 1993 to 2008, *J Forensic Sci* 55(5):1209–1217, 2010.
71. National Highway Traffic Safety Administration (NHTSA): *Drugs and human performance fact sheet: cannabis/marijuana*. http://www.nhtsa.gov/people/injury/research/job185drugs/cannabis.htm. Accessed February 18, 2015.
72. Sevigny EL: Is today's marijuana more potent simply because it's fresher? *Drug Test Anal Jan* 5(1):62–67, 2013.
73. United Nations Office on Drugs and Crime: *Why does cannabis potency matter? World Drug Report 2009 Series.* http://www.unodc.org/unodc/en/frontpage/2009/June/why-does-cannabis-potency-matter.html. Accessed February 19, 2015.
74. Borgelt LM, Franson KL, Nussbaum AM, Wang GS: The pharmacologic and clinical effects of medical cannabis, *Pharmacother (Review)* 33(2):195–209, February 2013.
75. Huntington's Outreach Project for Education at Stanford: *Medical marijuana policy in the United States.* http://web.stanford.edu/group/hopes/cgi-bin/hopes_test/?s=medical+marijuana/. Accessed February 19, 2015.
76. U.S. Food and Drug Administration: *FDA acts to reduce harm from opioid drugs*. http://www.fda.gov/forconsumers/consumerupdates/ucm251830.htm/. Accessed February 19, 2015.
77. World Health Organization: *Management of substance abuse: the global burden*. http://www.who.int/substance_abuse/facts/global_burden/en/. Accessed February 19, 2015.
78. Centers for Disease Control and Prevention (CDC): *Prescription painkiller overdoses in the U.S.* http://www.cdc.gov/vitalsigns/PainkillerOverdoses/index.html/. Accessed February 19, 2015.
79. Centers for Disease Control and Prevention (CDC): *Prescription drug overdose in the United States: fact sheet*. http://www.cdc.gov/homeandrecreationalsafety/overdose/facts.html/. Accessed February 19, 2015.
80. Centers for Disease Control and Prevention (CDC): *Compressed mortality file: underlying cause-of-death*. http://wonder.cdc.gov/mortsql.html/. Accessed February 19, 2015.
81. U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration: *The Drug Abuse Warning Network (DAWN) Report. Highlights of the 2011 Drug Abuse Warning Network (DAWN) findings on drug-related emergency department visits*. http://www.samhsa.gov/data/sites/default/files/DAWN127/DAWN127/sr127-DAWN-highlights.pdf. Accessed February 19, 2015.
82. Haydon E, Rehm J, Fischer B, et al: Prescription drug abuse in Canada and the diversion of prescription drugs into the illicit drug market, *Can J Public Health* 96(6):459–461, 2005.
83. Voon P, Kerr T: "Nonmedical" prescription opioid use in North America: a call for priority action, *Subst Abuse Treat Prev Policy* 8:39, December 2013.
84. National Institute on Drug Abuse: *Epidemiologic Trends in Drug Abuse: Advance report: proceedings of the Community Epidemiology Work Group, June 2013*. http://www.drugabuse.gov/sites/default/files/files/AdvanceReport2013.pdf. Accessed February 19, 2015.
85. The vaults of Erowid: https://www.erowid.org/chemicals/meth/meth_timeline.php/. Accessed February 19, 2015.
86. Grobler SR, Chikte U, Westraat J: The pH levels of different methamphetamine drug samples on the street market in Cape Town, *ISRN Dentistry* 1, 2011.
87. Vermont Department of Health: *A brief history of methamphetamine. A historical overview of methamphetamine*. http://healthvermont.gov/adap/meth/brief_history.aspx. Accessed January, 2012.
88. Ulrich A: *The Nazi death machine: Hitler's drugged soldiers, May 6, 2005, Der Spiegel*. http://www.spiegel.de/international/the-nazi-death-machine-hitler-s-drugged-soldiers-a-354606.html.
89. Defalque RJ, Wright AJ: Methamphetamine for Hitler's Germany: 1937 to 1945, *Bull Anesth Hist* 29(2):21–24, 32, April 2011.
90. Rasmussen N: *On speed: the many lives of amphetamine*, New York, March 2008, New York University Press, p. 148.
91. U.S. Food and Drug Administration: *Controlled Substances Act*. http://www.fda.gov/RegulatoryInformation/Legislation/ucm148726.htm. Accessed February 19, 2015.
92. United Nations Office on Drugs and Crime: *World Drug Report 2012*. http://www.unodc.org/documents/data-and-analysis/WDR2012/WDR_2012_web_small.pdf. Accessed February 19, 2015.
93. International Narcotics Control Board: *The green list: list of psychotropic substances under international control*. http://www.incb.org/documents/Psychotropics/green_lists/Green_list_ENG_2014_85222_GHB.pdf. Accessed February 19, 2015.
94. National Institute on Drug Abuse: *Trends & statistics*. http://www.drugabuse.gov/related-topics/trends-statistics. Accessed February 19, 2015.
95. Shaner JW: Caries associated with methamphetamine abuse. *J Mich Dent Assoc* 84:42–47, 2002.
96. McGrath C, Chan B: Oral health sensations associated with illicit drug abuse, *Br Dent J* 198:159–162, 2005.
97. Howe AM: Methamphetamine and childhood and adolescent caries, *Aust Dent J* 40:340, 1995.

14

# Patients Who Are Anxious or Fearful

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## OUTLINE

**Nature and Scope of Problem**
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- Effect on Dental Team
- Effect on Patient

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- Anxiety and Pain Memory
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- Distraction
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- Hypnosis and Guided Imagery
- Altering Treatment Approach and Sequence
- Pharmacologic Intervention
- Integrating Anxiolytic Therapy into Delivery of Dental Care

**Conclusion**

Even after years of experience, many dental practitioners find that treating fearful/anxious patients is stressful. Part of the stress comes from the manner in which patients express their dental fear. The anxious patient may exclaim, "Don't take it personally, but I hate going to the dentist." Some fearful patients appear angry and hostile, whereas others are cautious and withdrawn—both groups may be distrustful. Not only is such patient behavior unsettling to the dentist, but it may also significantly limit his or her ability to treat the patient's dental problems. This chapter is designed to help the practitioner understand the problem of dental fear and to deal with it more effectively. The following sections will familiarize the reader with (1) the nature and scope of the problem; (2) the characteristics of fearful patients; (3) approaches to evaluation, diagnosis, and treatment planning for fearful patients; and (4) suggestions on how to deliver dental care to fearful individuals, including pharmacologic interventions when necessary.

## NATURE AND SCOPE OF PROBLEM

The media often portray dental fear as a commonplace reaction to going to the dentist. Although many practitioners are offended by this portrayal, the fact remains that fear of the dentist is a common phenomenon and is universally recognized. Little wonder that some (but not all) patients are so forthright with their fearful dental stories.

Several studies confirm that high levels of dental anxiety and fear are relatively common among individuals in the United States and other countries.[1-4] Approximately 50% of U.S. adults report some dental fear, with 8% to 11% being fearful enough that going to a dentist at all is problematic. In a Seattle-area survey, 20% of respondents were classified as having high fear of dentistry.[5] Smith and Heaton reviewed 19 published reports involving more than 10,000 adults in the United States and concluded that the rate of dental anxiety and/or fear has remained stable over the past 50 years.[6] National surveys in Iceland, Taiwan, Finland, and Australia document that at least some dental fear is experienced by between 21% and 50% of adults.[7-9] Studies of children have shown a global variation in the prevalence estimates of dental anxiety ranging between 3% and 43%.[10] Although methods used to collect data on dental fear vary widely across studies, complicating attempts to make direct comparisons both within and between countries, dental fear nonetheless appears to be a problem internationally, affecting the use of dental services in all countries for which data are available.

Although many fears are regarded as socially unacceptable, the presence of dental fear is widely accepted and carries little social stigma. This may make it easier for patients to rationalize and justify their own dental fears and hence to maintain their own fearful and avoidant behavior. Given the international prevalence and general acceptance of dental fear, it is not possible for the practitioner to avoid fearful patients. Consequently, it is worth the time and effort required to learn to effectively manage and treat fearful patients.[11]

### Effect on Society

The large numbers of fearful dental patients and their associated behaviors have an effect on the greater society.[12] Some data suggest that one in three dentally fearful people will delay or avoid dental treatment because of their fear,[13] with the consequences often being unnecessary pain and suffering. Society then pays through lost workdays and diminished productivity of its members.[14] It has been estimated that between 15% and 33% of the U.S. public experience dental-related disability days. In a study of 2600 employed people, 25% reported an episode of work loss in the past 12 months related to a dental problem.[15] Data from the 1996 National Health Interview Survey indicate that, in all, 2.4 million work days were lost owing to acute dental conditions.[15a]

### Effect on Dental Team

Many individuals who suffer from fear of dental treatment cancel or fail to appear for their appointments. The cost of missed or unfilled appointments inevitably becomes a financial issue for the dentist. This increased cost to the dental practitioner in turn influences the cost of dental care for other patients in the practice. In addition, even when fearful patients do appear for their appointments, they often require more staff time and attention. Interactions with fearful patients may result in extra stress and fatigue for the practitioner and reduced job satisfaction among staff members as well. Dental fear may also result in reduced patient compliance, and, as a result, a diminished likelihood of treatment success for both patient and dentist.

### Effect on Patient

Dental fear has its greatest effect on the individual patient.[16,17] The physical and psychological effects are significant, and the emotional toll on the millions of affected individuals is inestimable. In some families, several generations of individuals have suffered ill health, oral infection, acute and/or chronic dental pain, loss of oral function, and loss of self-esteem—all because of anxiety about seeking dental care and treatment.

Some patients are embarrassed by their fear and may seek to hide it by avoiding going to the dentist altogether.[18] In other cases, if fearful patients do find the courage to schedule an appointment, they may fail to appear or avoid scheduling certain types of appointments (e.g., root canal therapy or surgery). This avoidance puts the patient at risk for failing to understand the symptoms he or she is experiencing, overestimating or underestimating their seriousness, and making it difficult to know when to seek help. Fearful patients may also have difficulty in making well-reasoned treatment decisions about their dental care needs. Some dentists may charge a fee for missed appointments, further increasing the financial burden of care for fearful patients. Delayed or nonexistent maintenance and preventive care frequently results in the need for more complex care, often at increased cost. If the patient delays too long, he or she must bear the burden of the greater cost for emergency care (Figure 14-1). To summarize, the fearful patient is at risk for poor oral health, a lowered quality of life, and a substantial financial obligation.[19,20]

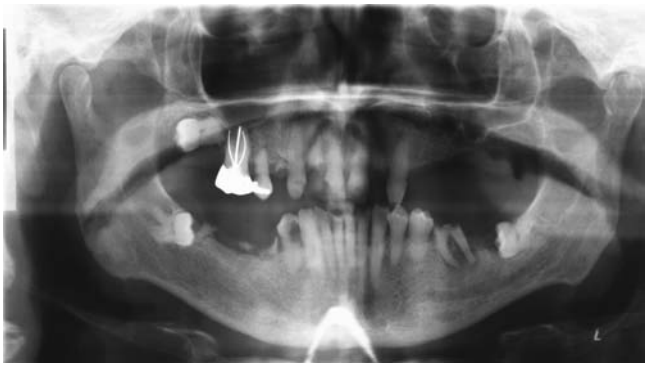

**FIG 14-1** Delaying dental treatment can result in increased cost to treat conditions such as rampant caries and replace missing teeth.

## CHARACTERISTICS OF DENTAL ANXIETY, FEAR, AND PHOBIA

**Anxiety** is both a physical and emotional response to an anticipated experience that the individual perceives as threatening in some way. In some instances, the anxiety is generalized with a poorly defined focus. In its most extreme form, anxiety may significantly limit the individual's ability to function effectively in everyday life. Pathologic anxiety requires psychological or psychiatric intervention. When the dentist observes symptoms of extreme generalized anxiety, the patient should be referred to an appropriate healthcare provider.

**Fear** is a multifaceted response to a perceived threat or danger. It will generally include emotional, cognitive, behavioral, and physiologic components. In its extreme form, fear of any stimulus can interfere with the ability to perform daily tasks. When the fear of a particular stimulus affects an individual's life to a significant extent, it is described as a **phobia**. Sometimes such fears become generalized to multiple stimuli. Dental phobia is a special case of dental fear characterized as a consistent and persistent fear that interferes with one's social or role functioning and often leads to avoidance of dental treatment of almost any type. Mental health workers may make a distinction between anxiety, fear, and phobias, but for many patients, the terms can be applied interchangeably.

Researchers in the field have identified some circumstances and events that contribute to dental anxiety in susceptible patients. For example, children who received restorative or surgical dental treatment as 9-year-olds are more likely to report dental anxiety as 12-year-olds if they do not make regular dental visits between those ages. Adult patients whose fears developed during childhood and early adolescence are less trusting and more hostile toward the dentist than other patients. Among adults, anxiety is often associated with the patient's current assessment of the dentist's likelihood to inflict pain.[21] Evidence suggests that when the patient no longer fears pain, dental fear declines. Also, longer episodes of treatment, including spending time building trust and encouraging good oral self-care behaviors, may actually

lessen the likelihood of dental fear. This suggests that brief emergency treatment appointments with such patients should be avoided.[22] The implications for the dentist are that special care should be taken in managing the distress and pain of adolescents who are irregular care seekers and will require invasive dental procedures. Additional time spent with the patient, establishing rapport, providing the patient with a degree of personal control over the pace of treatment delivery, and keeping the patient fully informed may lessen the likelihood of dental fears developing at a later date.

Fearful dental patients often report that they are frightened by certain specific dental stimuli.[23] The feared object or objects may include the needle, office sounds, drill, or even smell of the office.[24,25] Patients also may report distrust of dental personnel and fear of catastrophe, such as a heart attack or choking during treatment. Such patients often also have generalized anxiety about other life events. For many patients, the underlying fear is fear of pain.[26,27] For example, patients who catastrophize are likely to attend excessively to pain or pain-related procedures, magnify the threat value of the pain, and cope less effectively with pain when it occurs.[28] In fact, even among routine patients, fear of pain can be high.[29]

Emotional arousal increases the likelihood that patients will process the information they hear from the dentist and staff less carefully.[30] As a result, anxious patients cannot be counted on to pay close attention to the details of a message about their care. Instead, the anxious patient may pay closer attention to superficial and peripheral stimuli that reinforce negative stereotypes about dental treatment. The implications of this phenomenon are that, with a fearful patient, the dental team must be attentive to both verbal and nonverbal messages. An abrupt or "short" directive to the patient may be interpreted as an admonition. The patient may also misinterpret nonverbal messages, such as perceiving the appearance of the physical surroundings (presence of "sharp" instruments) as threatening. The patient may focus on items in the environment that reinforce the perception of being in a frightening place, including anything that appears disorganized or not sterile.

## Anxiety and Pain Perception

It is commonplace for dentists to downplay the degree of pain experienced by their patients. For some patients, the use of a local anesthetic may be sufficient to make them comfortable during treatment, but for others it is not. Pain is a complex experience.[31] The International Association for the Study of Pain defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage."[32] But the sensation of pain as it is experienced by a patient is more than a simple reflection of the amount of tissue damage that has occurred. Pain is always subjective and includes biological, psychological, and social dimensions. Sessle proposed that orofacial pain may be more complex than pain in other regions of the body because of the "special emotional, biologic, and psychological meaning" it holds for the person.[33] In addition, sensory nerves are heavily concentrated in the oral cavity, increasing the likelihood that all individuals are acutely aware of what is happening in their mouths.

Evidence suggests that anxiety lowers the pain threshold.[34] There is also some evidence that anxiety and fear may have different effects on pain reactivity. In a landmark experiment, Rhudy and Meager showed that experimentally induced anxiety led to increased pain reactivity, whereas high levels of fear led to decreased pain.[35] Whether the dental setting produces fear or anxiety is not clear, but, within the dental care context, patients may have worried for days about a scheduled treatment, resulting in elevated levels of autonomic arousal and high levels of anxiety. This elevated arousal may produce heightened levels of plasma catecholamines, which in laboratory studies have been shown to lower the pain threshold and tolerance.[36] It is not surprising, then, that many highly anxious patients show elevated levels of pain reactivity during dental treatment compared with less anxious patients.[37] Clinicians should therefore anticipate that anxious patients will experience more sensory and affective distress during dental treatment than less anxious patients and treat them accordingly.[38]

## Anxiety and Pain Memory

Anxiety appears to play a role in the level of pain that dental patients remember. Negative emotions, such as anxiety, become stronger predictors of the pain memory than the actual pain intensity. One study[39] asked patients to recall their perception of pain during root canal treatment at 1 week after treatment and again 18 months later. All patients had an accurate recall of the pain level at the 1-week interval, but, at 18 months, the patients with a higher level of anxiety remembered the pain as being greater than was actually recorded at the time of the treatment. Experimental pain research has shown that the recall of pain intensity is reasonably accurate immediately after a painful experience and after a short delay of approximately 2 weeks. But after 6 months, the memory of pain delivered within a stressful context becomes exaggerated, with women especially recalling more pain than men.[39] Moreover, exaggerated pain memories can alter brain pathways, further sensitizing the individual to painful stimulation.[40] These findings illustrate the importance of anxiety management at the time of dental treatment to minimize the patient's long-term recollection of the aversiveness of dental treatment and their anticipation of pain at future visits.

## Gender Differences in Pain Response

There is considerable interest in gender differences in both clinical and experimental pain reporting. Several reviews and meta-analyses show that men are somewhat more pain tolerant than women.[41] The differences, however, are often small,[42] and the findings are not always consistent.[43,44] Several explanations for the reported differences have been made, including the possibility that social learning encourages women to acknowledge painful stimuli, whereas men are expected to hide pain.[45,46] Gender-specific hormones have also been

implicated. For women, differences in the phase of the menstrual cycle are believed to influence pain sensitivity. A meta-analysis of experimental pain showed that, during the follicular phase of the menstrual cycle, women show the greatest tolerance and highest pain threshold.

Research suggests that certain forms of analgesia may be differentially effective in women and men, but these differences are not universal,[47-49] so it is not practical for the dentist to try to select an anxiolytic strategy or technique based on the gender of the patient. The best current wisdom is that there are large individual differences in the biological, psychological, and social mechanisms that underlie the human pain experience, and these individual differences are much more significant determinants of pain perception than is gender. Patients respond to dental pain and anxiety in unique ways, and a single approach to pain management in the dental office cannot be expected to work for all or even a majority of patients, regardless of gender.

## ETIOLOGY

The cause of dental fear is complex and multifactorial.[50] Although dental fear may appear at any age, current data suggests that approximately one-half of adults believe that their fear began during their preteen years.[51] Direct conditioning experiences and modeling play important roles in the development of fear in children who have a family history of dental fear. Such a history is predictive of early-onset dental anxiety.[52] Adolescent-onset patients are more likely to exhibit high levels of generalized anxiety. These fears may lessen with maturity and after positive experiences with the dentist.[53] For some patients, however, dental fear persists into adulthood. Evidence suggests that those who maintain their fear into adulthood tend to overpredict the level of pain they will experience during dental treatment. This overprediction of pain is often associated with a high level of anxiety during the treatment.[54] Although the data show that this group of patients may or may not report more pain during treatment, their anxiety may make it difficult to correct their expectations.[51] Thus, the vicious cycle of anxiety-pain-fear persists, with little opportunity for the patient or the dentist to disrupt the cycle. Only approximately one-quarter of fearful patients are believed to first develop their fear as adults.[51] Adult-onset dental fear seems to be associated with multiple severe fears and, in some cases, may be indicative of psychiatric problems. For others, it is a result of a seriously aversive experience in adulthood.

Although it is commonly considered that dental anxiety is a result of having had a negative dental experience, it is the case that many people who have had a painful experience demonstrate little or no dental fear, whereas others have considerable dental fear despite being unable to recall any traumatic past experience. It has been proposed that this considerable variation in outcome can be explained by differences in how people perceive the dental experience—that is, their cognitions.[55,56] For example, the perception of a lack of personal control during the dental appointment can contribute to dental fear.[1,56-58] Some theorists have suggested that dental fear may be constant despite improved dental technology because many patients find that during dental treatment, they can exert very little personal control over what will happen to them. Patients may perceive their inability to speak and their supine position below the level of the dentist as equivalent to helplessness. Several studies suggest that when perceived lack of control is coupled with a heightened desire for control, patients are at risk for high levels of dental stress and pain.[59,60] Whether this need for control is the result of negative experiences with the dentist at an early or more-advanced age is not clear. It is clear, however, that patients who want control and believe that they will not have it expect high levels of pain and experience and remember more pain than other patients. The resulting dental treatment is likely to be stressful for both the dentist and patient.

In general, patients younger than 40 years of age are more fearful than those who are older than 40, although in some countries middle-aged adults appear to have the most dental fear.[61] Differences among socioeconomic groups have also been found, with people from lower socioeconomic groups being more likely to have high dental fear.[61] One consistent finding is that females are more fearful than males, although the differences between men and women are not so great that dentists should assume that male patients will not be fearful.[62] Research shows that women demonstrate higher dental anxiety in association with root canal therapy than do men.[63] Men may appear more stoic than women because women find it more socially acceptable to be overt about their distress. The clinical significance of this finding is that dentists may underestimate the amount of anxiety and pain their male patient's experience.[64]

There is increasing evidence that women with high levels of dental fear are more likely to have a history of sexual/physical abuse than other women.[65] The current estimate of the prevalence of child sexual abuse worldwide is 19.7% for women and 7.9% for men, with the prevalence being approximately 5% and 25%, respectively, in the United States.[66] The sheer numbers of patients who have experienced sexual abuse suggest that dentists frequently treat sexually abused patients, and that a greater understanding of the effect of abuse on dental attitudes and reactions may help both the patient and dentist to form an effective treatment partnership. For instance, a study of sexually abused European women who were categorized by whether they had been exposed to sexual touching, intercourse, or oral penetration showed that women in the oral penetration group scored significantly higher on dental fear than women in the other two groups.[67] Specific problems, like gagging, are also associated with both dental anxiety and a history of sexual abuse.[68] Women with a history of childhood sexual abuse and high levels of dental fear consider interpersonal factors related to the dentist as more important than do women with high levels of dental fear but without a history of childhood sexual abuse. These interpersonal factors include not believing that the dentist can be trusted and the absence of a sense of control.[69]

Not surprisingly, psychological distress, including the tendency to catastrophize upcoming events, is greater among

women with an abuse history compared with other women.[70] Unfortunately, knowing that there can be a relationship between sexual abuse and dental anxiety does not usually help the dentist in managing the anxiety. Raising the issue of physical abuse, even when done with the utmost tact and sensitivity, can be embarrassing for both parties (especially if the inference is wrong), psychologically traumatizing for the patient, and irreparably harmful to the dentist-patient professional relationship. If there is clinical evidence of ongoing physical abuse, then the issue must be broached. Otherwise, unless the patient raises it, the dentist is usually best served by not delving into the question. If, however, all other strategies for managing the anxiety have been tried and none have been met with success, and if the dentist has reason to believe that the patient's dental anxiety has roots in underlying psychological problems that may have their origin with physical or sexual abuse, this avenue can be pursued. But if so, it must be with the guidance and counsel of—or via direct referral to—a mental health specialist with experience and training in dealing with abuse.

## RECOGNITION AND DIAGNOSIS OF DENTAL ANXIETY

Several directly observable behaviors can be used to identify the fearful patient. Often, patients will volunteer information about dental fear without being asked. It is important for the dentist not to become defensive. A statement such as, "Why do you feel that way?" may be interpreted as confrontational and may make it difficult to build a therapeutic relationship with the patient. Instead, comments such as, "I understand that you are concerned about receiving dental care. Can you please tell me more about your concerns?" allows the patient to elaborate without having to justify his or her feelings.

Anxiety about dental treatment may be apparent to the administrative and clinical assistants when a patient first enters the office. Giving attention to details relating to welcoming the patient helps to create a positive experience and a less-stressful environment. The patient may share information with the oral health team about previous dental experiences that will help explain why he or she feels anxious or fearful. It is also usually possible to observe a patient before or during the appointment and recognize fearfulness. Fearful patients often have enlarged pupils and sweaty or cold hands, and are extremely fidgety in the chair. They may either talk excessively or not want to talk at all. When a patient behaves in such a way, it is wise to say, "You seem uneasy, is there anything I can do to help you be more comfortable?" Ignoring the patient's fear does not help the patient relax, and the patient may interpret the dentist's behavior as uncaring or even callous. Moreover, it is easier to treat the patient if the dentist has more specific information about the patient's concerns.

Patients may exhibit indirect indicators of their dental fear. Dental assistants and front desk personnel are often in an excellent position to observe these indirect indicators. Patients who chronically cancel appointments and reschedule may be struggling with their fear of dental treatment. Similarly, patients who fail to appear or are chronically late may also be fearful patients. For patients exhibiting these behaviors, a question such as, "I see that you frequently have trouble getting here for your appointment. Are you nervous about receiving dental care?" allows the patient to either acknowledge the fear or to identify other barriers about which the dentist should know. In either case, the information helps the dentist make better decisions about future dental care.

### Standardized Indices

Whether any of the mentioned clues are apparent, it may be advantageous to quickly administer one of several available surveys to establish the patient's level of dental fear. The Modified Dental Anxiety Scale (eFigure 14-1 found in the expanded chapter on Evolve) has good psychometric properties, can be completed in only a few minutes, and can be quickly scored and interpreted.[4,71] Similarly, the Index of Dental Anxiety and Fear (eFigure 14-2 found in the expanded chapter on Evolve) contains eight questions and assesses the emotional, behavioral, cognitive, and physiologic components of fear.[72] Another instrument that has shown good predictive utility is the Iowa Dental Control Index.[57,59,73,74] These scales are free to obtain and use, provide a standardized way of obtaining information, and afford the patient a nonconfrontational way of revealing fears and concerns about dental treatment.

## PATIENT EXAMINATION, REFERRAL, AND TREATMENT PLAN PRESENTATION

### Interviewing the Fearful Patient

The use of a standard interview protocol (written questionnaire with oral follow-up questions or a complete open-ended format, as discussed in Chapter 1) may facilitate interviewing fearful patients. Not infrequently, the anxious patient will become "sidetracked" with the emotion-driven recollection of past dental experiences, and the response to questions in the patient history meanders, lacking logic and clarity. To keep the interview on track and in professional focus, the dentist will need to gently, smoothly, and efficiently return to the standard protocol and format for the information-gathering process. This may be accomplished by using a statement such as, "I am very interested in that part of your experience, but to be sure we have enough time please tell me about . . . " Similarly, however, it may become necessary to pause and deal with the patient's fear in the middle of the interview. The use of a standard set of questions allows the dentist to concentrate on the patient and the response to each verbal question, and still be confident that all relevant information has been gathered. It is often useful for the dentist to provide a rationale for particular questions or requests for specific information. The rationale need not be long or detailed but should clearly establish in lay language why obtaining the information is in the patient's best interest. As discussed earlier, stressed or fearful patients are frequently not attentive to the details of a message. It is a good practice for the dentist to verify that the dentist and patient are hearing the same message by summarizing each phase of the interview. The dentist may wish to say, "Sometimes I am not as

clear as I think I am or want to be. Have I said anything that is unclear or confusing to you?"

Even if not using a specific validated dental anxiety scale, an established question on the patient medical-dental health history questionnaire, such as, "Are you anxious about receiving dental treatment?" can be useful and revealing. If the patient responds positively, then a series of oral follow-up questions regarding the patient's perception of the cause(s) of the anxiety can lead to fruitful revelations about specific averse issues, materials, and techniques. This knowledge can then be very helpful in strategizing how treatment can be planned and carried out in ways that will help to mitigate the patient's aversion and anxiety.

Fearful patients often cite poor communication with the dentist as a factor in maintaining anxiety.[75] In addition, patients report that they do not believe their clinician adequately listens to their concerns. As pointed out in Chapter 1, accurate diagnostic information is the foundation of any rational treatment plan, but to obtain that information, the dentist must first develop a relationship of mutual trust with the patient. The first step in building such a relationship with a fearful patient is to develop rapport.

## IN CLINICAL PRACTICE

### The Angry Patient

Anxious and fearful patients may express their feelings to the dentist or his or her staff in the form of anger and blame. Reflective listening is an appropriate and often effective way to respond to an angry patient, regardless of the cause of the anger. When an individual is angry, a primary goal is to convey his or her feelings to the listener. If a patient is in the midst of strong emotions, he or she cannot listen effectively, so it is best not to offer advice at that moment. Try the following as a first step to diffuse the patient's anger:

1. *Do not* respond in anger to anger.
2. Listen calmly and attentively.
3. Face the patient squarely and look into his or her eyes.
4. The first response from the dentist or staff member should be one of understanding.

The following statements are often helpful in diffusing the situation:

"I can see that you are quite upset. Tell me more about what happened." Or "Sounds like you have had a hard time, tell me more." Or "Sounds like you are pretty upset. Can you tell me exactly what happened?"

These are effective ways of acknowledging the patient's feelings and encouraging him/her to talk more.

Strong feelings do not vanish by being ignored; they do diminish in intensity and lose their sharp edges when the speaker senses that the listener is accepting them with sympathy and understanding and is allowing the patient to express these feelings. Often the best approach to dealing with angry patients is to LISTEN! After the dentist or staff member has learned the nature of the problem and the patient's strong emotions have diminished, the usual techniques for effective communication can be used, using open-ended questions with appropriate follow-up questions based on the content and tone of the message.

Development of rapport can begin in the first few minutes of getting acquainted. One important way the dentist can demonstrate interest is to converse about nondental topics for a few minutes at the beginning of the appointment. Research shows that the dentist who talks about nondental topics is more likely to be perceived by the patient as friendly, and friendly dentists are more likely to produce satisfied patients. An important exception to the use of nondental topics to establish rapport involves the patient who immediately initiates conversation about dental-related issues associated with his or her fear. Failing to respond to such an initiative may suggest to the patient that the dentist is avoiding the topic of fear or lacks compassion. Addressing the patient as Mr., Mrs., or Ms., unless the patient has expressed a preference for use of his or her first name, demonstrates respect. Older patients and fearful patients may be offended if younger dentists or staff members address them by their first names. Developing rapport and trust may require additional time and attention with the fearful patient who is already on guard. It is well worth the effort, however, because if satisfied, formerly fearful patients become excellent ambassadors for a practice.

Building a relationship with the fearful patient involves "effective" listening. Although listening is sometimes viewed as analogous to the sending of an audio signal to a receiver that faithfully reproduces the signal as it was transmitted, listening is not a passive act. Both patients and healthcare providers listen through a filter of biases and prejudices that influence their interpretations of what is said. In this kind of an interaction, it is especially important that the dentist not assume that he or she fully understands what the patient is saying or how the patient feels.

The type of questions the clinician uses in interviewing a fearful patient can influence the degree of satisfaction with the interaction for both. For example, if the fearful patient is not talkative, the clinician should consider whether responses could be encouraged through use of more open-ended questions. If the patient is talking excessively, closed-ended questions will help the clinician control the interview. Incomplete or inaccurate information may result from questions that lead the patient to an answer that he or she believes the clinician is seeking, however. For example, "I don't suppose there have been any changes in your medications," may suggest to the patient that the dentist does not want to be bothered with any new information. A mix of open and closed questions produces the most effective interview and facilitates an ongoing dialogue.

When conversing with a patient, the clinician may find silences to be clumsy or uncomfortable and may begin speaking to prevent an awkward moment. Silence can be a useful tool when listening to a patient. In addition, excessive talking can be a sign of the clinician's own anxiety. Patients often report feeling that they are not given adequate time to respond to the dentist's questions. This is especially true with older patients, who may need a bit more time to understand what is being said or asked of them. The dentist should give the patient adequate time to collect his or her thoughts and

avoid the tendency to quickly fill the silence with comments or more questions. Permitting the silence to continue may encourage the patient to provide important information that would otherwise have been missed. Within limits, the clinician should encourage the fearful patient to talk more, rather than less, during the interview.

The clinician's physical orientation toward the patient also sends important messages about the level of interest in what the patient is saying. It is unlikely that the patient will continue talking if he or she gains the impression that the clinician does not care about what is being said (Figure 14-2). Facing the patient, making direct eye contact, and nodding as the patient speaks can be affirming and serve as an encouragement for more conversation. During the interview, the clinician should face the patient, with the chair at the same level as the patient's chair (Figure 14-3). These initial moments are often the time when the fearful patient assesses the dentist's trustworthiness and the extent to which the patient's concerns are received.

**FIG 14-2** Incorrect position for interviewing a patient.

**FIG 14-3** Correct position when conducting a patient interview.

In Western culture, eye contact is the principal means of demonstrating involvement with another human being. Eye contact should be steady and frequent (without staring). Glancing elsewhere is acceptable, but the patient's face should be the focus of the clinician's attention. The clinician may take notes, but it is important to reestablish eye contact after each note is taken to reinforce the impression that the clinician cares about what the patient is saying.

Fearful patients are sensitive to any communication that can be interpreted as belittling or disrespectful. This includes dental jargon that the patient does not understand or terms that the dentist or staff members do not clearly explain. Fearful patients may find insulting a statement such as, "There is no reason for you to be afraid," when the patient is convinced that there are abundant reasons for his or her fears. The more empathetic the dentist can be, the more likely it is that the fearful patient will accept treatment. The term **empathy** refers to the capacity and willingness to understand a situation from the other person's point of view. It does not imply endorsement of another person's attitude, but rather is an acknowledgment that the patient has a right to an opinion. Reflecting back, but not parroting what the patient has said, is a useful way to show empathy. For example, if the patient says that he or she hates going to the dentist, a reflective statement might be, "Sounds like you have had some unpleasant experiences with dentists in the past." The patient may elaborate, and at the appropriate time, the dentist can offer reassurance by saying that he or she will do whatever can be done to make the treatment as comfortable as possible.

Demonstrating clinical empathy can be more of a challenge in a diverse society. Dentists frequently treat patients from ethnic, racial, and cultural groups differently than their own. It is not reasonable to expect that a dentist can fully identify or understand what it is like to be from another ethno-racial cultural group. It is still possible, however, to demonstrate clinical empathy if empathy is developed as a feedback loop much like hypothesis testing.[76] Successive cycles of conversation will establish what the patient believes about the nature of dental disease and what needs to be done, and can allow the patient and dentist to move closer to a shared understanding about an acceptable course of treatment. If nothing else, the dentist's honest attempt to understand the patient's perspective will facilitate trust. (See Video 14-1, Interview of an Anxious Patient.)

## Referral

At any point in treatment, the dentist may decide to refer a fearful patient to a mental health worker for professional counseling and therapy. This decision may depend on the dentist's own skills and interests in working with fearful patients. One criterion used for referral is whether the fear imposes a significant barrier to successful completion of care. If this is the case, then referral may be warranted. If a therapist's name is not readily available, a call to a county or state psychological or psychiatric association will yield the

names of professionals who work with anxiety disorders. If the patient is currently in therapy, it is appropriate to ask the patient's permission to speak with the therapist. If the patient gives the dentist permission to contact the therapist, the dentist should consider maintaining an ongoing dialogue with the therapist during the course of dental treatment. Questions that the dentist and the therapist might discuss include: Do adjustments need to be made in the sequence of the dental treatment plan? Do adjustments need to be made in the anxiety management strategies as the treatment progresses? Is sedation or pharmacotherapy contraindicated? Should new anxiety treatments be tried? Based on the conversation with the therapist, the dentist can decide if further referral is necessary or if the patient is being treated adequately for his or her dental fear. If the patient's dental fear and anxiety do not subside, then other measures may be necessary, including pharmacotherapy. As with all treatment, careful documentation of the anxiety treatment is important. In the United States, the dental team must adhere to the Health Insurance Portability and Accountability Act (HIPAA) privacy standards when discussing the patient's care among themselves and in sharing information with any other dentist, mental health worker, or medical care provider.

### Treatment Plan Presentation

After the interview, examination, and review of pertinent diagnoses, the dentist discusses the proposed treatment, step by step, with the patient. The patient will be more receptive to the discussion if the dentist makes sure the individual has relaxed sufficiently to be able to listen and provide input during the discussion of the proposed plan and to give informed consent (see the *Ethics in Dentistry* box). To set the stage for presenting the treatment plan to a highly stressed and fearful patient, the dentist may suggest that the patient take a few deep breaths and relax leg and back muscles. Often, it will help relieve the patient's anxiety if the treatment plan is presented and discussed away from the operatory—for example, in a nearby conference room.

The patient's trust in the proposed treatment plan depends on the level of rapport developed, the perceived sincerity of the dentist, the level of competence that the dentist conveys, and the patient's confidence in the dentist. The collaborative relationship is unlikely to grow if the patient is suspicious of the dentist's motives for recommending treatment. As a routine part of the information gathered by the dentist, both the short- and long-term goals of the patient should be identified. These goals may or may not be the same as the dentist's goals and may include improved esthetics or function, or relief from pain. The dentist should consider what nondental goals may motivate the patient and the effect on care those goals might have. For example, if the patient's goal is to have an improved smile to gain more confidence on the job, then relating the proposed treatment to an improved smile may foster the patient's trust. Keeping the fearful patient active in the decision making increases trust and helps the dentist to be aware of what the patient is thinking. Even with those individuals who say they do not want to be involved in the treatment decisions, it is in the dentist's best interest to keep the patient engaged during the decision-making process. Surprises are counterproductive with fearful patients, and an informed patient is less likely to be surprised. As the patient assumes a more active role in decision making, he or she accepts responsibility and ownership of the treatment plan. This, in turn, helps reduce anxiety and makes the patient a more willing partner in dental care. When possible, the plan should be structured to progress from least-complex treatment to more complex. This progressive increase in complexity will allow the patient to gain confidence in his or her ability to receive treatment.

**ETHICS IN DENTISTRY**

**Obtaining Informed Consent from an Anxious Patient**

Because anxiety may reduce a patient's ability to attend to explanations of evaluation and prospective treatment procedures, the dentist should take particular care to ensure that a fearful or anxious patient is fully informed before accepting an agreement to proceed. Informed consent requires that the patient have sufficient understanding to make the decision and does so voluntarily. Some patients may nod in agreement, while not fully understanding the evaluation or the proposed treatment. When a patient is recognized as anxious or fearful, the dentist should ensure that the patient's agreement truly reflects consent.

The dentist's conversation with the patient is the most important component of obtaining truly informed consent. Discussion gives the patient the opportunity to ask questions and allows the dentist to gauge the patient's understanding of the proposed procedure. With every patient, the dentist should document the conversation and the information provided, and that the patient's questions were addressed. The consent form should add to the conversation, but does not replace it. Although the consent form provides detailed written information, patients do not always read these forms carefully. Written forms present a considerable barrier for patients with poor reading skills. The form may be full of dental and legal technical language, making it difficult for any patient to understand. For the anxious patient, the form itself may raise further concerns because all the risks of the procedure are listed. The dentist should review the contents of the written consent form with every patient after verbal consent is obtained.

## DELIVERY OF CARE TO THE FEARFUL PATIENT

The fearful patient is best served if the context in which care is received is based on mutual respect and concern. Many fearful patients have not previously received routine preventive care and may have extensive treatment needs, including some requiring complex, invasive treatment. If so, the patient will need reassurance that the dentist will make every effort to maintain the patient's comfort during treatment. However, no promises should be made that the treatment

will be painless or free of discomfort. Pain-free dentistry is not a promise that can always be kept. It is also important to acknowledge the patient's feelings. Acknowledgment does not represent endorsement, but simply confirms that what the patient said was heard. During treatment, frequently checking on the level of comfort and keeping the patient informed of progress can help relieve anxiety.

As a part of the framework for care of a fearful patient, the dentist should work quickly and systematically without appearing hurried. Planning ahead and informing the patient about the next step can be reassuring. Keeping promises made to the patient will maintain the patient's trust; such promises may include the length of the appointment or the frequency of breaks. Being honest about what is and is not realistic helps both the dentist and patient. Fearful patients appreciate a frequent review of what has been accomplished, what remains to be completed, and any unanticipated deviations from the original plan.

Providing fearful patients with a sense of control can facilitate compliance with the proposed care. Research has shown that fears about dental care increase when the fearful patient wants control during treatment and believes that he or she will not have it. Control can be provided both through information and choices about the treatment and during the treatment process. A strategy that returns some level of control to the patient involves inviting the individual to raise a hand when he or she would like the dentist to take a "time out." A dentist should not be surprised if a patient tests his or her willingness to give up control during the treatment by frequently raising his or her hand. Other options may include giving patients a choice of music to listen to during treatment.

Patients who manage their apprehension about dental treatment often have identified coping strategies that have worked well for them in the past. Fearful patients frequently do not have such well-defined strategies. Asking about preferred coping strategies may help the patient develop confidence in the process. Dental anxiety is often managed with conscious sedation techniques, which are described later in the chapter under Pharmacologic Intervention. These techniques are reliable and safe, but it is important to remember that these agents do not treat anxiety; they only facilitate treatment.[77] Kvale and colleagues' meta-analysis of 38 studies using behavioral intervention to reduce either dental anxiety or anxiety-related behavior concluded that dental anxiety is treatable and that the effects of the behavioral treatment are long lasting.[78] No single intervention has emerged as significantly more effective than others. Rather, several behavioral interventions have proven effective in treating dental fear and anxiety and are reviewed in the following sections.

## Distraction

Effective in the short term, distraction is less effective for long-term behavior change. Music represents one of the easiest distraction techniques to use and is particularly effective if the patient selects the music and listens over individual headphones (Figure 14-4). Regardless of the patient's anxiety level, many patients prefer to have music in the background and report that music makes them more comfortable.[79] In a randomized clinical study, patients who listened to music during dental treatment reported less pain and discomfort and a greater sense of personal control. Visually interesting artwork, décor, or tropical fish tanks can be useful in distracting the patient from feared stimuli. Some practitioners have used video games or a television set in the operatory as an effective and comforting distraction for anxious patients.[80,81] Additionally, two-dimensional and three-dimensional virtual-reality goggles have demonstrated reductions in blood pressure, pulse rate, and pain among patients undergoing some dental procedures,[82,83] although the effectiveness of this type of distraction may depend on patient characteristics, such as desire for control.[84]

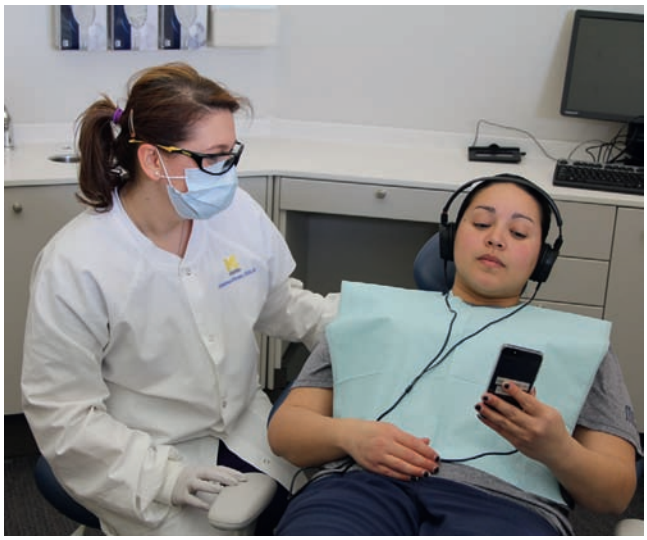

**FIG 14-4** Music is a common distraction technique used in the dental office.

## Relaxation

The goal of relaxation is to achieve both muscular and mental relaxation. Research shows that relaxation can be an effective method of reducing patient anxiety.[85,86] Deep breathing coupled with muscle relaxation can be effective in stress reduction. Many fearful adults tend to hold their breath during basic procedures such as application of a rubber dam, injections, or impression-taking. When an individual's blood becomes poorly oxygenated because of an insufficient amount of fresh air entering the lungs, states of anxiety, depression, and fatigue arise, adding to the stressful situation. Deep breathing exercises help to reduce this unwanted stress and may consist of as little as 2 to 4 minutes of breathing deeply in, holding the breath, and then exhaling completely. By demonstrating that deep breathing is something the patient can do independently, a new sense of control is provided to the patient, in addition to the calming effects provided by the breathing techniques. It may even be helpful to attach a heart rate monitor so that the dentist and the patient can assess this aspect of arousal and success in controlling it. Pausing during

the procedure to suggest that the patient briefly repeat the deep breathing techniques can also be useful.

Muscle relaxation is also very useful in calming the patient. This method includes a series of exercises tensing and relaxing specific muscle groups (Box 14-1). Breathing and muscle techniques can be combined by tensing the muscles while breathing in and relaxing them while breathing out. Practicing this rhythmic coordination of relaxation techniques will quickly and effectively improve the patient's ability to relax.[1] Periodic reinforcement of muscle relaxation during treatment helps the patient regain composure. Pausing during the dental procedure and suggesting that the patient take several slow, deep breaths also can be useful. For some fearful patients, the mere act of deeply inhaling and exhaling completely can help dispel negative reactions to receiving care.

## Hypnosis and Guided Imagery

Hypnosis is a guided, self-controlled state of mind in which concentration and focus are directed inward. An altered level of consciousness is reached, similar to "zoning out" while daydreaming or reading a book. Guided imagery is a form of mild hypnosis that shares similarities with distraction and can be useful with fearful patients.[87] It produces a light, trancelike state from which patients can easily emerge, and the procedure is less time consuming for the clinician than guiding patients into a deeper hypnotic state. Asking the patient to focus on a place where he or she feels very relaxed, comfortable, or safe is a good starting point for guided imagery and can be effectively combined with relaxation training.[88] Information about appropriate images can be gathered during the examination process. Current research shows that patients experience reduced pain and distress when they themselves choose the place to be imagined. The patient should be asked to choose imagery that is associated with little movement so that movements will not interfere with the provision of care. During guided imagery, the patient achieves an altered state similar to daydreaming or focused attention. By focusing on a calm and safe scene, positive emotions are elicited that can block or mitigate the anxiety arising from the dental treatment. An analysis of imagery topics chosen by patients showed that the topics are highly individual and further supports the efficacy of guiding patients to a "safe and comfortable place" of their own choosing.[89,90] Guided imagery is effective in managing pain during outpatient procedures and can be implemented by

### BOX 14-1 Muscle Relaxation Procedures

The following script can be used with patients for muscle relaxation:

*"The tension and anxiety that you tell me you feel when you think about receiving dental treatment may be caused by the tensing of your muscles, even if you don't realize that your muscles are tense. If you like, I'd be happy to teach you a way to relax your muscles that may help you feel calm. As a result, the dental treatment may feel more comfortable for you. Relaxation is the opposite of anxiety. It's impossible to feel both relaxed and tense at the same time. The exercise involves relaxing your muscles systematically throughout your body. Would you like to try that?*

*"Begin by putting all of your consciousness in your feet. Don't worry if your attention drifts away. For many patients, it takes a little practice to be able to move your attention to a specific part of your body (momentary hesitation). Feel your feet. Your feet may feel either warm or cool at this moment. Imagine the muscles in your feet. Make them tense and hold for a count of four . . . 1, 2, 3, 4. Now relax those muscles and notice how they feel while I count to four (momentary hesitation) . . . 1, 2, 3, 4. Make those muscles tense again as I count slowly to four . . . 1, 2, 3, 4. Notice how your muscles feel. Breathe in and feel the tension and breathe out to feel the relaxation. Perhaps you'd like to try it again . . . breathe in and feel your muscles tighten, and breathe out to feel the relaxation (momentary hesitation).*

*"When you're ready, move your attention to your calves (momentary hesitation). Notice how the muscles in your calves feel. Those muscles may feel warm or cool. Imagine those muscles for a moment. Now, inhale and make those muscles tense while holding your breath for a count of four (momentary hesitation) . . . 1, 2, 3, 4. Now exhale and relax those muscles and notice how they feel while I slowly count to four . . . 1, 2, 3, 4. I suggest that we repeat that. Breathe in and make those muscles tense as I count to four (momentary hesitation) . . . 1, 2, 3, 4. Hold the tension. Now slowly exhale while relaxing those muscles as I count to four (momentary hesitation) . . . 1, 2, 3, 4."*

After reading this script, the clinician might suggest that the patient try on his or her own to breathe in and feel tension in the calves and breathe out, feeling the calf muscles relax. Use the same technique to alternately tense and relax the thigh and buttocks muscles.

After completing the procedures for the feet, calves, thighs, and buttocks, move on to the next three major muscle groups: (1) hands, forearms, and biceps; (2) chest, stomach, and lower back; and (3) head, face, throat, and shoulders. The technique is often most effective when the clinician moves slowly from one muscle group to the next. One approach is to suggest that the patient move all of his or her attention to the hands, forearms, and biceps and then to move the attention to the individual set of muscles in, for instance, the hands. It is helpful to talk slowly and softly and to provide suggestions after the relaxation phase, such as: *your muscles may feel loose, limp, or calm.* Using rhythmic breathing to coordinate the muscle tightening and relaxing is frequently a good way to help the patient fully participate in this exercise. Make suggestions such as *the sound of your breath exhaling will help remind you to relax your muscles.* Some patients find it helpful for the dentist to make a tape of the entire procedure so the patient can take it home and practice.

For most people, relaxing quickly and effectively requires a great deal of practice. It is a good idea for the dentist to remind the patient that it may take several practice sessions before he or she is able to feel relaxed in the dental chair. Above all, the dentist should not become impatient if the patient cannot relax immediately after beginning the relaxation procedures.

the dental team without disrupting the workflow in the patient care setting.[89,91]

In the past, the success of hypnosis was believed to depend on the hypnotizability of the patient and was associated with a specific, "phobic" portion of the population.[92] However, more recent indications are that nearly all patients are equally able to engage in imagery during invasive outpatient procedures and that the imagery can result in reduced pain and anxiety.[92] Although nearly all patients are equally susceptible to hypnotism, attitudes, motivations, and fears relating to common misconceptions may interfere or impede the patient's willingness to be placed in a hypnotic state. The most successful conditions involving hypnotism in the clinical setting include a well-trained hypnotherapist and a patient who is highly motivated to overcome a problem.

For most mildly or moderately anxious patients, the most effective management strategy for the dentist will be taking time, actively listening to the patient's concerns and fears, and emphasizing building a trusting relationship. For more serious cases of anxiety, deep breathing techniques and hypnosis and/or guided imagery are among the most useful tools. The effectiveness of hypnosis in treating dental fear has been demonstrated. Hypnosis, however, requires specialized training and experience, and a brief "how to" belies the complexity of the strategy. For dentists who are interested in receiving training in hypnosis, relevant organizations can be located via the Internet or through printed materials.[1] Information about training opportunities may be available through local dental societies.

## Altering the Treatment Approach and Sequence

If the patient begins to show high levels of stress, fear, or anxiety during treatment, it may be unwise to continue.[93,94] Under such circumstances, little will be gained and much could be lost in terms of the patient's trust in the dentist. If the patient expresses fear about certain, but not all, procedures, the dentist may need to alter the plan. For example, if the patient fears extractions, the dentist may need to delay that part of the treatment until greater trust is built. Fearful patients may overestimate their ability to cope and agree to more treatment than they can tolerate. Fear and anxiety can limit the patient's ability to listen carefully so that when less treatment occurs than was planned, the dentist must be sure the patient understands why the change occurred. Halting treatment and setting mutual goals for future appointments may be more realistic. Slow but purposeful techniques, with the least fearful, least painful, and least traumatic care sequenced first, should relieve anxiety.

## Pharmacologic Intervention

Although many patients benefit from the behavioral techniques previously described, some patients will continue to experience extreme dental fear and anxiety. These patients may require *both* psychological and pharmacotherapeutic modalities to receive safe and effective dental care. The use of medications in the clinical management of apprehensive dental patients must be carefully monitored to prevent patient injury or death. The administration of any drug is never completely without risk, and therefore the use of these agents should be limited to patients who require some degree of sedation or anxiety control to undergo dental treatment.

### Levels of Sedation

Pharmacologic techniques for anxiety control and sedation range from the use of oral antihistamines to induce drowsiness to general anesthetics, which render the patient unconscious. Depth of sedation is described as a continuum; as the level of sedation progresses, there are changes in patient responsiveness and ability to independently maintain an airway, and possible cardiovascular function impairment.[95,96]

The administration of any sedation involves an inherent unpredictability. Some patients may fall into a deeper level of sedation than intended by the practitioner. The dentist and staff must be able to recognize and manage these situations and be prepared to provide necessary airway and cardiovascular support, if needed, until the patient recovers or emergency medical assistance arrives.[96]

Useful definitions for the levels of sedation used in dentistry can be found in the American Dental Association's (ADA's) "Guidelines for the Use of Sedation and General Anesthesia by Dentists." The following definitions are excerpted from these guidelines[97]:

> "Minimal sedation: *a minimally depressed level of consciousness produced by a pharmacological method, that retains the patient's ability to independently and continuously maintain an airway and respond* normally *to tactile stimulation and verbal command. Although cognitive function and coordination may be modestly impaired, cardiovascular functions are unaffected.*"
>
> "*Note: In accord with this particular definition, the drug(s) and/or techniques used should carry a margin of safety wide enough never to render unintended loss of consciousness. Further, patients whose only response is reflex withdrawal from repeated painful stimuli would not be considered to be in a state of minimal sedation.*"
>
> "Moderate sedation: *a drug-induced depression of consciousness during which patients respond* purposefully *to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.*"
>
> "*Note: In accord with this particular definition, the drugs and/or techniques used should carry a margin of safety wide enough to render unintended loss of consciousness unlikely. Repeated dosing of an agent before the effects of previous dosing can be fully appreciated may result in a greater alteration of the state of consciousness than is the intent of the dentist. Further, a patient whose only response is reflex withdrawal from a painful stimulus is not considered to be in a state of moderate sedation.*"

"Conscious sedation: *a minimally depressed level of consciousness that retains the patient's ability to independently and continuously maintain an airway and respond appropriately to physical stimulation or verbal command and that is produced by a pharmacological or non-pharmacological method or a combination thereof.*"

"*Note: In accord with this particular definition, the drugs and/or techniques used should carry a margin of safety wide enough to render unintended loss of consciousness unlikely. Further, patients whose only response is reflex withdrawal from repeated painful stimuli would not be considered to be in a state of conscious sedation.*"

"Combination inhalation-enteral conscious sedation *(combined conscious sedation): conscious sedation using inhalation and enteral agents. When the intent is anxiolysis only, and the appropriate dosage of agents is administered, then the definition of enteral and/or combination inhalation-enteral conscious sedation (combined conscious sedation) does not apply.*"

"Deep sedation: *a drug-induced state of depression of consciousness during which patients cannot be easily aroused but responds purposefully following repeated or painful stimulation. The ability to independently maintain ventilator function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained.*"

"General anesthesia: *a drug-induced loss of consciousness during which patients are not arousable, even by painful stimulation. The ability to independently maintain ventilator function is often impaired. Patients often require assistance in maintaining a patent airway and positive pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function. Cardiovascular function may be impaired.*"

It is imperative that dentists who use medications for anxiety control and sedation receive comprehensive training in all aspects of patient sedation. Standards of safe sedation practice require the following[97,98]:

- Practitioners who are well acquainted with the dosages, adverse effects, and interaction profiles of all medications prescribed.
- Comprehensive preoperative evaluation of patients, including a thorough medical history, pretreatment evaluation, and examination.
- Physiologic and visual monitoring of the patient from the onset of sedation through the recovery period.
- The maintenance of appropriate equipment, medications, facilities, staff, and training to deal with emergency situations.
- A fully documented record of the procedure, medication(s) used, route of administration, vital signs, adverse reactions if any, recovery, and any emergency procedures used.

The ADA guidelines referenced previously outline the advanced training and skills that are required for a practitioner to administer each level of sedation to patients. In the United States, professional licensure is regulated at the state level, and the educational requirements, rules, and regulations regarding dental anesthesia and sedation practice vary from state to state. A license to practice dentistry does not automatically authorize the licensee to administer anxiolytic/sedative medications. Practitioners must meet and maintain the advanced education requirements for dental anesthesia and sedation as set by their state's Board of Dental Examiners.[98]

The American Dental Society of Anesthesiology (ADSA) is an essential resource for dentists who are interested in incorporating sedation into their clinical practice. The ADSA offers reference sources, training, and continuing education for both dental practitioners and assistants. The website www.dentalanesthesiaguide.com contains each state's current dental anesthesia rules and regulations.[98]

## Routes of Administration

The *enteral* route of drug administration uses the gastrointestinal (GI) tract and includes oral, sublingual (SL), buccal, and rectal administration. The *parenteral* route encompasses all other means of drug delivery, including intravenous (IV), intramuscular (IM), subcutaneous (SC), transdermal, inhalation, and intranasal. The route of drug administration chosen for anxiolysis depends on practitioner and staff training, and patient-specific factors, such as the patient's level of cooperation, ability to swallow solid dosage forms, personal preference, and cost.

The oral route (PO or *per os*) is the most common, safe, and cost-effective way to administer anxiolytic medications in the general practice setting. In the clinical practice of anxiolysis/sedation, it is important to remember that all routes of drug administration can cause any level of sedation. When medications are given via most routes, there is a "lag time" or latent period between ingestion of the drug, onset of action, and subsequent peak of clinical effect. In contrast, central nervous system (CNS) effects of drugs administered either IV or via the respiratory tract (inhalation and intranasal routes) are nearly instantaneous.

When medications are given via the oral route, both the rate and extent of absorption will vary owing to both drug and patient-specific factors. This variability is reflected in the manufacturer's package insert and drug information resources, which will indicate a range of time (1 to 2 hours or more) for the drug to reach peak plasma levels. For solid dosage forms, the latent period ("lag time") that exists before the onset of drug effect occurs because the tablet or capsule must first disintegrate in the fluids of the GI tract, and the resulting particles dissolve into solution before the medication can be absorbed. After passing through the intestinal wall, the drug goes to the liver, where it may be partially metabolized (hepatic "first-pass effect") before entering into the systemic circulation. Depending on the chemical properties of drug and the dosage form, this can mean that the sedative agent will be administered anywhere from several minutes to more than an hour before the start of the procedure.[99]

In addition, the oral route is complicated by a high degree of interpatient variability. Patient-specific factors that affect the rate and extent of drug absorption administered orally include gastric pH, vascularity, area of absorptive surfaces, GI motility, presence of other substances, and concomitant disease states. When using oral medications for anxiolysis, the dentist must take all of these factors into account when instructing the patient in the proper timing of home administration to achieve peak effects during the procedure.

When choosing a drug for anxiolysis/sedation, the practitioner must take into account the length of procedure, the patient's medical history, concomitant disease states, and current medications. In obtaining a medication history, the dentist must specifically question the patient about the use of herbal products, homeopathic agents, and dietary supplements, in addition to currently used prescription and over-the-counter medications. Many individuals do not report the use of herbals or dietary supplements to their healthcare providers. Some believe that these products are "natural" and therefore not drugs, whereas others are uncomfortable revealing self-medication practices for fear of criticism. Certain products are known to prolong bleeding times, enhance or attenuate sedation, and affect blood pressure.[100]

Impairment of cognitive and motor functioning by anxiolytics and sedative-hypnotic agents requires that all patients have a responsible escort to and from the dental office. To ensure patient safety and prevent possible litigation, it is advisable to begin the procedure only after the patient escort is in attendance. Practitioners may find it helpful to contact patients 1 or 2 days before the scheduled appointment to remind them to bring an escort and thus avoid postponement of treatment.

Therapeutic classes of drugs for the management of fearful patients include anxiolytics, sedative-hypnotics, nitrous oxide, opioids, and general anesthetics. These agents have a profound depressant effect on the CNS and may cause alteration of seizure threshold, skeletal muscle relaxation, and decreased respiratory drive.[101]

## Pediatric Anxiolysis/Sedation

Although self-administered anxiolytic medication is appropriate for most adults, the American Academy of Pediatric Dentistry (AAPD) guidelines for monitoring pediatric sedation state that administration of sedative medications at home poses unacceptable risks, especially to preschool-aged children traveling in car safety seats as sedation places them at risk for suffocation.[100] In 2000, Coté et al performed a critical incident analysis of morbidity and mortality associated with pediatric sedation. Of the 95 cases reviewed, 51 resulted in death, and an additional nine patients suffered permanent neurologic injury. Oral sedation was involved in 37 deaths, although multiple routes of administration were used in many patients. Although dentistry represented only one-third of the cases, dental practitioners were responsible for 91% of children who either died or suffered permanent neurologic damage.[102]

Several reviews of adverse events associated with pediatric dental sedation suggest that children ages 2 to 6 are at highest risk of serious adverse events and death.[102,103] In several cases, the adverse event happened before the children arrived at the office. In other cases, death occurred hours after discharge.[103] Commonly cited factors in these events were administration of multiple medications, lack of monitoring during and/or after the procedure, and inadequate resuscitation (failure to rescue) in the office setting.[103,104]

## Benzodiazepines

In the past, dentists frequently used barbiturates or chloral hydrate to sedate anxious patients before dental treatment. These agents have relatively narrow therapeutic indexes, meaning that the difference between a therapeutic (normal) dose and lethal dose is small. The synthesis of benzodiazepines in the late 1950s allowed for safer and more efficacious treatment of acute anxiety over previous alternatives. Benzodiazepines are available in oral, IM, IV, and rectal dosage forms and are currently considered first-line therapy for the pharmacologic management of the fearful patient (see *In Clinical Practice: Oral Benzodiazepines for Minimal Sedation* box).

Benzodiazepines are characterized by anxiolytic, sedative-hypnotic, anticonvulsant, amnestic, and muscle relaxant properties. This class of drug exerts its various pharmacologic effects by promoting the binding of the inhibitory neurotransmitter γ-aminobutyric acid (GABA) to specific subunits on the $GABA_A$ receptor. These agents are used in dentistry either alone or in combination with nitrous oxide or other medications to induce sedation. Anterograde amnesia, the inability to recall events during drug action, is a dose-related phenomenon.

Currently, more than a dozen oral benzodiazepines are available on the U.S. market (Table 14-1). They are often divided into either anxiolytic or sedative-hypnotic (insomnia) categories, depending on their pharmacodynamic actions. At normal therapeutic doses, anxiolytic benzodiazepines relieve anxiety and produce a mild degree of sedation without causing significant motor impairment or alteration in consciousness.

**TABLE 14-1 Select Oral Benzodiazepines for Anxiolysis[99]**

| Agent | Oral Dosage Forms | Maximal Daily Adult Anxiolytic Dosage* |
|---|---|---|
| Alprazolam (Xanax†) | 0.25-, 0.5-, 1-, and 2-mg tablets<br>1 mg/mL solution | Up to 4 mg/day in divided doses |
| Diazepam (Valium†) | 2-, 5-, and 10-mg tablets<br>5 mg/5 mL and 5 mg/mL solutions | Up to 40 mg/day in divided doses |
| Lorazepam (Ativan†) | 0.5-, 1-, and 2-mg tablets<br>2 mg/mL solution | Up to 10 mg/day in divided doses |
| Oxazepam | 10-, 15-, and 30-mg capsules | Up to 120 mg/day in divided doses |

*Maximal adult daily dosage for healthy patients younger than 50 years.
†Generic equivalent available.

At higher doses, benzodiazepines cause effects similar to alcohol intoxication in many patients, making this class of medication unsuitable for patients who are recovering alcoholics or substance abusers, as it places them at risk of recidivism.

The choice of benzodiazepine and dosage depends on the pharmacologic profile of the agent and patient-specific factors, such as age, concomitant medications, previous experience with the drug, and health status (Boxes 14-2 and 14-3).

Paradoxical (disinhibition) reactions, characterized by symptoms that can include excitement, increased talkativeness, hyperactivity, crying, or hostility, occur in fewer than 1% of patients receiving benzodiazepines and may be a dose-related phenomenon. This adverse effect occurs most frequently in patients who have underlying psychiatric conditions, a history of violent or aggressive behavior, or substance or alcohol abuse. Other risk factors for paradoxical reactions to benzodiazepines include a history of unusual reactions to sedatives, alcohol use or abuse, and age, with both the very young and the very old patient being more at risk.[99,101,105,106]

The dose and administration schedule of benzodiazepines is dependent on the patient's age; hepatic, renal, and pulmonary function; and the pharmacokinetic profile (absorption, distribution, metabolism, excretion) of the particular agent.

### BOX 14-2 Drug Interactions with Benzodiazepines[99]

- Alcohol and other CNS depressants—CNS depressant effects may be potentiated and the risk of apnea may be increased
- Clozapine—respiratory depression or arrest may occur
- Itraconazole, ketoconazole, fluvoxamine, nefazodone—concurrent use may inhibit the metabolism of benzodiazepines that are metabolized by oxidation, resulting in delayed elimination and increased plasma levels
- Hypotensive agents—may potentiate hypotensive effects of benzodiazepines
- Opioid analgesics—additive CNS depression; must decrease the dosage of opioid by >30% and administer in small increments

### BOX 14-3 Contraindications to Benzodiazepines[98,101,105]

- Breast-feeding—infants cannot metabolize the agents to inactive compounds, causing sedation, feeding difficulties
- COPD—ventilatory failure may be exacerbated
- Geriatric patients—experience more pronounced CNS effects; parenteral administration may cause apnea, hypotension, and bradycardia
- Glaucoma—angle closure may be precipitated or worsened by benzodiazepines
- Hepatic disease—half-life of some agents may be prolonged
- Myasthenia gravis—condition may be exacerbated
- Obstructive sleep apnea (OSA)—exaggerates effect of apneic episodes
- Pregnancy—increased risk of congenital malformations in first trimester, neonatal CNS depression
- Recovering substance abusers—sensation of intoxication may promote recidivism

As with paradoxical reactions, the elderly and very young are more likely to experience adverse effects with these agents. Benzodiazepines are not recommended for use in pregnant women or women who are breast-feeding.

Flumazenil (Romazicon) is a benzodiazepine receptor antagonist that reverses the action of benzodiazepines in the CNS by *competitive inhibition* at the benzodiazepine binding site on the GABA/benzodiazepine receptor complex. Intravenous flumazenil antagonizes the sedative, amnestic, psychomotor impairment, and ventilatory depressant properties of the benzodiazepines and will reverse the behaviors associated with paradoxical reactions to these agents. The reversal of benzodiazepine-induced effects usually occurs within 2 minutes of IV administration, with the peak effects occurring within 10 minutes. The duration and degree of reversal depend on the dose and plasma concentration of flumazenil. Because flumazenil has a shorter elimination half-life (0.9 hours) than benzodiazepines, more than one dose of the reversal agent may be required if resedation occurs.

## IN CLINICAL PRACTICE

### Oral Benzodiazepines for Minimal Sedation

The major determinant of the onset and intensity of action of a single oral dose of a benzodiazepine is the rate of absorption from the GI tract. More than 90% of orally administered diazepam is absorbed, taking an average of 1 to 1.5 hours (range: 0.25 to 2.5 hours) to reach peak plasma concentration. Absorption is both delayed and decreased in the presence of a meal that included a moderate amount of fat, with the lag time increasing from 15 minutes in a fasting state to 45 minutes in the presence of food. As a result, the time to peak plasma concentration is delayed from an average of 1.25 hours in the fasting state to 2.5 hours. Consequently, the maximum concentration in the plasma will be decreased by an average of 20%.[105]

Other benzodiazepines also show varying times to peak concentrations. Oral lorazepam, for example, has an average time to peak concentration of 2 hours, but this varies widely, with a normal range of 1 to 6 hours. The prescribing practitioner must fully understand the pharmacokinetics (absorption, distribution, metabolism and excretion) of all medicines prescribed, especially CNS depressants.

Titration, sometimes referred to as "stacking," is defined as the administration of small incremental doses of a drug until a desired effect is achieved. The titration of sedative agents in dentistry is only recommended for drugs administered via the intravenous or inhalation route and is generally not recommended for sedatives and anxiolytics given via any other routes. Multiple, consecutive doses of anxiolytic/sedative agents via these other routes can result in dangerous accumulation of drugs in the body and may result in excessive sedation, beyond the intent of the practitioner. An important component of prescribing minimal sedation is ensuring that the initial dose of a drug administered by the enteral route does not exceed the manufacturer's recommended maximum dose (MRD) for home use without medical supervision.[97]

To ensure that minimal sedation is not exceeded, patients who fail to achieve adequate sedation with the prescribed anxiolytic dose should be reappointed for a later date, when an increased dose (not to exceed the maximum recommended dose) or an alternate agent can be used.

## Nitrous Oxide

The use of nitrous oxide and oxygen ($N_2O$-$O_2$) inhalation for dental sedation and as an adjunct to dental anesthesia has been widely accepted by both patients and practitioners (Figure 14-5). The primary use in dentistry is in the management of fear and anxiety. A high degree of safety and efficacy, coupled with fast onset and termination of effect has made this form of inhalation sedation a useful option for many general dentists. The use of $N_2O$-$O_2$ does require a significant initial capital expense, and proper training is required of all personnel who will be administering this form of pharmacosedation.

Nitrous oxide ("laughing gas") is the most frequently administered inhalation anesthetic, even though it is the least potent of the anesthetic gases. It exerts its effects on the CNS, producing cortical depression and diminishing all sensations including sight, touch, and pain. In addition to its sedative effect, $N_2O$ possesses analgesic properties that make it a useful adjunct to local anesthetic in various clinical situations. At a concentration of 30% to 40%, $N_2O$ produces the maximum degree of analgesia, while the patient remains able to respond to verbal commands.[107,108]

Nausea and vomiting are the most frequent complications associated with $N_2O$-$O_2$ therapy. To lower the risk of these adverse effects, the dentist should only use concentrations of $N_2O$ below 50%, try to limit patient exposure to less than 45 minutes, and instruct the patient to avoid food or liquid for several hours before the appointment.

The percentage of $N_2O$ required for pharmacosedation may depend on many circumstances, including the type of procedure and the use of concomitant medications. Patient-specific factors, such as level of anxiety and pain threshold, also must be taken into consideration. The percentage of $N_2O$ must be titrated for each patient during every procedure.

The rapid induction technique of $N_2O$-$O_2$ (also called "fixed dose") administration involves the initial use of a high percentage of $N_2O$ (up to 50%) to quickly sedate the patient. The rapid-induction technique can result in oversedation, leading to a negative patient experience. Some of the signs and symptoms of oversedation include mouth breathing, nausea, vomiting, hallucinations, inability to move or communicate, out-of-body experiences, disassociation, combative behavior, and loss of consciousness, all of which contribute to a negative patient experience.[108] With rare exceptions, the fixed dose administration of nitrous oxide is not recommended.

The titration technique is regarded as the current standard of care when administering $N_2O$-$O_2$. After the patient is breathing 100% oxygen at an established flow rate via a nasal hood, $N_2O$ is introduced at 10% to 20%. The gas is then titrated in 5% to 10% increments every 1 to 3 minutes until the desired level of clinical sedation is achieved. At the end of the procedure, the patient is given 100% oxygen for at least 5 minutes or until he or she no longer exhibits clinical signs of sedation. When completely recovered from the effects of the nitrous oxide, the patient may leave the office unescorted.[108]

To avoid hypoxia, $N_2O$ must always be administered with at least 25% oxygen (atmospheric oxygen is 21%). The use of pure $N_2O$ and the resultant anoxia can lead to seizures, brain damage, and death.[107,109] Nitrous oxide has low lipid solubility, which promotes rapid recovery because almost all of the gas is eliminated through the lungs within 5 minutes of halting $N_2O$-$O_2$ administration. Because $N_2O$ is rapidly exhaled, it may cause "diffusion hypoxia" by diminishing the patient's other blood gases (oxygen and carbon dioxide). This phenomenon results in patient malaise, headache, nausea, and lethargy. To prevent this problem, it is important that the dentist provide 100% oxygen for at least 5 minutes immediately after cessation of nitrous oxide administration.[108]

Patients with many serious systemic conditions can often be managed successfully with $N_2O$-$O_2$ sedation. For patients with cardiovascular disease, the oxygen-enriched atmosphere of $N_2O$-$O_2$ therapy decreases myocardial work and reduces the risk of an ischemic event. Nitrous oxide does not undergo significant metabolism in the body, so hepatic and/or renal dysfunction will not alter the clinical or physiologic effects of this agent. Patients otherwise unable to cooperate with dental treatment can often be managed successfully with a combination of nonpharmacologic techniques and $N_2O$-$O_2$ sedation.[108]

Anesthetic gases must be used with caution in patients with diseases or infections of the respiratory system. For patients with chronic obstructive pulmonary disease (COPD) who are on hypoxic drive, elevated blood oxygen levels (from oxygen-enriched gas administration) may result in a decreased respiratory drive. Patients with upper respiratory infections, sinusitis, or other problems that compromise their ability to exchange air via the nose may have difficulty obtaining sufficient anesthetic through a nasal hood. Patients with infections, such as pneumonia and tuberculosis, can be at risk as a result of decreased lung capacity. Dental practitioners must take thorough health histories before scheduling the use of $N_2O$-$O_2$ sedation and obtain physician consults when there is any concern regarding the patient's suitability for inhalation sedation and/or anesthetic.

**FIG 14-5** Patient receiving nitrous oxide analgesia.

### Intravenous Sedation

The IV route is the most effective method of conscious sedation. Although IV sedation has been a mainstay for years in oral surgery practices, other dental specialists have adopted this technique for treatments involving implants, and for periodontal and endodontic procedures. An advantage of IV administration is the ability to rapidly titrate the dosage to achieve the desired depth of sedation. Depending on patient need, sedation can vary from light to profound, and nearly all patients can be adequately sedated with this method.

The amnestic effect of this form of sedation is particularly advantageous for the extremely fearful patient. Under conscious sedation, patients can maintain patent airways and respond to verbal commands and physical stimuli. At higher doses, the patient moves into deep sedation, in which protective reflexes (such as coughing) may be lost and the patient may no longer be able to independently maintain an open airway.

Drugs commonly used for IV sedation in dentistry include the benzodiazepines, diazepam (Valium), and midazolam (Versed). These agents may be administered alone or in conjunction with narcotics, such as fentanyl (Sublimaze) or meperidine (Demerol). Many states in the United States require a special permit to administer IV sedation. Initial investment in drugs and monitoring equipment is significant, and the dentist must consider the liability issues that accompany heavier sedation. The use of IV conscious sedation requires specialized instruction in advanced cardiac life support, an extensively equipped emergency kit, appropriate monitoring equipment, and a trained support team. Iatrogenic injury, resulting from dose errors, failure to monitor vital signs, or the toxic effects of sedatives can be fatal.

Patients with respiratory, cardiovascular, or hepatic diseases and those at the extremes of age are at higher risk for developing complications while undergoing deeper sedation. Thorough patient medical histories must be obtained and informed consent given before intravenous sedation is administered.

### General Anesthesia

General anesthesia offers the highest level of patient sedation. The patient under general anesthesia experiences the elimination of all sensation, accompanied by total loss of consciousness as well as loss of the ability to maintain a functional airway and, as a result, is at risk for a myriad of serious complications. This option is relatively expensive and is often reserved for young children or patients with developmental disabilities or those who have significant anxieties associated with dental treatment. Only trained dentist-anesthesiologists can perform outpatient general anesthesia in an ambulatory surgical care setting. Patients also may be admitted to a hospital for inpatient general anesthesia. In this setting, the dental procedure is carried out in an operating suite with an anesthesiologist responsible for drug delivery and patient monitoring.

## Integrating Anxiolytic Therapy into Delivery of Dental Care

For many practitioners, finding the optimal anxiety management plan for a patient often involves a trial and error approach that can be stressful for both the patient and dentist. Although successful treatment of a fearful patient can be a time-consuming endeavor, it is often a rewarding experience for the practitioner.

The patient interview and treatment plan presentation are opportune times for the dental practitioner to assess both the need for anxiolytic measures and the patient's willingness to accept various anxiolytic management strategies. In the course of the interview, the dentist should question the patient as to his or her previous experiences with anxiety management. If the patient is adamant that techniques such as hypnosis and guided imagery do not work, then the practitioner should avoid suggesting these modalities to preserve trust with the patient. On the other hand, a conversation that begins, "I understand that your experience with guided imagery showed that it didn't work for you. Newer techniques have been developed that may make it effective for you," may open the door for a patient to reconsider the use of guided imagery. The dentist might reassure the patient that he or she will not attempt to use guided imagery without telling the patient in advance. Patients who have previously had positive experiences with anxiolytic drugs are likely to request and respond positively to the same tactics.

The anxiolytic management strategy used will depend on practitioner experience and patient-specific factors. Patients with needle phobias may only require anxiolytic treatment when local anesthetic injections are necessary. Those with a history of negative dental experiences may require anxiolytic treatment for all appointments or only for those procedure(s) that resulted in discomfort in the past. Presenting the anxiolytic management plan in an empathetic, positive manner is an essential component of successful treatment because it instills confidence in the patient. Recounting examples of success with managing anxiety for other patients using the same management strategy can serve to reinforce the effectiveness of the plan and increase the patient's expectations of success.

The anxiolytic management plan may change over time because of either positive or negative patient experiences. At the conclusion of an appointment, the practitioner should inquire about the patient's perceptions of the experience. The dentist's approach should be supportive and nonjudgmental, offering positive comments that will encourage the patient to continue with treatment. If a procedure must be terminated because of anxiety, or if the patient still expresses a great deal of fear, the dentist can offer alternate or additional strategies, such as adding an anxiolytic medication to guided imagery. Patients who are extremely fearful and minimally responsive to standard anxiolytic management strategies may need to be referred to practitioners qualified to perform deeper sedation.

Patients with positive dental encounters may, over time, experience a reduction in anxiety that decreases or eliminates the need for anxiolytic treatment. Although it may not be possible to eradicate dental fear, a compassionate approach to

the management of these patients will enable them to obtain care with a minimum of stress.

## CONCLUSION

Many factors contribute to the development of dental fear, and this problem will not be resolved in a single visit with a dentist. The dentist can select from among many tools to navigate the complex psychosocial issues presented by the fearful patient. Most of these tools require the dental team to invest time and energy. If inroads are to be made in treating the high number of fearful dental patients, greater emphasis must be placed on addressing their specific concerns through effective communication and more-effective pain and stress management.

The purpose of the pharmacotherapeutic management of anxiety is to provide dental care in such a manner that the patient feels relaxed and safe. Creating such an atmosphere is often best accomplished with nonpharmacologic interventions in addition to drug therapy. Ideally, positive dental experiences will lead to a reduction of fear so that the patient no longer requires anxiolytics or sedatives before dental treatment.

## REVIEW QUESTIONS

- What effect does dental anxiety have on society?
- What effect does dental anxiety have on the affected patient?
- What are the signs and symptoms of dental anxiety?
- What is the typical cause of dental fear and anxiety?
- How can the dentist recognize and diagnose dental anxiety?
- When should a patient be referred for professional help with dental anxiety?
- What techniques will you use to treat the anxious patient?
- What pharmacologic strategies (e.g., analgesia, sedation, general anesthetic) are available for managing the anxious patient, and what are the advantages and disadvantages of each?

## REFERENCES


1. Milgrom P, Weinstein P, Heaton LJ: *Treating fearful dental patients: A patient management handbook*, ed 3, Seattle, 2009, Dental Behavioral Resources.
2. Armfield JM: The extent and nature of dental fear and phobia in Australia, *Aust Dent J* 55:368–377, 2010.
3. Nicolas E, Collado V, Faulks D, Bullier B, et al: A national cross-sectional survey of dental anxiety in the French adult population, *BMC Oral Health* 7:12, 2007.
4. Humphris G, Crawford JR, Hill K, Gilbert A, et al: UK population norms for the modified dental anxiety scale with percentile calculator: Adult dental health survey 2009 results, *BMC Oral Health* 13:29, 2013.
5. Milgrom P, Fiset L, Melnick S, Weinstein P: The prevalence and practice management consequences of dental fear in a major US city, *J Am Dent Assoc* 116:641–647, 1988.
6. Smith TA, Heaton LJ: Fear of dental care: Are we making any progress? *J Am Dent Assoc* 134:1101–1108, 2003.
7. Ragnarsson B, Arnlaugsson S, Karlsson KO, et al: Dental anxiety in Iceland: An epidemiological postal survey, *Acta Odontol Scand* 61:283–288, 2003.
8. Moore R, Brodsgaard I, Mao TK, et al: Fear of injections and report of negative dentist behavior among caucasian American and Taiwanese adults from dental school clinics, *Community Dent Oral Epidemiol* 24:292–295, 1996.
9. Lahti S, Vehkalahti MM, Nordblad A, Hausen H: Dental fear among population aged 30 years and older in Finland, *Acta Odontol Scand* 65:97–102, 2007.
10. Folayan MO, Idehen EE, Ojo OO: The modulating effect of culture on the expression of dental anxiety in children: A literature review, *Int J Paediatr Dent* 14: 241–245, 2004.
11. Baron RS, Logan H, Hoppe S: Emotional and sensory focus as mediators of dental pain among patients differing in desired and felt dental control, *Health Psychol* 12: 381–389, 1993.
12. Gift HC, Reisine ST, Larach DC: The social impact of dental problems and visits, *Am J Public Health* 82:1663–1668, 1992.
13. Armfield JM: Predicting dental avoidance among dentally fearful Australian adults, *Eur J Oral Sci* 121: 240–246, 2013.
14. Reisine S, Miller J: A longitudinal study of work loss related to dental diseases, *Soc Sci Med* 21:1309–1314, 1985.
15. Reisine ST: Dental health and public policy: The social impact of dental disease, *Am J Public Health* 75:27–30, 1985.

15a. National Center for Health Statistics: *Current estimates from the National Health Interview Survey*, (Vital and Health Statistics: Series 10, Data from the National Health Survey; no. 200). Hyattsville, MD, 1996, U.S. Department of Health and Human Services, National Center for Health Statistics.

16. Berggren U: Psychosocial effects associated with dental fear in adult dental patients with avoidance behaviours, *Psychology and Health* 8:185–196, 1993.
17. Schuller AA, Willumsen T, Holst D: Are there differences in oral health and oral health behavior between individuals with high and low dental fear? *Community Dent Oral Epidemiol* 31:116–121, 2003.
18. Moore R, Brodsgaard I, Rosenberg N: The contribution of embarrassment to phobic dental anxiety: A qualitative research study, *BMC Psychiatry* 4:10, 2004.
19. Reisine ST, Fertig J, Weber J, Leder S: Impact of dental conditions on patients' quality of life, *Community Dent Oral Epidemiol* 17: 7–10, 1989.
20. Hagglin C, Berggren U, Hakeberg M, Ahlqwist M: Dental anxiety among middle-aged and elderly women in Sweden. A study of oral state, utilisation of dental services and concomitant factors, *Gerodontology* 13:25–34, 1996.
21. Eli I, Uziel N, Baht R, Kleinhauz M: Antecedents of dental anxiety: Learned responses versus personality traits, *Community Dent Oral Epidemiol* 25:233–237, 1997.
22. Poulton R, Thomson WM, Davies S, et al: Good teeth, bad teeth and fear of the dentist, *Behav Res Ther* 35:327–334, 1997.

23. Robin O, Alaoui-Ismaili O, Dittmar A, Vernet-Maury E: Emotional responses evoked by dental odors: An evaluation from autonomic parameters, *J Dent Res* 77:1638–1646, 1998.
24. Schuurs AH, Duivenvoorden HJ, Thoden van Velzen SK, Verhage F: Fear of dental procedures, *Community Dent Health* 3:227–237, 1986.
25. Oosterink FM, de Jongh A, Aartman IH: What are people afraid of during dental treatment? Anxiety-provoking capacity of 67 stimuli characteristic of the dental setting, *Eur J Oral Sci* 116:44–51, 2008.
26. Freeman R: The role of memory on the dentally anxious patient's response to dental treatment, *Irish J Psych Med* 8: 110–115, 1991.
27. Lindsay S, Jackson C: Fear of routine dental treatment in adults: Its nature and management, *Psychol Health* 8:135–153, 1993.
28. Lin CS: Pain catastrophizing in dental patients: Implications for treatment management, *J Am Dent Assoc* 144:1244–1251, 2013.
29. Moore R, Brodsgaard I, Berggren U, Carlsson SG: Generalization of effects of dental fear treatment in a self-referred population of odontophobics, *J Behav Ther Exp Psychiatry* 22:243–253, 1991.
30. Baron RS, Inman ML, Kao CF, Logan H: Negative emotion and superficial social processing, *Motiv Emotion* 16:323–346, 1992.
31. Russell MW: The management of dental pain: A review of possible alternatives to drug therapy, *Tex Dent J* 98:6–8, 1980.
32. International Association for the Study of Pain: *Classification of chronic pain: Descriptions of chronic pain syndromes and definitions of pain terms*, Seattle, 1994, IASP Press.
33. Sessle BJ: The neurobiology of facial and dental pain: Present knowledge, future directions, *J Dent Res* 66:962–981, 1987.
34. Litt MD: A model of pain and anxiety associated with acute stressors: Distress in dental procedures, *Behav Res Ther* 34:459–476, 1996.
35. Rhudy JL, Meagher MW: Fear and anxiety: Divergent effects on human pain thresholds, *Pain* 84:65–75, 2000.
36. Caceres C, Burns JW: Cardiovascular reactivity to psychological stress may enhance subsequent pain sensitivity, *Pain* 69: 237–244, 1997.
37. Klages U, Ulusoy O, Kianifard S, Wehrbein H: Dental trait anxiety and pain sensitivity as predictors of expected and experienced pain in stressful dental procedures, *Eur J Oral Sci* 112:477–483, 2004.
38. Maggirias J, Locker D: Psychological factors and perceptions of pain associated with dental treatment, *Community Dent Oral Epidemiol* 30:151–159, 2002.
39. Gedney JJ, Logan H, Baron RS: Predictors of short-term and long-term memory of sensory and affective dimensions of pain, *J Pain* 4:47–55, 2003.
40. Hampton T: Pain and the brain: Researchers focus on tackling pain memories, *JAMA* 293:2845–2846, 2005.
41. Riley JL, Robinson ME, Wise EA, et al: Sex differences in the perception of noxious experimental stimuli: A meta-analysis, *Pain* 74:181–187, 1998.
42. Berkley KJ: Sex differences in pain, *Behav Brain Sci* 20:371–380; discussion 435–513, 1997.
43. Kallai I, Barke A, Voss U: The effects of experimenter characteristics on pain reports in women and men, *Pain* 112:142–147, 2004.
44. Logan HL, Gedney JJ: Sex differences in the long-term stability of forehead cold pressor pain, *J Pain* 5:406–412, 2004.
45. Robinson ME, Riley JL, Myers CD, et al: Gender role expectations of pain: Relationship to sex differences in pain, *J Pain* 2:251–257, 2001.
46. Wise EA, Price DD, Myers CD, et al: Gender role expectations of pain: Relationship to experimental pain perception, *Pain* 96:335–342, 2002.
47. Fillingim RB, Gear RW: Sex differences in opioid analgesia: Clinical and experimental findings, *Eur J Pain* 8:413–425, 2004.
48. Gear RW, Miaskowski C, Gordon NC, et al: Kappa-opioids produce significantly greater analgesia in women than in men, *Nat Med* 2:1248–1250, 1996.
49. Sershen H, Hashim A, Lajtha A: Gender differences in kappa-opioid modulation of cocaine-induced behavior and NMDA-evoked dopamine release, *Brain Res* 801:67–71, 1998.
50. Liddell A, Gosse V: Characteristics of early unpleasant dental experiences, *J Behav Ther Exp Psychiatry* 29:227–237, 1998.
51. Locker D, Liddell A, Dempster L, Shapiro D: Age of onset of dental anxiety, *J Dent Res* 78:790–796, 1999.
52. Davey GC: Dental phobias and anxieties: Evidence for conditioning processes in the acquisition and modulation of a learned fear, *Behav Res Ther* 27:51–58, 1989.
53. Holtzman JM, Berg RG, Mann J, Berkey DB: The relationship of age and gender to fear and anxiety in response to dental care, *Spec Care Dentist* 17:82–87, 1997.
54. Arntz A, van Eck M, Heijmans M: Predictions of dental pain: The fear of any expected evil, is worse than the evil itself, *Behav Res Ther* 28:29–41, 1990.
55. Armfield JM: Cognitive vulnerability: A model of the etiology of fear, *Clin Psychol Rev* 26:746–768, 2006.
56. Armfield JM, Slade GD, Spencer AJ: Cognitive vulnerability and dental fear, *BMC Oral Health* 8:2, 2008.
57. Logan HL, Baron RS, Keeley K, et al: Desired control and felt control as mediators of stress in a dental setting, *Health Psychol* 10:352–359, 1991.
58. Law A, Logan H, Baron RS: Desire for control, felt control, and stress inoculation training during dental treatment, *J Pers Soc Psychol* 67:926–936, 1994.
59. Baron RS, Logan H: Desired control, felt control, and dental pain: Recent findings and remaining issues, *Motiv Emotion* 17:181–204, 1993.
60. Logan HL, Baron RS, Kohout F: Sensory focus as therapeutic treatments for acute pain, *Psychosom Med* 57:475–484, 1995.
61. Armfield JM, Spencer AJ, Stewart JF: Dental fear in Australia: Who's afraid of the dentist? *Aust Dent J* 51:78–85, 2006.
62. Doerr PA, Lang WP, Nyquist LV, Ronis DL: Factors associated with dental anxiety, *J Am Dent Assoc* 129:1111–1119, 1998.
63. Peretz B, Moshonov J: Dental anxiety among patients undergoing endodontic treatment, *J Endod* 24:435–437, 1998.
64. Watkins CA, Logan HL, Kirchner HL: Anticipated and experienced pain associated with endodontic therapy, *J Am Dent Assoc* 133:45–54, 2002.
65. Dougall A, Fiske J: Surviving child sexual abuse: The relevance to dental practice, *Dent Update* 36:294–296, 298–300, 303–304, 2009.
66. Pereda N, Guilera, G, Forns M, Gomez-Benito J: The prevalence of child sexual abuse in community and student samples: A meta-analysis, *Clin Psych Rev* 29:328–338, 2009.
67. Willumsen T: Dental fear in sexually abused women, *Eur J Oral Sci* 109:291–296, 2001.
68. Uziel N, Bronner G, Elran E, Eli I: Sexual correlates of gagging and dental anxiety, *Community Dent Health* 29:243–247, 2012.
69. Willumsen T: The impact of childhood sexual abuse on dental fear, *Community Dent Oral Epidemiol* 32:73–79, 2004.

70. Fillingim RB, Wilkinson CS, Powell T: Self-reported abuse history and pain complaints among young adults, *Clin J Pain* 15:85–91, 1999.
71. Humphris GM, Morrison T, Lindsay SJ: The modified dental anxiety scale: Validation and United Kingdom norms, *Community Dent Health* 12:143–150, 1995.
72. Armfield JM: Development and psychometric evaluation of the index of dental anxiety and fear (IDAF-4C +), *Psychol Assess* 22:279–287, 2010.
73. Coolidge T, Heima M, Coldwell SE, et al: Reliability and validity of the revised Iowa dental control index in a non-clinical sample, *Pers Indiv Differ* 38:773–783, 2005.
74. Brunsman BA, Logan HL, Patil RR, Baron RS: The development and validation of the revised Iowa dental control index (IDCI), *Pers Indiv Differ* 34:1113–1128, 2003.
75. Geboy MJ: *Communication and behavior management in dentistry*, Toronto, 1989, BC Decker.
76. Coulehan JL, Platt FW, Egener B, et al: "Let me see if I have this right...": Words that help build empathy, *Ann Int Med* 135:221–227, 2001.
77. Hainsworth JM, Moss H, Fairbrother KJ: Relaxation and complementary therapies: An alternative approach to managing dental anxiety in clinical practice, *Dent Update* 32:90–92, 94–96, 2005.
78. Kvale G, Berggren U, Milgrom P: Dental fear in adults: A meta-analysis of behavioral interventions, *Community Dent Oral Epidemiol* 32:250–264, 2004.
79. Bare LC, Dundes L: Strategies for combating dental anxiety, *J Dent Educ* 68:1172–1177, 2004.
80. Frere CL, Crout R, Yorty J, McNeil DW: Effects of audiovisual distraction during dental prophylaxis, *J Am Dent Assoc* 132:1031–1038, 2001.
81. Corah NL: Dental anxiety: Assessment, reduction and increasing patient satisfaction, *Dent Clin North Am* 32:779–790, 1988.
82. Hoffman HG, Garcia-Palacios A, Patterson DR, et al: The effectiveness of virtual reality for dental pain control: A case study, *Cyberpsychol Behav* 4:527–535, 2001.
83. Furman E, Jasinevicius TR, Bissada NF, et al: Virtual reality distraction for pain control during periodontal scaling and root planing procedures, *J Am Dent Assoc* 140:1508–1516, 2009.
84. Armfield JM, Heaton LJ: Management of fear and anxiety in the dental clinic: A review, *Aust Dent J* 58:390–407; quiz 531, 2013.
85. Corah NL, Gale EN, Illig SJ: The use of relaxation and distraction to reduce psychological stress during dental procedures, *J Am Dent Assoc* 98:390–394, 1979.
86. Corah NL, Gale EN, Pace LF, Seyrek SK: Relaxation and musical programming as means of reducing psychological stress during dental procedures, *J Am Dent Assoc* 103:232–234, 1981.
87. Bills IG: The use of hypnosis in the management of dental phobia, *Aust J Clin Exp Hypn* 21:13–18, 1993.
88. Shaw AJ, Niven N: Theoretical concepts and practical applications of hypnosis in the treatment of children and adolescents with dental fear and anxiety, *Br Dent J* 180:11–16, 1996.
89. Fick LJ, Lang EV, Logan HL, et al: Imagery content during nonpharmacologic analgesia in the procedure suite: Where your patients would rather be, *Acad Radiol* 6:457–463, 1999.
90. Lang EV, Lutgendorf S, Logan H, et al: Nonpharmacologic analgesia and anxiolysis for interventional radiological procedures, *Semin Intervent Rad* 16:113–123, 1999.
91. Lang EV, Benotsch EG, Fick LJ, et al: Adjunctive non-pharmacological analgesia for invasive medical procedures: A randomised trial, *Lancet* 355:1486–1490, 2000.
92. Gerschman JA: Hypnotizability and dental phobic disorders, *Anesth Prog* 36:131–137, 1989.
93. Kleinhauz M, Eli I: Hypnotic induction in dentistry coping with the fear of losing control (autonomy): A brief communication, *Int J Clin Exp Hypn* 39:125–128, 1991.
94. Klepac RK: Fear and avoidance of dental treatment in adults, *Ann Behav Med* 8:17–22, 1986.
95. American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists: Practice guidelines for sedation and analgesia by non-anesthesiologists, *Anesthesiology* 96:1004–1017, 2002.
96. American Society of Anesthesiologists Quality Management and Departmental Administration Committee: *Continuum of depth of sedation: definition of general anesthesia and level of sedation/analgesia.* https://www.asahq.org/quality-and-practice-management/standards-and-guidelines (Accessed September 20, 2015)
97. American Dental Association: Guidelines for the use of sedation and general anesthesia by dentists, 2012. http://www.ada.org/~/media/ADA/About%20the%20ADA/Files/anesthesia_use_guidelines.ash. Accessed February 9, 2015.
98. Boynes, SG: *Dental anesthesiology: A guide to the rules and regulations of the United States*, ed 5, 2013, Freemont, Calif, No-No Orchard Publishing.
99. Facts and Comparisons eAnswers: *Benzodiazepines*. http://www.wolterskluwercdi.com/facts-comparisons-online/. Accessed June 30, 2015.
100. Wong WW, Gabriel A, Maxwell GP, Gupta SC: Bleeding risks of herbal, homeopathic, and dietary supplements: a hidden nightmare for plastic surgeons? *Anesthet Surg J* 32(3):332–346, 2012.
101. Mihic S, Harris R: Hypnotics and sedatives. In Brunton LL, Chabner BA, Knollmann BC, editors: *Goodman and Gilman's the pharmacological basis of therapeutics*, ed 12, New York, 2011, McGraw-Hill Professional.
102. Coté CJ, Notterman DA, Karl HW, et al: Adverse sedation events in pediatrics: A critical incident analysis of contributing factors, *Pediatrics* 105:805–814, 2000.
103. Lee HH, Milgrom P, Starks H, Burke W: Trends in death associated with pediatric dental sedation and general anesthesia, *Ped Anesth* 23(8):741–746, 2013.
104. Coté CJ, Karl HW, Notterman DA, et al: Adverse sedation events in pediatrics: Analysis of medications used for sedation, *Pediatrics* 106(4):633–644, 2000.
105. Valium [package insert] USA. Roche Products Inc, 2008.
106. Pfizer: *Xanax (alprazolam) prescribing information*. New York, NY, March 2006.
107. Facts and Comparisons eAnswers: *Nitrous Oxide*. http://online.factsandcomparisons.com.proxy.lib.uiowa.edu/MonoDisp.aspx?monoid=fandc-hcp15266&book=DFC&fromtop=true&search=540289%7c15&isStemmed=True&asbooks=/. Accessed August 31, 2014.
108. Malamed S: Inhalation sedation. In *Sedation: A guide to patient management*, ed 5, St Louis, 2010, Mosby.
109. Patel PM, Patel HH, Roth DM: General anesthetics and therapeutic gases. In Brunton LL, Chabner BA, Knollmann BC, editors: *Goodman and Gilman's the pharmacological basis of therapeutics*, ed 12, New York, 2011, McGraw-Hill Professional.

# 15

# Patients With a Psychological Disorder

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## OUTLINE

**Patient Evaluation**
- Obtaining Patient History
- Patient with Diagnosed Psychological Disorder
- Patient with Undiagnosed Psychological Disorder
- Patient with Poorly Controlled Psychological Disorder

**General Treatment Planning Considerations for the Patient with a Psychological Disorder**

**Major Types of Psychological Disorders**

**Anxiety Disorders**
- Generalized Anxiety Disorder
- Panic Disorder
- Social Anxiety Disorder (Social Phobia)
- Specific Phobias
- Medications Used to Treat Anxiety
- Treatment Planning for Patients with Anxiety Disorders

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**Somatic Symptom and Related Disorders**
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**Medication Effects That Affect Dental Treatment**
- Interactions of Psychotherapeutic Drugs with Medications Used in Dentistry
- Confusion
- Orthostatic Hypotension
- Intraoral Effects of Psychotherapeutic Agents

**Effect of Psychological Disorders on the Oral Cavity**
- Xerostomia
- Dental Caries
- Periodontal Disease
- Facial and Masticatory Muscle Pain and Bruxism

**Conclusion**

Psychiatric disorders are common in our society and are expressed primarily as abnormalities of thought, feelings, and behaviors that cause emotional distress and result in impairment of function. The most common classes of psychiatric disorders, in order of prevalence, in the United States are anxiety disorders, mood disorders, impulse control disorders and substance disorders.[1] In most instances, specific symptoms as listed in the diagnostic criteria must be present for at least 6 months before diagnosis can be made.

Epidemiologic studies indicate that 26.2% of the U.S. adult population experience signs and symptoms of a recognized mental disorder each year.[1] Serious mental illness is thought to occur in nearly 6% of the population and is the leading cause of disability in the United States.[1] In 2012, the U.S. Substance Abuse and Mental Health Services Administration (SAMHSA) reported that fewer than 50% of adults with mental illnesses received mental health services in the past year.[2]

These statistics suggest that, at any point in time, a large number of patients presenting for dental care may have a treated or untreated psychological disorder. Although the dentist will not be called on to diagnose psychological disorders, practitioners should be able to recognize the signs and symptoms of undiagnosed or untreated disorders. The dentist also has an important role in managing the oral effects of such a disorder or the side effects of medications used to control it. A patient's self-destructive behaviors and lack of oral healthcare may cause significant problems in the oral

cavity, which the dental team will be expected to manage. Additionally, psychological problems may necessitate a marked alteration in both the nature and scope of the patient's plan of care. These issues are the focus of this chapter.

## PATIENT EVALUATION

Scheduling enough time for the first visit for a patient with psychological disorders is imperative. Some patients need extra time to respond to questions or assimilate information provided by the dentist. Imagine how a patient with an anxiety disorder might respond if placed in a situation that includes pressures to respond quickly to questions. Such a patient may just give up on dental care because he or she has not been afforded the opportunity to interact in a comfortable manner. In any clinical setting, there may be instances when the patient must be scheduled without adequate time for a more slowly paced interview. Developing rapport with the patient may be the best use of the time remaining after determination of the patient's chief complaint.

### Obtaining Patient History

Some patients with psychological problems will be honest about their health history, but many believe that a stigma is attached to psychological disorders and may be reluctant to provide all relevant information. The importance of establishing rapport quickly and effectively cannot be overstated. An effective way to open discussion when the dentist suspects that the patient suffers from a psychological disorder is to mention a physical finding that may relate to the disorder. For example, because some medications for psychological disorders cause dry mouth, a nonjudgmental, nonthreatening question, such as "I notice that your mouth seems much drier than usual. Have there been any changes in your health that could account for this change?" may open a discussion in which the relationship between physical findings and psychological status can be described. From the initiation of the professional relationship, honest and open communication between the dentist and the patient can ease the discomfort of discussing mental disorders. The practitioner should reassure the patient that this information is necessary to ensure provision of the best possible treatment and that the inquiry is not meant to be intrusive or embarrassing. The patient will be more forthcoming if questions are framed in a nonjudgmental fashion with the understanding that overall health status can affect the delivery of dental care.

Patients with psychological problems are often less defensive and more open about divulging medication history than about their psychological health history. Open discussion can be invaluable in assisting the dentist in understanding the nature of the psychological problem, the extent of its control, and the severity of the disease. Such discussion can also alert the dentist to possible oral side effects of medications and potential adverse drug interactions. For these reasons, when reviewing patient medications, it is important to learn who prescribed a particular medication, its purpose, the dosage, whether any recent changes in dosing have occurred, and whether the patient has suffered any adverse reactions. The clinician must ensure that the same questions are asked for *all* of the patient's medications. Many over-the-counter remedies (antihistamines, decongestants, herbal products, and homeopathic remedies) have significant oral side effects and can potentiate the adverse reactions of prescription medications. It is estimated that 70% of patients will not voluntarily report the use of homeopathic or herbal medications to their healthcare practitioners. Many patients do not consider herbal and homeopathic agents to *be* medications because they are "natural" substances, whereas others anticipate that reporting self-directed therapy will elicit a negative reaction.

### Patient with Diagnosed Psychological Disorder

Even the patient with a well-managed psychological disorder presents the clinician with the potential for related treatment planning modifications. It is essential that the dentist become knowledgeable about the diagnosis, treatment, and effectiveness of treatment of the psychological disorder before providing dental treatment. On numerous occasions, a consultation with the patient's physician will be indicated. The patient may provide the dentist with information that the physician has not been made aware of. Additionally, there are several oral changes that can result from medications that warrant discussion with the physician, such as dry mouth, mouth lesions, or movement disorders. If the dentist concludes that contact with the physician is appropriate, consent must be given by the patient before it can occur. In the vast majority of instances, the patient will grant consent. Many times, simply explaining the reason for contacting the physician will be sufficient to convince the patient to provide consent. However, there will be times when the patient refuses to provide consent, putting the dentist in a difficult position. The patient's refusal to allow the clinician access to information that could affect not only the dental treatment, but also his or her overall health, makes it inappropriate for the clinician to proceed. In such situations, it will be important to explain to the patient that treatment cannot proceed without this information and that any dental treatment provided under such circumstances would fall below the standard of care. The clinician should avoid giving in to the patient's wishes in this situation. The risks to both the patient and clinician far outweigh the benefits of acquiescing to the patient's wishes. If the patient cannot be persuaded to grant consent, the doctor-patient relationship should be terminated.

Instances may occur in which the patient's history and behavior suggest the presence of a psychological disorder, but there is no indication of treatment in the patient's history. The explanation may be either that the patient is noncompliant or that the patient's physician and the patient are both aware of the problem, but the patient has chosen not to pursue therapy. In either case, the treating dentist must have complete health and medication histories to effectively manage the patient with a diagnosed psychological disorder.

In such instances, it may be necessary for the dentist to confront the patient about his or her concerns and request that the patient be reevaluated by a physician or other mental healthcare provider.

### Patient with Undiagnosed Psychological Disorder

Observing the patient's behavior helps the clinician to recognize the individual with an undiagnosed psychiatric disorder. Although the patient who displays inappropriate behaviors or responds to questions in a strange way may simply be nervous, it also may be the case that he or she has an undiagnosed psychological problem. Obviously, behavioral changes will be more readily recognizable in an established patient whom the dentist has seen before. When such questions are raised in the dentist's mind, it is appropriate to determine whether a primary care physician has evaluated the patient recently and, if not, to suggest that such an examination be pursued. It is possible that the patient is unaware that his or her behavior has been changing and may resent the implication that there is a "problem." Addressing these issues can be stressful for both patient and dentist. Approaching the subject in the context of the effect of the patient's overall health on the way that oral healthcare is delivered, along with an expression of concern for the patient's health, may help the patient understand the rationale for providing the dentist with more information.

When the dentist suspects an undiagnosed psychological disorder, every effort should be made to convince the patient to see his or her primary care physician for a complete evaluation. Most patients will appreciate this demonstration of concern for their health. On the other hand, some patients may perceive such a referral as a refusal to treat. The patient should be reassured that the dentist will continue to provide care, but that a health status evaluation by a physician is necessary to ensure that the most appropriate oral healthcare is delivered. Although it is not ethical to withhold emergency care, a highly symptomatic patient must be made aware that definitive care may be deferred until the mental health concern has been addressed. In particular, it would be dangerous to provide dental treatment when it is unclear whether the patient is reporting all current medications. The potential for an adverse drug interaction is greatly increased when dealing with psychotropic medications.

### Patient with Poorly Controlled Psychological Disorder

Poorly controlled psychological disorders manifest in a similar manner as undiagnosed disorders, although the symptoms may be less severe. Several possible explanations may account for the behavior, including noncompliance secondary to a lack of "insight" by the patient. Insight refers to the patient's awareness of his or her own mental illness. Patients with such insight are aware of their deteriorating mental health and will seek professional care when the condition worsens. Others, especially those who are psychotic, lack insight and tend to be noncompliant in terms of taking medications and seeing the physician on a regular basis.

Noncompliance may also relate to financial considerations associated with healthcare costs, the belief that a chronic disorder is "cured," or the unpleasant side effects of prescribed medications. Providing the patient with a strategy to deal with the xerostomia associated with many psychotropic medications is one way for the dental practitioner to enhance compliance (see *Xerostomia,* later in this chapter).

By helping the patient recognize the deleterious oral and systemic effects of noncompliance and deal positively with the undesirable side effects of compliance, the dental practitioner may be able to encourage the patient to resume medication therapy. The patient should be encouraged to discuss problems relating to the drug's effects and side effects, and the cost of treatment and medications with the psychiatric care provider. If the patient remains unwilling to comply with the recommended therapy, it may be appropriate for the dentist to inform the medical, psychiatric, or psychological care provider of the problem. Some mental disorders are refractory to pharmacotherapy, and the patient may never be completely asymptomatic despite the best available treatment. (Video 15-1, Interview With a Patient With Mental Disorders on Evolve.)

## GENERAL TREATMENT PLANNING CONSIDERATIONS FOR THE PATIENT WITH A PSYCHOLOGICAL DISORDER

Patient compliance is the major determinant of treatment success in both dentistry and medicine. Both long- and short-term prognoses are affected significantly by how well the patient maintains his or her physical, oral, and psychological health. The finest restorative or periodontal treatment will fail if the patient is unwilling or unable to maintain adequate oral hygiene. The dentist must communicate the importance of maintaining oral health and the ways in which the disease process or its treatment can interfere with oral health (see the *Ethics in Dentistry* box). Once the dentist is comfortable with the patient's ability to practice adequate oral hygiene, the prognosis for dental treatment may be the same as for any other dental patient.

Control of dental diseases should be pursued aggressively, but definitive treatment ideally should be deferred until the patient can demonstrate consistently adequate oral hygiene. For those patients with severe mental illness, this may be impossible, and limited definitive care (i.e., holding phase; see Chapter 18) may be the only option available to improve function and esthetics, especially for severely decayed and broken-down teeth. It is particularly important that the oral hygiene of patients with psychological disorders is assessed at every appointment. Changes in oral hygiene status may result from medication changes or a change in the patient's psychological status. Drastic changes in oral hygiene should be discussed with the patient, with emphasis placed on the potential harmful effects on the oral cavity.

## ETHICS IN DENTISTRY

**Managing the Patient with Psychological Problems**

When a patient with psychological problems declines to pursue a treatment plan, the dentist or any health professional may be frustrated, confused, or even angry. One of the most powerful questions a clinician can ask a patient is "Why don't you want this treatment?" The patient's response may help the clinician make the important distinction between noncompliance and an autonomous, thoughtful, and informed refusal of treatment.

Noncompliance can be defined as a failure on the patient's part to follow through with what he or she agreed to do. An example of noncompliance is the patient who agrees to implement a routine of oral hygiene but does not follow through. This differs from a patient's clear and rational decision not to pursue treatment. Most often, refusal of treatment is articulated to the clinician, thus allowing an open discussion of the benefits and risks of nontreatment along with the other options available. Once the clinician understands the reasons for the patient's refusal, these issues can be addressed through further discussion or modifications of the treatment plan that address the patient's concerns. A truly informed refusal must be respected by the clinician as the reciprocal of informed consent.

The ability of the patient to cope with dental treatment should be ascertained before beginning each procedure. The patient must be compliant and cooperative, and must give consent to proceed. Taking the extra time necessary to be sure that the patient is comfortable, well informed, and free of anxiety can ensure that treatment proceeds in predictable fashion.

After receiving permission from the patient, the dentist may wish to establish a professional relationship with the clinician treating the psychological disorder. Ongoing interactions between the dentist and the mental health professional can only improve the care of the patient. The dentist needs to be aware of changes in treatment or medications so that no untoward events occur. The mental health clinician can provide insight concerning patient compliance and may characterize projected patterns of patient behavior. In turn, the dentist can provide the clinician with information about the effects of medication use on oral structures and offer possible solutions to counteract xerostomia, alterations in taste, and other intraoral side effects of psychotropic medications. Contact with a physician is especially important if the patient seems suicidal. Signs of suicidal ideation include verbalization of a plan, the potential for the plan to succeed, construction of a suicide letter, or an attempt to gain access to large quantities of medications with fatal overdose implications. In such a situation, it is very helpful to have already established rapport with the patient's primary care physician or other clinician treating the psychological disorder so that a strategy for immediate intervention can be developed.

## MAJOR TYPES OF PSYCHOLOGICAL DISORDERS

Although it is not practical or appropriate for the dental clinician to diagnose psychological problems, it is helpful to have some background knowledge about the standard categorizations and treatments of common mental disorders when discussing patient histories with other healthcare professionals. In addition, it is helpful for the dentist to be aware of the approach the clinician is likely to use to evaluate the patient. Psychological problems have been categorized in *The Diagnostic and Statistical Manual of Mental Disorders (DSM-V)* published by the American Psychiatric Association.[3]

In the following sections, the diagnostic criteria, symptoms and prevalence of major psychological disorders are summarized. The ramifications for dental treatment planning are reviewed for each major category.

## ANXIETY DISORDERS

Anxiety disorders are among the most common psychological illnesses encountered in clinical practice. The National Institute of Mental Health (NIMH) estimates that more than 40 million U.S. adults are affected by disabling anxiety disorders each year.[1,4] In general, these illnesses are chronic, develop before age 30, and occur twice as frequently in women as in men. The etiology of anxiety disorders is thought to be based on a combination of factors, which may include genetic predisposition (family history of depression or anxiety), childhood adversity, and occupational or traumatic stress.[1,3]

The hallmark feature of anxiety disorders is excessive fear and anxiety leading to behavioral disturbances. Although the terms fear and anxiety are often used interchangeably, they are distinct entities. **Fear** is the emotional response to real or perceived imminent threat and is associated with autonomic arousal (flight or fight response) and escape behaviors. **Anxiety** is the anticipation of future threat and is associated with vigilance and avoidance behaviors intended to reduce the unwanted feelings.[3]

For most people, stress-induced situational fear and anxiety are usually transient, resolving when the situation or event has passed. Patients with pathologic anxiety have intense, persistent, intrusive worries and fears and develop avoidance behaviors to calm their emotions. These disorders can greatly disrupt the individual's life and result in significant disability. Worries tend to be age congruent, with younger people worried over their competence and performance, whereas older people worry about a greater range of life circumstances, making diagnosis of anxiety more likely in this population. People with anxiety disorders often also exhibit comorbidities, such as major depression or substance abuse.[3]

The differential diagnosis of anxiety disorders requires ruling out other psychiatric conditions (mood disorders, schizophrenia, dementia), physical illnesses (arrhythmias, ischemic heart disease, hyperthyroidism, seizures), and the adverse effect of drugs. Drugs whose effects may include anxiety symptoms include prednisone, bupropion, selective serotonin reuptake inhibitors (SSRIs), levodopa, marijuana, quinolone antibiotics, bronchodilators, ibuprofen, and stimulants, such as caffeine, nicotine, cocaine, and amphetamines.[5]

**BOX 15-1 Symptoms of Generalized Anxiety Disorder[3,5]**

**Psychological**
Excessive anxiety and worrying
Feeling "on edge" or restless
Poor concentration or mind going blank

**Physical**
Fatigue
Irritability
Muscle tension
Sleep disturbances

DSM-V divides anxiety disorders into several categories, often with overlapping features. The categories relevant to dental practice are generalized anxiety disorder (GAD), panic disorder, social anxiety disorder (SAD), and phobias. Dental phobias and anxiety are very important to the practicing dentist and are discussed in more detail in Chapter 14.

## Generalized Anxiety Disorder

The essential feature of **generalized anxiety disorder** is excessive anxiety and worry (apprehensive expectation) about multiple events or activities that has occurred most days for the past 6 months. The intensity and frequency of the anxiety and worry are out of proportion to the actual likelihood or effect of the anticipated event. GAD tends to have a slow onset, with symptoms that wax and wane over the course of a lifetime. The 12-month prevalence of GAD is 0.9% of adolescents and 2.9% of adults in the United States, with females twice as likely as males to experience GAD.[3] The psychological and physical symptoms of GAD (Box 15-1) cause significant disability and result in 110 million disability days per year in the United States.[3]

GAD is often comorbid with other mental disorders such as depression, panic attacks, and substance abuse. Patients report a chronic level of anxiety that is heightened during stressful events. It is important to remember that the patient's response to an external event is very personal and should not be discounted by the clinician.

Treatment for GAD is patient specific and often consists of a combination of medications and such psychological modalities as psychotherapy, stress management, psychoeducation, and cognitive behavioral therapy (CBT). CBT is a psychotherapeutic approach that is designed to alter the behaviors and thinking patterns that cause and maintain anxiety. For patients with GADs, this approach includes symptom management techniques, restructuring, training, and self-monitoring. Although highly effective, CBT is not widely available and most patients are treated with other modalities and medications.[5,6] Table 15-1 lists nonpharmacologic and pharmacologic treatment approaches for anxiety disorders.

Antidepressants belonging to the SSRI and selective norepinephrine reuptake inhibitor (SNRI) classes are the first-line pharmacologic agents for many types of anxiety disorder. In contrast to benzodiazepines, these drugs do not cause dependency, have more favorable side effect profiles, manage comorbid depression, and reduce apprehension and worry in patients with anxiety disorders.[5]

Benzodiazepines exert their anxiolytic effects by controlling the autonomic and somatic symptoms of anxiety. They are the most efficacious agents for the management of acute anxiety and are used when rapid relief of anxiety symptoms is required.

## Panic Disorder

The hallmark symptom of panic disorder is recurrent, unexpected panic attacks. Full-symptom panic attacks are defined

**TABLE 15-1 Treatment Approaches for Anxiety Disorders[5-7,24]**

| Anxiety Disorder and Preferred Treatments | First-Line Medications* | Alternatives* |
|---|---|---|
| **Generalized Anxiety Disorder (GAD)** | | |
| Cognitive behavioral therapy (CBT) +/- drug therapy; acute efficacy is similar for both.<br>Psychotherapy is the preferred treatment.<br>Anxiolytics are indicated for patients with functional disability. | SSRIs (escalitopram, paroxetine)<br>SSRIs (venlafaxine, duloxetine) | Benzodiazepines<br>Buspirone |
| **Panic Disorder (PD)** | | |
| Pharmacotherapy +/- CBT.<br>Patients with agoraphobic avoidance often need CBT in addition to pharmacotherapy.<br>Psychological treatment + medications may decrease relapse when medications are discontinued. | SSRIs | Benzodiazepines<br>Clomipramine |
| **Social Anxiety Disorder (SAD)** | | |
| Pharmacotherapy +/- CBT; acute outcomes are equal for both.<br>Drug therapy is more effective in treatment of acute symptoms, patients respond slowly, and therapy may be lifelong. | SSRIs | Benzodiazepines |

*Only select agents within each drug class have proven efficacy.

as abrupt surges of intense fear or discomfort that reach a peak within minutes and during which at least 4 of 13 defined symptoms (Box 15-2) occur. Limited-symptom attacks have fewer than 4 symptoms.[3] Panic attacks can arise in a calm or anxious state and can be expected or unexpected. They reach peak intensity within the first 10 minutes and resolve in 20 to 30 minutes.[5] The occurrence of panic attacks is not considered to be a mental disorder, but rather a constellation of symptoms that may occur in association with other anxiety or mental disorders (depression, substance abuse, posttraumatic stress) or medical conditions (cardiac, gastrointestinal, respiratory). The 12-month prevalence estimates for panic attacks in U.S. adults is 11.2%, with a mean age of onset of 22 to 23 years.[3]

As the symptoms of panic attacks seem life-threatening, frightened patients often seek medical assistance only to find that their symptoms have largely resolved before they are examined. The severe nature of the symptomology can prompt healthcare providers to perform testing for a variety of serious illnesses.

Diagnostic criteria for panic disorder include recurrent, unexpected panic attacks followed by at least one of the following:

- Persistent worry about additional attacks or their consequences ("going crazy," losing control, having a heart attack)
- A significant maladaptive change in behavior related to the attacks (behaviors designed to avoid experiencing panic attacks)

Persons who suffer from panic disorder develop avoidance behaviors in an attempt to avoid/limit panic attacks or their consequences.[3] Fear of open and crowded spaces, **agoraphobia**, is common among patients with panic disorder and can render them homebound, and completely dependent on others to perform the activities of daily living. The 12-month prevalence rate for panic disorder in the United States is 2% to 3% of adults and adolescents, with a female predominance of 2:1 over males.[3] Most patients with panic disorder have other anxiety disorders (agoraphobia), major depression, or bipolar disorder. Treatments for panic disorder include psychotherapy, CBT, SSRI antidepressants, benzodiazepines, or buspirone.[5]

**BOX 15-2 Symptoms of Panic Attacks[3]**

**Psychological**
Feelings of depersonalization or derealization
Fear of losing control or going crazy
Fear of dying

**Physical**
Palpitations, pounding heart, or increased heart rate
Chest pains or discomfort
Feeling dizzy, unsteady, lightheaded, or faint
Sweating
Chills or heat sensation
Trembling or shaking
Paresthesias
Feelings of choking
Nausea or abdominal distress
Sensations of shortness of breath or smothering

## Social Anxiety Disorder (Social Phobia)

SAD is the most common anxiety disorder, with an estimated 12-month prevalence rate of 7% in the United States.[3] The essential feature of a social phobia is the persistent distinct fear or anxiety about one or more social situations in which the individual fears being scrutinized by others. Common fears include social interactions (meeting people, conversing), being observed (eating or drinking), or performing (giving a speech, recital). Patients with SAD fear possible embarrassment (Box 15-3).[3] The response to the social situation must be of sufficient intensity to produce notable anxiety or fear and result in significant distress or interference with normal daily activities. Blushing is the predominant physical indicator. SAD is associated with increased rates of school dropout and chronic unemployment. Many patients develop concurrent mood or substance abuse disorders. Only 50% of individuals with these symptoms seek treatment, often only after 15 or more years of symptoms.[3]

Treatments for SAD are patient specific and may involve psychotherapy, CBT, SSRI antidepressants, anxiolytic agents, and beta-adrenergic agents (for performance anxiety).[5]

## Specific Phobias

Specific phobias are characterized by immediate and excessive fear or anxiety about specific objects or situations (e.g., air travel, animals, heights, seeing blood). Patients actively avoid the "phobic stimulus." Diagnostic criteria require the fear, anxiety, or avoidance to be persistent, lasting at least 6 months and causing significant distress or impairment in daily functioning.[3] In the United States, the 12-month prevalence estimate for specific phobia is 7% to 9% and varies with age. The estimated prevalence rate in children is approximately 5%, whereas the rate among 13- to 17-year-olds is 16% and among older adults only 3% to 5%.[3] Females are affected at a 2:1 rate over males. Certain medically related phobias are experienced equally by both genders. These include fear of receiving injections, fear of seeing blood, or fear of injury.[3] Patients with specific phobias often exhibit sympathetic

**BOX 15-3 Symptoms of Social Anxiety Disorder[3]**

**Psychological**
Fears: Embarrassment, humiliation, rejection
Offending others

**Physical**
Blushing
Sweating
Trembling
Inadequate eye contact
Overly soft voice
"Shy" bladder

nervous system arousal when faced with the phobic stimulus. Individuals with blood/injection/injury-specific phobias often experience an initial brief acceleration of heart rate and increased blood pressure, followed by a deceleration of heart rate and drop in blood pressure, which elicits a vasovagal fainting or near-fainting response.[3]

Specific phobias usually develop in childhood, although trauma-induced phobias can occur at any age. Patients are asymptomatic unless in contact with the specific stimulus to their anxiety. Although most patients simply avoid the feared objects and do not seek professional care, treatment includes desensitization therapy and anxiolytic agents for acute situations.

## Medications Used to Treat Anxiety

Anxiolytic agents (Table 15-2) are used to reduce the severity, frequency, and duration of anxiety symptoms. Benzodiazepines are the most efficacious agents for the relief of *acute anxiety* symptoms. These drugs cause central nervous system (CNS) depression through potentiation of gamma-aminobutyric acid (GABA), a neurotransmitter that decreases neuronal excitability. The sedative and anxiolytic effects of benzodiazepines are mediated through binding to the $\alpha_1$ and $\alpha_2$ subunits of GABA, increasing its affinity for the GABA receptor. Although all benzodiazepines are anxiolytics, one-half of the agents marketed in the United States are used as sedative-hypnotic agents.

Pharmacokinetic (absorption, distribution, metabolism, excretion) and pharmacodynamic parameters (degree of sedation, adverse effects) determine the choice of agent. Serious complications of benzodiazepine therapy include physical dependence and abuse. To avoid these problems, SSRI or SNRI antidepressants are prescribed for patients who require long-term pharmacotherapy for anxiety, as they have been shown to decrease apprehension and worry. The lag time before onset of these effects is 2 to 4 weeks, during which time a benzodiazepine may be needed for relief of symptoms. Ideally, benzodiazepine use for acute anxiety disorders should be limited to 2 to 4 weeks and used on a scheduled rather than as-needed basis.[5]

The development of physical dependence is a concern when treating patients with chronic anxiety disorders. Benzodiazepine withdrawal can manifest as worsening of preexisting anxiety, insomnia, irritability, restlessness, and muscle tension. Gradual tapering of benzodiazepines over weeks is necessary to minimize withdrawal symptoms. Patients should be counseled not to decrease or discontinue anxiolytic agents without contacting their primary healthcare provider.

The short-term use of benzodiazepines by patients with anxiety disorders rarely results in abuse, although it is more likely to occur in patients with histories of alcohol or other sedative-hypnotic dependence. When taking the medication history, it is important to determine the prescribed regimen, duration of drug therapy, and *actual drug usage.*

A number of oral side effects can accompany anxiolytic medications, including excessive salivation, or **ptyalism;** the perception of dry mouth, or xerostomia; difficulty swallowing, or **dysphagia;** and abnormalities of taste, referred to as **dysgeusia.** Patients experiencing the CNS adverse effects of these drugs, such as confusion or memory problems, may be unable to give adequate informed consent or understand postoperative or oral hygiene instructions. When planning to sedate a patient for dental treatment, drug dosages may need to be altered to prevent excessive sedation in patients already receiving medications that depress the CNS.

## Treatment Planning for Patients with Anxiety Disorders

Treatment planning considerations for dental patients who suffer from anxiety disorders (other than dental anxiety/

**TABLE 15-2 Oral Agents to Treat Acute Anxiety[7,8]**

| Anxiolytic Agents | Usual Dosage Range (mg/day) | Select Adverse Effects (Indications, Off-Label Use*) |
|---|---|---|
| **Benzodiazepines (BDZ)** | | Xerostomia—hypersalivation, agitation, anxiety, vertigo (anxiety, GAD, ethanol withdrawal*) |
| Alprazolam (Niravam, Xanax) | 0.75-4 | (PD, premenstrual syndrome,* premenstrual dysphoric disorder,* not ethanol withdrawal) |
| Chlordiazepoxide (Librium) | 15-300 | |
| Clonazepam (Klonopin, orally disintegrating tablet) | 1-4 | (PD, seizures, nystagmus,* restless leg syndrome,* not indicated for anxiety) |
| Clorazepate (Tranxene) | 7.5-60 | (Partial seizures) |
| Diazepam (Valium) | 2-40 | Hypersalivation or (seizure treatment, muscle spasms, sedation induction, agitation,* BDZ withdrawal,* seizure prophylaxis) |
| Lorazepam (Ativan) | 0.5-10 | (Insomnia, sedation induction, sedation maintenance,* agitation,* chemotherapy-induced nausea and vomiting*) |
| Oxazepam | 30-120 | (Insomnia*) |
| **Antihistamine** | | |
| Hydroxyzine (Vistaril) | 25-400 | (Anxiety, ectopic dermatitis, nausea and vomiting, ethanol withdrawal, pruritis, sedation induction, allergic rhinitis,* GAD,* insomnia*) |

*Off-label uses for medications.

phobia) are summarized in Box 15-4. The decision to sedate these patients for dental treatment should be made in consultation with the patient and his or her physician. The choice of appointment length is affected by the decision regarding sedation. Short, early-morning appointments are preferred for the anxious patient who does not receive additional sedation. Long appointments are indicated when the patient will be sedated so as to accomplish as much treatment as possible at one visit. Allowing the patient some control over the timing of procedures during the appointment may reduce general anxiety and help make the experience less threatening. Postoperative information should be provided both verbally and in writing to prevent any confusion about the instructions.

## DEPRESSIVE DISORDERS

Mood disorders, also referred to as **affective disorders**, share the features of a sad, empty or irritable mood, along with somatic and cognitive changes that cause significant dysfunction.[3] Depressive disorders have an unknown etiology but are understood to be the result of a complex interaction of life events, genetic predisposition, and alterations in CNS neurotransmitters.[7,8] Patients with these disorders manifest symptoms associated with changes in the neurotransmitters norepinephrine (NE), serotonin (5-HT), and dopamine (DA). Most antidepressants exert their effects by altering the levels or effective concentrations of these neurotransmitters.[7,8]

### Major Depressive Disorder

**Major depressive disorder (MDD)** is the most common depressive disorder. This condition has a 12-month prevalence rate in the United States of 7%. MDD is a disabling, often recurrent, disease with patients exhibiting significant occupational, social, and physical impairment. The onset of MDD often occurs in puberty, with incidence peaking in the twenties. Females are 1.5 to 3.0 times more likely than males to suffer from this disorder.[3] First-degree family members of individuals diagnosed with MDD have a two- to fourfold higher risk for the disorder than the general population. The course of the disorder varies widely; those with early-onset, multiple episodes, or severe or persistent symptoms are at higher risk of recurrence. The risk of recurrence of MDD decreases as the duration of remission increases.[3] Box 15-5 lists the main diagnostic criteria for MDD.

The clinician must remember that depressive illnesses often are associated with the treatment or progression of chronic physical disease. MDDs are managed with a combination of medication, behavioral therapy, and, occasionally, electroconvulsive therapy. MDD responds best to a combination of drug therapy and psychotherapy.

### Persistent Depressive Disorder (Dysthymia)

**Persistent depressive disorder** is defined as a depressed mood for most of the day, for more days than not, for at least 2 years in adults and 1 year in children and adolescents. The disorder also includes the presence, while depressed, of at least two of the following symptoms: poor appetite or overeating, insomnia or hypersomnia, low energy or fatigue, low self-esteem, poor concentration or difficulty making decisions, or feelings of hopelessness.[3] The disorder usually presents in childhood or adolescence with an insidious onset. The 12-month prevalence in the United States is estimated at 2%. The effect of this disorder on functional ability varies widely and can equal or exceed the disability seen with MDD.[3] Individuals with persistent depressive disorder are at higher risk of other psychiatric comorbidity, especially substance abuse, than those with MDD.

### Antidepressant Medications

Antidepressants are beneficial in 70% of patients and are chosen based on the patient's personal or family history of antidepressant response, any comorbid medical conditions, cost, and the potential for drug interactions.[9] A list of commonly prescribed antidepressant medications can be found in Table 15-3.

**BOX 15-4 Treatment Planning Considerations for Patient with Anxiety Disorders**

- An accurate health and drug history is essential.
- The length of the appointment(s) must be carefully considered.
- Sedation should be considered as a means of improving the patient's acceptance of and response to treatment. Early-morning appointments are preferred if the patient is anxious.
- Sedative drugs taken at bedtime the night before the appointment can relieve preappointment insomnia.
- Medications with CNS depressant activities should be used judiciously.
- The patient should be allowed some control over procedures. For example, invite the patient to raise a hand if a break is necessary or if discomfort is experienced.
- Both written and verbal posttreatment instructions should be provided to the patient to prevent confusion.
- If the patient is to be sedated, arrangements must be made for an escort to and from the appointment.

**BOX 15-5 Diagnostic Criteria for Major Depressive Disorder[3]**

The diagnostic criteria for MDD include five or more of the following symptoms present during the same 2-week period. These symptoms occur nearly every day and will be associated with depressed mood or loss of interest/pleasure:

- Depressed mood (feeling sad, empty, hopeless), tearfulness.
- Decreased interest or pleasure in almost all activities.
- Significant weight loss/gain (>5% in a month), change in appetite.
- Insomnia or hypersomnia.
- Psychomotor agitation or retardation.
- Fatigue or loss of energy.
- Feelings of worthlessness, excessive or inappropriate guilt.
- Diminished ability to think or concentrate, indecisiveness.
- Recurrent thoughts of death, recurrent suicidal ideation, suicide attempt or plan.
- The symptoms cause significant distress or dysfunction.

## TABLE 15-3 Antidepressant Medications: Dosages and Indications[7,8]

| Antidepressant Medications | Usual Dosage Range (mg/day) | Select Adverse Effects (Other Indications, Off-Label Use*) |
|---|---|---|
| **Dopamine Reuptake Blocking Agent** | | Seizures, xerostomia, dysphagia, dysguesia, bruxism, gingivitis, glossitis |
| Bupropion HCl (Wellbutrin, -XL, Zyban) | 200-450 | (Nicotine withdrawal, neuropathic pain,* ADHD*) |
| Bupropion HBr ER (Aplezin) | 174-522 | |
| **Monoamine Oxidase Inhibitors (MAOIs)** | | Xerostomia, orthostatic hypotension, hypertension, tachycardia, hypertensive crisis when given mixed-acting or indirect-acting sympathomimetics |
| Isocarboxazid (Marplan) | 20-60 | (Panic disorder,* social phobia*) |
| Phenelzine (Nardil) | 15-90 | (Panic disorder,* social phobia,* migraine prophylaxis,* OCD*) |
| Selegiline (Eldepryl, Zelapar) | 1.25-10 | (Parkinsonism, depression*) |
| Selegiline Transdermal (Emsam) | 6-12 | |
| Tranylcypromine (Parnate) | 20-60 | (Panic disorder,* social phobia*) |
| **Noradrenergic Antagonist** | | Drowsiness, dysguesia, orthostatic hypotension, ulcerative stomatitis |
| Mirtazapine (Remeron) | 15-45 | (tremor,* pruritis*) |
| **Selective Serotonin Reuptake Inhibitors (SSRIs)** | | Sedation, dry mouth, all cause bruxism, increased risk of bleeding (impaired platelet aggregation) especially when used with NSAIDs or other anticoagulants, (other uses [labeled and off-label] include OCD, anxiety, panic disorder, PTSD, social phobia, hot flashes, premenstrual dysphoric disorder, posttraumatic stress syndrome) |
| Citalopram (Celexa) | 20-40 | (Menopause*) |
| Escitalopram (Lexapro) | 10-20 | |
| Fluoxetine (Prozac, Sarafem) | 10-80 | (Bulimia nervosa, fibromyalgia,* anorexia nervosa,* obesity,* orthostatic hypotension*) |
| Fluvoxamine (g, Luvox CR) | 50-300 | (Bulimia nervosa*) |
| Paroxetine (Paxil, -CR Brisdelle) | 7.5-75 | 7.5 mg for hot flashes, (menopause, premature ejaculation*) |
| Sertraline (Zoloft) | 50-200 | (Hot flashes,* pruritus,* premature ejaculation*) |
| **SSRI/Alpha-1 Antagonist** | | Alpha-1 adrenergic antagonist, xerostomia, dysguesia, stomatitis, increased risk of bleeding (impaired platelet aggregation) especially when used with NSAIDs or other anticoagulants |
| Nefazodone | 200-600 | |
| **SSRI/Serotonin Receptor Agonist/ Antagonist** | | Xerostomia, dysguesia, increased risk of bleeding (impaired platelet aggregation) especially when used with NSAIDs or other anticoagulants |
| Vortioxetine (Brintellix) | 10-20 | |
| **SSRI/Serotonin Receptor Partial Agonist** | | Xerostomia, dysguesia, increased risk of bleeding (impaired platelet aggregation) especially when used with NSAIDs or other anticoagulants |
| Vilazodone (Viibryd) | 10-40 | |
| **Serotonin Norepinephrine Reuptake Inhibitors (SNRIs)** | | Hypertension, xerostomia, sedation |
| Desvenlafaxine ER(Pristiq, Khedezla) | 50-400 | (Hot flashes,* menopause*) |
| Duloxetine (Cymbalta, Irenka) | 30-120 | (Anxiety, hot flashes, neuropathic and musculoskeletal pain, fibromyalgia, stress urinary incontinence [women])* |
| Levomilnacipran ER (Fetzima) | 20-120 | |
| Milnacipran (Savella Ixel) | 100-200 | (Fibromyalgia, depression*) |
| Venlafaxine (Effexor -XR) | 75-375 | Dysgeusia, ([-XR: GAD, panic disorder, social anxiety disorder], ADHD*, diabetic neuropathy,* hot flashes,* migraine prevention,* OCD,* PTSD*) caution with vasoconstrictors |
| **Serotonin-2 Receptor Antagonist** | | Xerostomia, dysguesia, orthostatic hypotension, very sedating |
| Trazodone (Oleptro ER) | 150-400 | (Insomnia,* anxiety,* panic disorder,* alcoholism*) |

**TABLE 15-3 Antidepressant Medications: Dosages and Indications—cont'd**

| Antidepressant Medications | Usual Dosage Range (mg/day) | Select Adverse Effects (Other Indications, Off-Label Use*) |
|---|---|---|
| **Tetracyclic Antidepressant** | | |
| Maprotiline | 75-225 | Xerostomia, dysguesia, dysphagia, drowsiness, cardiac dysrhythmias (Enuresis*) |
| **Tricyclic Antidepressants (TCAs)** | | High incidence of xerostomia, orthostatic hypotension, ulcerative stomatitis, glossitis, dysphagia |
| ***Tertiary Amines*** | | |
| Amitriptyline | 50-200 | (Neuropathic pain,* migraine prophylaxia,* insomnia,* fibromyalgia*) |
| Clomipramine (Anafranil) | 25-250 | (OCD, depression,* anxiety) |
| Doxepin | 50-300 | Doxepin 3-6 mg (Silenor) for sleep maintenance (Anxiety, eczema, insomnia) |
| Imipramine (Tofranil, -PM) | 50-200 | (Enuresis, ADHD,* bulimia nervosa,* overactive bladder*) |
| Trimipramine (Surmontil) | 50-200 | |
| **Tricyclic Antidepressants** | | |
| ***Secondary Amines*** | | |
| Amoxapine | 50-400 | Also blocks dopamine receptors, tardive dyskinesia, parkinsonian reactions |
| Desipramine (Norpramin) | 50-300 | (ADHD* bulimia nervosa,* neuropathic pain,* panic disorder,* social phobia) |
| Nortiptyline (Pamelor) | 25-150 | (Neuropathic and musculoskeletal pain,* enuresis,* panic disorder,* migraine prophylaxis,* nicotine withdrawal*) |
| Protriptyline (Vivactil) | 10-60 | (Sleep apnea,* chronic obstructive pulmonary disease*) |

*Off-label uses for medications.

## Tricyclic Antidepressants

Tricyclic antidepressants (TCAs) were considered first-line therapy for depressive disorders until the development of the SSRIs, which offer an improved safety profile and equal efficacy with fewer adverse effects. TCAs interact with many neurotransmitter systems, causing a wide variety of adverse effects. In addition to inhibiting NE and 5-HT reuptake, they block muscarinic M1, histamine H1, and alpha-adrenergic receptors and are thus associated with strong anticholinergic effects, orthostatic hypotension, weight gain, and cardiac conduction disturbances. These agents are especially dangerous in overdose situations and must be used with caution in patients with any cardiac disease.[7] Today, TCAs are most commonly prescribed as adjunctive agents for the management of chronic pain syndromes, including postherpetic neuralgia, peripheral neuropathy, and arthritic pain.[10]

It is important to note that TCAs exhibit a pharmacodynamic interaction with vasoconstrictors by potentiating the pressor response of direct-acting sympathomimetics (epinephrine, levonordefrin) used with local anesthetics. Intensification of pressor activity results in raised blood pressure. This hypertensive effect is much greater with levonordefrin than with epinephrine, making epinephrine the vasoconstrictor of choice in patients who are taking TCAs. Yagiela and others set the standard of care by suggesting an epinephrine limitation of 0.05 mg (5.4 mL of local anesthetic with 1:100,000 epinephrine) per dental appointment session for patients on TCAs,[11] whereas Brown and Rhodus reported minimal interactions between TCAs and vasoconstrictors.[12]

## Selective Serotonin Reuptake Inhibitors

SSRIs represent the majority of newly written prescriptions for depression and are without many of the serious side effects encountered with TCAs.[13,14] Although their cardiovascular side effects are mild, SSRI use is associated with multiple adverse effects, including nausea, fatigue, drowsiness, headache, nervousness, sexual dysfunction, insomnia, and xerostomia.[7,8] SSRIs have been linked to nocturnal bruxism (Figure 15-1). It has been suggested that the SSRI-induced increase in serotonin in the mesocortical tract causes inhibition of the release of DA in the brain. DA acts centrally to inhibit the motor activity of jaw muscles; therefore, reduced

**FIG 15-1** Attrition of the mandibular teeth from nocturnal bruxism.

levels of this neurotransmitter allow for development of bruxism.[15,16] Patients may develop bruxism and myalgia within the first few weeks of SSRI therapy.

Serotonin release by platelets is involved in hemostasis. Psychotropic drugs that decrease serotonin reuptake are known to increase the risk of upper gastrointestinal bleeding. This risk is potentiated by drugs that interfere with hemostasis (e.g., aspirin, warfarin, nonsteroidal antiinflammatory drugs [NSAIDs]).[7]

### Serotonin-Norepinephrine Reuptake Inhibitors

TCAs were the first serotonin norepinephrine reuptake inhibitors, but their effects on multiple neurotransmitter systems cause a variety of adverse effects, even at moderate doses. Newer agents have been developed that interact more specifically to inhibit the reuptake of serotonin and norepinephrine, thus avoiding many of the adverse effects associated with TCAs. These agents are prescribed for patients who have not derived an antidepressant benefit from SSRI therapy, as well as for neuropathic pain syndromes and anxiety disorders, among other indications.[7] The side effect profile is similar to that of the SSRIs.

### Monoamine Oxidase Inhibitors

Monoamine oxidase inhibitors (MAOIs) were the first class of antidepressants available for clinical use. The monoamine oxidase enzyme system consists of 2 isoforms (MAO-A and MAO-B), which are responsible for the metabolic breakdown of biogenic amine neurotransmitters. MAO-A deaminates NE, epinephrine and 5-HT while MAO-B metabolizes DA (together with MAO-A) and phenylethylamine.

The original MAOI antidepressants (phenelzine, and tranylcypromine) are irreversible inhibitors of both isoforms of monoamine oxidase and commonly designated as MAO-As. The use of MAO-As causes increased concentrations of these biogenic amines in storage sites throughout the CNS and sympathetic nervous system. The antidepressant effect of MAO-As can be attributed to both the increased availability of these neurotransmitters and drug-induced changes in receptor sensitivity (down-regulation of adrenergic and serotonin receptors).[7]

MAO-As are rarely used in clinical practice due to their extensive drug and food interaction profile. These agents prevent the inactivation of tyramine (an exogenous monoamine) by peripheral monoamine oxidase in the GI tract. Freely circulating tyramine causes the release of norepinephrine from storage sites and can result in a potentially fatal hypertensive crisis. It is crucial that patients on MAO-As avoid tyramine-containing foods (e.g., aged cheeses, fermented sausages, soy sauce, red wine).

In addition to dietary restrictions, many common over-the-counter and prescription drugs may elicit hypertensive reactions when combined with MAO-As. Of special importance in dentistry is the interaction between these agents and indirect or mixed-acting sympathomimetics (pseudoephedrine, ephedrine, phenylephrine), which can produce a life-threatening hypertensive crisis. Direct-acting sympathomimetics (levonordefrin, epinephrine), however, react minimally when administered to patients on MAO-A therapy.[11,17]

Newer drugs (selegiline, rasagiline) have been developed that are specific antagonists of MAO-B, the enzyme that is responsible for the breakdown of dopamine. These MAO-B inhibitors are primarily used for the treatment of Parkinson's disease.

Gaining information about who has prescribed an antidepressant and the indications for the drug's use represents an important component of the medication history, particularly because many patients take antidepressants for nonpsychiatric indications. Jumping to the conclusion that a patient is depressed because of a prescribed medication can damage the mutual trust and rapport between patient and dentist. It is also important to evaluate the patient's use of herbal remedies, such as St. John's wort, for depression. Although the therapeutic value is questionable, there is still potential for drug interactions similar to SSRIs.

## Treatment Planning for the Patient with Depressive Disorder

The dentist should address three interrelated areas of concern in the management of patients with depressive disorders: medications, mental status, and oral health needs (Box 15-6). The primary medication issue involves the determination of whether vasoconstrictors can be used safely. Cautious use of vasoconstrictors is recommended for patients taking TCAs and MAOIs. The hypertensive response to vasoconstrictors is largely dose dependent, so it is imperative that the dentist be aware of the details of the patient's current regimen. Vasoconstrictors may be used safely for patients taking SSRIs. Direct-acting sympathomimetics are the only vasoconstrictors appropriate for patients currently taking or recently withdrawn from MAOI therapy. The dentist should be cautious in prescribing centrally acting analgesics, such as hydrocodone, to patients taking certain antidepressants, because they may enhance the sedative side effects.

Before beginning a procedure, the dentist should determine whether the patient feels well enough to undergo treatment. Routine treatment should be deferred if the patient is

**BOX 15-6 Treatment Planning Considerations for Patient with Depressive Disorders**

- Obtain an accurate health and medication history.
- Recommend an aggressive plaque control program.
- Be aware of drug interactions with vasoconstrictors, NSAIDs, and others.
- Manage diminished salivary output or xerostomia.
- Evaluate for increased parafunctional activities and myalgia.
- Determine whether the patient feels well enough to tolerate treatment.
- Defer treatment if necessary because of poor mental or oral hygiene status.

experiencing the manic phase of bipolar disorder. Patients with depressive disorders may have a significant oral hygiene compliance problem. If the patient is experiencing a depressive episode that interferes with the ability to maintain oral health, plaque control with a chlorhexidine rinse may be indicated. Xerostomia should be treated aggressively to prevent caries. Postoperative instructions should be given both verbally and in writing to prevent any confusion. There may be times when the depth of the patient's depression is so great that definitive treatment should be deferred until the depression is better controlled.

## BIPOLAR I AND BIPOLAR II DISORDERS

**Bipolar disorders** are characterized by cyclical episodes of mania, or elevated mood, and, usually, depression. Epidemiologic studies show that bipolar disorders have a lifetime prevalence rate of approximately 2.6% in the United States.[1] Genetic predisposition is an important determinant in the development of bipolar disorders. Environmental triggers and the dysregulation of neurotransmitters and neurohormones are also contributing factors to this disorder.[18]

Patients who have experienced one or more episodes of mania are classified as having bipolar I disorder. Bipolar I disorder differs from MDD in that patients experience mania, which is characterized by recurrent fluctuations of increased energy, expansive mood, and inappropriate behavior. During manic episodes, patients often exhibit symptoms of grandiosity, increased talking, racing thoughts, hyperactivity, and decreased need for sleep. A diagnosis of Bipolar II disorder requires at least one episode of major depression and at least one hypomanic episode for diagnosis. Manic and depressive episodes are often separated by intervals in which the patient exhibits no signs or symptoms of mental illness. Alcohol and substance abuse are frequent comorbid conditions associated with bipolar illness. Suicide attempts occur in up to 50% of patients with bipolar illness, and 10% to 19% commit suicide.[18]

Multiple theories exist to explain the mood swings that occur in patients with bipolar disorders. Dysregulation of the neurotransmitters NE and DA may account for the mood swings that occur in this disease. Increased dopaminergic ($D_2$) activity can result in hyperactivity, mania, and psychosis. Lithium, an inhibitor of the formation of DA, was the first agent used as a "mood stabilizer" for bipolar disorder. Lithium is effective in a majority of patients with Bipolar I and II disorders but has the disadvantage of possessing a low **therapeutic index,** meaning it is easily toxic.[7,18] Currently, lithium and valproate are considered first-line medications both for the treatment of acute mania and as prophylaxis for recurrent manic and depressive episodes. Alternative or adjunctive treatments include anticonvulsants (lamotrigine, carbamazepine) and second-generation antipsychotics (quetiapine, risperidone, aripiprazole).[18] NSAIDs, thiazide diuretics, and angiotensin-converting enzyme inhibitors can elevate lithium levels. Of dental concern is the xerostomia, dysgeusia, and salivary gland swelling that may occur with lithium therapy.

## SCHIZOPHRENIA SPECTRUM AND OTHER PSYCHOTIC DISORDERS

These illnesses include schizophrenia, personality (schizotypal) disorders, and other psychotic disorders. These disorders have varying effects on level of function, but often include prolonged symptoms of progressive social withdrawal, poor self-care, auditory hallucinations, delusions, disordered thinking (speech), flattened affect, and impaired concentration.[19]

### Schizophrenia

Approximately 1% of the U.S. population suffers from schizophrenia, with both genders equally affected. The hallmark symptoms of delusions and hallucinations (psychosis) often start between 16 and 30 years of age.[3] Schizophrenia is a chronic disease that requires lifelong treatment. The long-term prognosis for this disorder is poor, as patients have significant, lifelong impairment in interpersonal relationships and the ability to function in society.[20]

Symptoms of schizophrenia are usually characterized as positive, negative, and cognitive (Box 15-7). Positive symptoms are symptoms that occur owing to the disease. These include hallucinations, delusions, and thought and movement disorders. Hallucinations, most commonly "hearing voices," are disturbances of perception, whereas delusions are fixed, false beliefs. The most common delusions are the persecutory type, in which affected individuals may believe they are being conspired against, followed, spied on, or harassed by other individuals or organizations.[3]

Disorganized thinking (formal thought disorder) manifests as problems with speech. Difficulty in communication results from a lack of continuity of thought, in which the individual lacks concentration, focus, and logical sequence. Topics may change rapidly (derailment), and the patient may be easily distracted. Speech may suddenly stop or be garbled.

**BOX 15-7 Symptoms of Schizophrenia[3]**

**Positive**
Delusions
Hallucinations
Disorganized thinking (speech)
Movement disorders

**Negative**
Diminished emotional expression
Lack of drive or motivation
Diminished speech
Inability to experience pleasurable activities
Lack of desire to be social

**Cognitive**
Difficulty focusing
Diminished "working memory"
Difficulty understanding and using information

Data also from http://www.nimh.nih.gov/health/topics/schizophrenia/index.shtml. Accessed May 1, 2014.

Movement disorders can manifest as repetitive motions or, rarely, catatonia.[3]

Negative symptoms are disruptions in emotions and behavior. The most predominant negative symptoms of schizophrenia are diminished emotional expression, often thought of as blunted or flattened affect, and avolition, a lack of drive or motivation to initiate or sustain activities. Other negative symptoms include **anhedonia** (an inability to experience pleasure in life), **alogia** (diminished speech), and **asociality** (lack of desire for social interaction).[3] Cognitive symptoms include difficulty in several areas: focusing or paying attention, understanding and using information to make decisions, and difficulty using information immediately after learning it.

Antipsychotic medications are the treatment of choice for acute psychotic episodes and to prevent relapse. The positive symptoms of schizophrenia (hallucinations and delusions) respond best to pharmacotherapy, whereas the negative symptoms are more difficult to treat. The serious, debilitating nature of schizophrenia requires both comprehensive psychosocial management and continuous use of antipsychotic agents to reduce the frequency of relapse.[3,20]

## Antipsychotic Medications

Antipsychotic drugs are commonly divided into two groups: first-generation agents and second-generation (sometimes called "atypical" agents). The exact mechanism of antipsychotic action is unknown, but currently available agents have various levels of $D_2$ and serotonergic ($5\text{-}HT_{2A}$) antagonism. In addition, many affect other neurotransmitter receptors (e.g., alpha-1, histamine-1, $D_3$), accounting for different adverse effect profiles. Although both groups of drugs have similar efficacy, each is associated with significant adverse effects.

First-generation antipsychotics have a high affinity for $D_2$ receptors. These agents are noted for extrapyramidal side effects (pseudoparkinsonism, tardive dyskinesia, dystonia). Although second-generation agents have fewer neurologic side effects, many are associated with significant metabolic effects. These include weight gain, hyperlipidemias, and diabetes mellitus. Choice of agent therefore depends on patient-specific factors that take into account comorbid conditions and family history of cardiovascular disease and diabetes. As with antidepressants, family and personal history of antipsychotic efficacy can aid in drug selection. Table 15-4 lists

**TABLE 15-4 Common Antipsychotic Medications**[7,8]

| Antipsychotic Medications | Usual Dosage Range (mg/day) | Possible Adverse Events (Other Indications, Off-Label Use*) |
|---|---|---|
| **First-Generation Antipsychotics** | | Xerostomia, orthostatic hypotension, tardive dyskinesia, dysphagia, dysguesia (other indications [label and off-label] include schizophrenia, acute psychosis, agitation) |
| Chlorpromazine | 100-1000 | (acute intermittent porphyria, nausea and vomiting, hiccups, tetanus) |
| Fluphenazine | 2-20 | |
| Haloperidol (Haldol) | 2-100 | (ADHD, Tourette's syndrome, delirium,* mania,* migraine,* hiccups*) |
| Loxapine | 10-80 | (Bipolar depression) |
| Molindone (Moban) | 15-225 | |
| Perphenazine | 2-24 | Nausea and vomiting |
| Pimozide (Orap) | 1-10 | (Tourette's syndrome) |
| Prochlorperazine (Compazine) | 15-40 | (Nausea and vomiting, anxiety, migraine*) |
| Thioridazine | 150-300 | |
| Thiothixene | 6-60 | |
| Trifluoperazine | 2-40 | (Anxiety) |
| **Second-Generation Antipsychotics** | | All except lurasidone cause QT prolongation, xerostomia, sialorrhea, dysphagia, bruxism, dysguesia (other indications [label and off-label] include schizophrenia, bipolar disorder, mania) |
| Aripiprazole (Abilify) | 10-30 | (Autism, depression) |
| Asenapine (Saphris) | 10-20 | |
| Clozapine (Clozaril, Versacloz, Fazaclo) | 12.5-900 | Increased salivation 31%, (schizoaffective disorder, bipolar disorder,* psychosis/agitation*) |
| Iloperidone (Fanapt) | 12-24 | |
| Lurasidone (Latuda) | 40-80 | |
| Olanzapine (Zyprexa) | 5-20 | (Depression) |
| Paliperidone (Invega, -Sustenna) | 3-12 | |
| Quetiapine (Seroquel, -XR) | 150-800 | (Depression, obsessive-compulsive disorder*) |
| Risperidone (Risperdal) | 1-8 | (Autism, Tourette's syndrome*) |
| Ziprasidone (Geodon) | 40-160 | (Tourette's syndrome*) |
| **Second-Generation Antipsychotic and Selective Serotonin Reuptake Inhibitor** | | Adverse events – see individual agents |
| Olanzapine/fluoxetine (Symbyax) | 6/25-18/75 | (Depression associated with bipolar I disorder, treatment-resistant depression) |

*Off-label uses for medications.

antipsychotic agents with their normal daily oral dosage range and indications for use.

**Tardive dyskinesia** is characterized by persistent involuntary movement of the lips, jaws, or face and involuntary movements of the extremities, and usually occurs after prolonged use of antipsychotic medications. Risk factors include advanced age, poor drug response, the occurrence of acute extrapyramidal symptoms, diagnosis of organic mental disorder, mood disorders, and, possibly, female gender.[20]

Although some reports of spontaneous remission have been reported, there is no treatment for tardive dyskinesia. Fine tremor of the tongue has been reported as a prodrome of tardive dyskinesia, and if the medication is discontinued subsequent to this finding, the full range of symptoms may not occur. The dentist may be the first healthcare provider to recognize the onset of tardive dyskinesia. Every effort should be made to identify early signs of this disorder so that the medication regimen can be altered and further damage prevented.

The involuntary movements of the jaws that characterize tardive dyskinesia make it difficult for the patient to maintain adequate oral hygiene and may precipitate the development of temporomandibular disorders. It can be very challenging to perform a clinical procedure on a patient with involuntary jaw movements.

### Treatment Planning for the Patient with a Psychotic Disorder

Treatment planning considerations for the patient with psychotic disorders are summarized in Box 15-8. The dentist has two primary responsibilities when treating the schizophrenic patient:

1. The dentist needs to be sure that adequate control of the disease process is being maintained.
2. The dentist must be alert to the development of any oral effects of the disease or the antipsychotic medications and must be prepared to manage these appropriately.

All except emergency treatment must be deferred for the patient with uncontrolled or poorly controlled psychoses. Chlorhexidine rinses should be considered with the understanding that the patient may not be able to cope with a task as simple as swishing and expectorating.

**BOX 15-8 Treatment Planning Considerations for Patient with Psychotic Disorders**

- Obtain an accurate health and medication history.
- Implement an aggressive plaque control program.
- Manage diminished salivary output or xerostomia; encourage the patient to maintain adequate hydration.
- Determine whether the patient feels well enough to tolerate treatment.
- Defer treatment if necessary because of poor mental or oral hygiene status. Be alert for adverse effects of psychotropic medications, especially (1) orthostatic hypotension and (2) extrapyramidal effects, such as pseudoparkinsonism, acute dystonia, akathisia, or tardive dyskinesia.

Xerostomia, orthostatic hypotension, anticholinergic effects, and extrapyramidal effects are major treatment planning considerations in the medicated patient with a psychotic illness.[21] Because most antipsychotic medications are associated with salivary gland hypofunction, adequate plaque and caries control is of critical importance. Cholinergic agonists, such as cevimeline and pilocarpine, will stimulate saliva production in patients with diminished salivary flow rates. Because of the potential for serious drug and disease state interactions, consultation with the prescribing healthcare provider should be made before use of a cholinergic agent. Orthostatic hypotension is unavoidable in patients treated with antipsychotic agents, but its manifestation—syncope—can be prevented by minimizing rapid changes in patient positioning and by keeping the patient in a seated position until any sensation of dizziness has dissipated.

The **extrapyramidal effects** of psychotic medications may necessitate modification of the dental treatment plan. These effects include tardive dyskinesia; **pseudoparkinsonism,** similar to the tremor disorder seen with Parkinson's disease; **dystonia,** an irregular contraction of muscles; and **akathisia,** the inability to sit still. Patient sedation or the use of general anesthesia may be considered as strategies for diminishing the effects of tardive dyskinesia, but the interaction between sedative, anesthetic, and antipsychotic medications must be carefully evaluated. Definitive dental care should be deferred if the patient is experiencing a psychotic episode.

## OTHER PATHOLOGIC BEHAVIORS

### Obsessive-Compulsive and Related Disorders

Obsessive-compulsive disorder (OCD), body dysmorphic disorder, hoarding, excoriation, and substance/medication-induced OCD have a close relationship to anxiety disorders. OCD is a psychiatric condition in the United States with a 12-month prevalence rate of 1.2% of the population. *Obsessions* are defined as recurrent persistent thoughts, urges, or images that the patient recognizes as inappropriate. Attempts to suppress these unwanted thoughts produce significant anxiety. *Compulsions* (or rituals) are repeated behaviors or mental acts that the patient feels compelled to perform in response to an obsession (e.g., ritualistic washing due to fears of contamination). Box 15-9 lists some common symptoms of OCD.[3,22]

The onset of OCD usually occurs in late adolescence or early adulthood, with most patients exhibiting both obsessive and compulsive symptoms. Patients with OCD usually have some level of insight, recognizing that their thoughts and behaviors are irrational, but are unable to control them (Figure 15-2). Common themes are cleaners and checkers. Checkers spend much of their day making sure that lights or the stove is turned off, or that all of the doors and windows are locked, owing to an underlying fear of catastrophe. Cleaners may continually clean themselves in an attempt to avoid illness.[3] This ritualistic cleansing may involve every waking hour.

OCD usually presents with other mental disorders.[23] CBT is the treatment of choice for mild OCD. Many patients also require pharmacologic intervention in the form

**BOX 15-9 Symptoms of Obsessive-Compulsive Disorder[3]**

**Obsessions**

Repetitive thoughts:
- Contamination (germs/disease, bodily fluids, dirt)
- Unwanted sexual thoughts

Repetitive images:
- Violent or horrific scenes
- Inappropriate sexual conduct

Repetitive urges:
- Fear of acting on impulse to harm self/others

Perfectionism (fear of losing important information, need to put objects in specific order)

**Compulsions**

Cleaning: constantly washing self or objects, excessive toothbrushing

Checking: that nothing terrible happened, that a mistake has not been done or harm to self/others

Repeating: rewriting, repeating bodily movements, repeating activities in exact/safe numbers

Collecting: hoarding items

Mental: counting while performing a task

**FIG 15-2** Compulsive lip biting in a patient with obsessive-compulsive disorder (OCD).

of high doses of potent SSRIs.[24] Even with pharmacologic treatment, many OCD patients still suffer from lifelong disabling symptoms.[3]

### Treatment Planning for Patients with Obsessive-Compulsive and Related Disorders

Treatment planning considerations for the patient with OCD are similar to those for the patient with anxiety disorders. Length of appointment and the use of sedation are important considerations in the plan for treating these patients. When providing instructions to the patient, be very specific about how long or how many times a particular activity should be performed.

## Posttraumatic Stress Disorder

Posttraumatic Stress Disorder (PTSD) was once thought to be primarily a disorder of war veterans (approximately 30% of individuals who have spent time in a war zone manifest signs or symptoms of PTSD).[25,26] Although direct exposure to actual or near death, serious injury, or sexual violence are all triggers of PTSD, individuals can also develop PTSD after witnessing these events happening to others or learning that the traumatic event(s) have happened to someone close to them, or after repeated exposure to traumatic situations (emergency medical personnel, police).[3] PTSD is now recognized in many different population groups, such as survivors of natural disasters and victims of mugging, rape, or automobile accidents.

An estimated 7.7 million U.S. adults are affected by PTSD every year.[25] The disorder may occur at any age. The symptom clusters identified in DSM-V include reexperiencing, avoidance, persistent negative alterations in cognition and mood, and arousal and reactivity. These can manifest as nightmares, flashbacks, avoidance of pleasurable activities, difficulty with social interactions, lack of trust, irritability, and aggression. This disorder is often associated with anxiety, depression, or substance abuse. Symptom onset most frequently occurs within the first 3 months after the trauma but may be delayed. Fifty percent of adults will completely recover within 3 months, whereas others continue to experience chronic symptoms that fluctuate in response to life stressors, new trauma, or reminders of the event.[3]

Treatment for PTSD is dependent on presenting symptoms and often consists of psychoeducation or psychosocial/therapy, including CBT. Antidepressants, usually SSRIs, are first-line pharmacotherapeutic agents in the management of this disorder, as they also treat the associated anxiety and depression that often accompany PTSD.

### Treatment Planning for Patients with Posttraumatic Stress Disorder

Patients with PTSD require many of the basic treatment planning considerations used for patients with anxiety or depression. It is important to determine whether the patient can identify his or her "good" days and "bad" days so that appointments on "bad" days can be avoided. Additionally, there is a high level of substance abuse associated with PTSD, so the clinician should be cognizant of the potential for drug interactions as well as illicit drug use. Patients with PTSD have a high prevalence of bruxism and other parafunctional activities. Bruxism in the presence of a dry mouth may result in more rapid loss of tooth structure than would be the case in a patient with normal salivary output. Additionally, bruxism places a greater occlusal load on existing and planned resorations.[27,28]

## Attention-Deficit/Hyperactivity Disorder

Central to the diagnosis of attention-deficit/hyperactivity disorder (ADHD) is a continuous pattern of inattention and/or hyperactivity-impulsivity that affects functioning or development.[3] This disorder occurs in approximately 5% of U.S. children and persists into adulthood for 50% of affected individuals. *Inattention* can present as difficulty staying focused or on task, a lack of persistence, inability to follow through on

instructions, or being disorganized. *Hyperactivity* manifests as excessive motor activity, fidgeting, or talkativeness. *Impulsivity* can be seen in an inability to delay gratification, interrupting conversations, or intrusive behavior.

This disorder has a strong genetic component and occurs more frequently in males, at a 2:1 ratio in childhood and a 1.6:1.0 ratio in adulthood.[3] Children with ADHD often experience lower academic achievement and problems with peer relationships. Adults exhibit fewer symptoms of ADHD than children; impairment is seen in decreased employment, occupational performance, and attendance, and higher levels of interpersonal conflict.[3]

Stimulant medications (e.g., methylphenidate, dexmethylphenidate, mixed amphetamine salts, dextroamphetamine) are considered first-line pharmacologic therapy for ADHD, as they target the core symptoms of the disorder. These agents are short-acting, and immediate-release dosage forms must be taken 2 to 3 times daily. Extended-release formulations are preferred, as once-daily dosing improves compliance. Nonstimulant agents used in the management of ADHD include atomoxetine, bupropion, and alpha-2 adrenergic agonists (guanfacine, clonidine). A combination of ADHD-specific cognitive and behavioral interventions and pharmacotherapy produces better outcomes than pharmacotherapy alone.[29] Common adverse effects of stimulants include reduced appetite, weight loss, stomachache, insomnia, headache, irritability, and xerostomia.[7,29] Appetite suppression has potentially disastrous dental consequences when combined with dry mouth. Parents frequently allow the child to eat anything as long as he or she eats something, with dietary choices often including foods high in fat and refined carbohydrates. A refined carbohydrate diet and dry mouth constitute strong risk factors for dental caries. Clenching and bruxism seem to be more prevalent in children with this disorder, but it is unclear whether these behaviors are the result of the disorder or the treatment.

### Treatment Planning for the Patient with Attention-Deficit/Hyperactivity Disorder

Patients with ADHD may exhibit widely disparate behaviors. Untreated persons may exhibit hyperactivity, impulsivity, and distractibility. They may have difficulty staying in one place for any length of time, making it difficult to complete a complex dental procedure. Persons who are under treatment for the disorder tend to be more sedate, but may suffer from the adverse effects of their medications—dry mouth, bruxism, and anorexia (Box 15-10).

Children and adolescents are the age groups most likely to be affected with this disorder and the age groups also more likely to have a higher incidence of dental caries. Most medications used in the management of the disorder affect the patient's behavior but do not address any underlying learning disabilities. Patient instructions must be given with this fact in mind. Instructions should be provided in both verbal and written form and may need to be transmitted to a family member or caregiver as well. Bruxism and dental attrition are more common in these patients. If the use of a night guard is considered, the age of the patient and potential for growth of the dental arches must be evaluated and taken into account.

**BOX 15-10 Treatment Planning Considerations for Patient with Attention-Deficit/Hyperactivity Disorder**

- Obtain accurate health and medication histories.
- Recommend an aggressive plaque control program.
- Manage xerostomia and encourage adequate hydration. Recommend maintaining an adequate diet (reduce high carbohydrate content foods).
- Provide written and verbal patient instructions.
- Recommend judicious use of a night guard to avoid any effect on facial development in children.

## SOMATIC SYMPTOM AND RELATED DISORDERS

This diagnostic class includes individuals with a diagnosis of somatic symptom disorder, factitious disorder, illness anxiety disorder, or conversion disorder. These disorders share the feature of predominant somatic (body) symptoms that are associated with a disproportionate degree of patient distress and impairment.[3] Somatic symptom disorder diagnostic criteria include at least one somatic complaint (most patients have more than one) that is distressing or causes a disruption in daily life. According to DSM-V[3], at least one of the following symptoms must also be present:

1. Disproportionate and persistent thought about the seriousness of one's symptoms.
2. Persistently high level of anxiety about health or symptoms.
3. Excessive time and energy devoted to these symptoms or health concerns.

The U.S. prevalence of this disorder is estimated at 5% to 7%, and it is more common in females.

### Somatic Symptom Disorder

For these individuals, an underlying excessive fear of illness and preoccupation with the state of their health leads to overuse of medical care as the individual seeks confirmation of his or her fears/symptoms. Health concerns assume a dominant role in the lives of patients with severe disease, adversely affecting interpersonal relationships and quality of life.[3] Patients with somatic symptom disorder do not fabricate the symptomatology. An underlying medical disorder may or may not be present. When physical illness is present, the level of impairment is markedly higher than expected.[3]

These patients may be demanding with regard to diagnostic testing and may attempt to dictate treatment. It is important for the dentist to identify the problem and provide reassurance that appropriate tests will be performed to help diagnose complaints. Many may also have been diagnosed with other psychological problems, such as depression or an anxiety disorder. Patients with somatization disorder sometimes have several physicians and may be receiving different treatments from each. Identification of all prescription medications and prescribers

minimizes the possibility of creating an adverse response to a medication prescribed in the course of dental treatment.

When the patient presents with symptoms that do not match the physical signs, it is important for the dentist to confer with the patient's primary care physician. The patient may have omitted pertinent information regarding his or her general health status that will explain the complaint, or the dentist may be able to provide the physician with a new piece of information that facilitates a formal diagnosis. In either instance, clear lines of communication must remain open between the dentist and primary care physician. The patient may insist that the dentist make a diagnosis and recommend a specific treatment for the complaint at the time of presentation. In such instances, it is prudent to defer both diagnosis and/or treatment until adequate data are collected to ensure that an accurate diagnosis is made.

The identification of patients with any of the somatoform disorders often takes months to years and is easier to perform in retrospect. Complaints that do not coincide with the physical signs or symptoms that transcend normal anatomic and physiologic boundaries (e.g., neurogenic pain in the mandible that crosses the midline, pain that jumps from maxillary to mandibular teeth) should raise the index of suspicion that a somatoform disorder exists. However, appropriate diagnostic procedures should be performed to rule out a true oral pathologic entity or emergent condition.

## Factitious Disorder

**Factitial injuries** are oral lesions created by the patient that are not attributable to oral disease or accidental trauma. The patient may or may not be aware of having caused the injury. In a patient suffering from OCD, the injury may be a part of a ritual; in a psychotic patient, a form of self-mutilation; or the lesion may simply be the result of an innocent habit in a mouth rendered susceptible because of inadequate saliva. The common types of dental factitial injuries include gingival abrasion with a fingernail (Figure 15-3), obsessive tooth brushing, use of inappropriate aids to clean the teeth, and burns caused by aspirin placement over sore tissue. Although factitial injuries are usually minor, there have been reports of self-extraction of teeth and even autoglossectomy in schizophrenic patients.[30,31] Dental treatment for the more minor forms of factitial injury will involve patient education and symptomatic care.

**FIG 15-3** Gingival irritation as a result of repeated abrasion with a fingernail.

## Denial

A patient's refusal to accept a particular diagnosis is characterized as denial. Although more commonly manifested in association with the diagnosis of a life-threatening disease, denial also can occur in the dental setting. Many patients will deny that their teeth need to be removed when faced with the diagnosis of terminal periodontitis. The dentist can help the patient deal with difficult diagnoses by recognizing denial and providing the patient with a mechanism by which he or she can either confirm or disprove the initial diagnosis (i.e., obtaining a second opinion).

The very fact that the dentist offers the option of securing a second opinion helps diminish anxiety and may allow the person to process the available information in a logical manner. Avoidance of a power struggle or a "my way or the highway" confrontation helps the patient deal with difficult diagnoses and may diminish the effect of denial on dental treatment.

## Collusion

Sometimes the patient attempts to manipulate the dentist into performing a task "as a favor" and at the same time withholds specific information that would in all likelihood have a negative effect on the dentist's willingness to provide the favor. The request may seem trivial, as when the patient says, "Let's not tell my doctor what happened today," when discussing a syncopal episode, vomiting, or a behavior outburst. It could very well be that the physician has told the patient that if such an episode recurs, then serious changes will be made in the treatment regimen. Becoming involved in this type of patient conspiracy, regardless of how trivial it may seem, can have disastrous consequences for both the dentist and patient. It is best to explain to the patient that you will need to speak to the involved persons (e.g., caregiver, physician) to ensure that the patient's health is not compromised. It is difficult for a patient to be upset with a dentist who is truly concerned about his or her overall health.

## Delusions

Sometimes a patient reports a complaint for which no physical signs are apparent. The complaint may be a prodrome for an emergent condition—for example, tingling of the lip before the onset of recurrent herpes labialis, trigeminal neuralgia, or ongoing pulpal necrosis. Adequate diagnostic procedures help identify these conditions. Some oral complaints may be delusional, however. Patients may report that insects are in their gums or that their teeth are disintegrating. Delusional oral complaints may signal the onset of a psychotic episode or the failure of treatment for an existing psychotic disorder. In either instance, referral to or consultation with the primary care physician or therapist is essential. Oral health complaints, no matter how unlikely, must be adequately

explored because a series of bizarre symptoms may in fact reflect a genuine physical pathologic condition. Diabetic neuropathies, for example, can often produce uncommon symptoms that could be mistakenly interpreted as delusional.

### Secondary Gain

Secondary gain occurs when a patient seeks the reward of attention or avoidance of unpleasant tasks as an outcome of his or her illness. Gains include securing time off work, avoiding unpleasant responsibilities, obtaining sympathy, and procuring drugs. This behavior is fairly common in persons with multiple chronic illnesses, but also can manifest in dental patients, especially those with a chronic pain complaint. The index of suspicion should be raised when the patient continues to report pain despite multiple, apparently adequate treatments. These patients may be unable to drive and must be transported to the office by a family member. They may report that they can no longer carry out the activities of daily living. It becomes apparent that if these patients ever recover from their "illness," they may lose their captive audience and need to take care of themselves. This cycle can have untoward effects on the patient, family, and dentist. Consultation with the primary care physician may provide insight into the management of such patients.

## MEDICATION EFFECTS THAT AFFECT DENTAL TREATMENT

### Interactions of Psychotherapeutic Drugs with Medications Used in Dentistry

Many psychotherapeutic agents interact with medications commonly used in dentistry. Although a thorough discussion of dental drug interactions with psychotherapeutic agents is beyond the scope of this text, practitioners must be aware of the drug-drug and drug–disease state interactions that can occur with the medications they prescribe or use in clinical practice. Many interactions relate to the potentiation of the sedative or anticholinergic actions of the psychotherapeutic medication (e.g., dry mouth, orthostatic hypotension, additive sedation). Consultation with the physician prescribing the psychotherapeutic medications should be made when any sort of sedation is planned so that dosage can be adjusted to prevent adverse events.

### Confusion

Many psychotropic medications cause confusion. More prevalent in older patients, this can occur in any age group. Patient confusion is an important factor to take into account when providing dental treatment. The onset of confusion may be a sign that the patient is overmedicated. It is not unusual for the patient with these problems to report that he or she had forgotten whether the medication had been taken at the appropriate time and took a second dose just in case.

Oral hygiene and postoperative instructions should be given both verbally and in writing. Make sure that the patient understands the instructions and if in doubt, also give the instructions to a family member or care provider. If possible, avoid prescribing medications that cause CNS depression and may exacerbate patient confusion. When confusion is a concern, nonopioid analgesics may be a more prudent choice than a centrally acting analgesic.

### Orthostatic Hypotension

Many medications used to manage psychological disorders function to diminish sympathetic tone and cause lowered blood pressure. As a result, sudden changes in position can produce dizziness and a feeling of light-headedness. Syncope is a common occurrence after dismissal of a patient who has spent an hour reclined in a dental chair. Orthostatic hypotension cannot be completely avoided but can be minimized by allowing the patient to slowly acclimate to the seated and standing position after a dental procedure. Orthostatic hypotension may be exacerbated with the use of intravenous sedation or with nitrous oxide conscious sedation. Monitoring preprocedural and postprocedural blood pressure readings or continuously measuring blood pressure is considered the standard of care in management of the sedated patient.

### Intraoral Effects of Psychotherapeutic Agents

Many prescription, over-the-counter, and herbal medications have intraoral effects. Adverse effects include, but are not limited to, problems such as dysgeusia, stomatitis, lichenoid reactions, halitosis, and xerostomia. Most psychotherapeutic agents cause xerostomia, which is the most common adverse intraoral effect of all drugs. (See Xerostomia, later in this chapter.)

Dysgeusia, or altered taste sensation, can be an adverse effect of many drugs, including psychotherapeutic agents. Patients may report a persistent unpleasant taste, altered taste of foods, or generalized loss of taste sensation, referred to as **ageusia.** Patients suffering from dysgeusia should be questioned extensively regarding the nature, severity, and persistence of the altered taste sensation. For some patients, an alteration in taste sensation may be a nuisance; for others, it may interfere with nutritional intake and hydration. Some patients eat constantly in an attempt to eliminate an unpleasant taste in the mouth. Others eat nothing because food "doesn't taste the same." Because large carious lesions, severe periodontal disease, or oral ulcerations also can produce a persistent taste in the mouth, the practitioner must rule out intraoral disease as a causative factor in dysgeusia before considering patient medications as the primary cause. Every effort should be made to diminish the effects of dysgeusia so that it does not interfere with the patient's well-being.

The clinical presentation of reactions to lichenoid drugs may be very similar to erosive lichen planus and can be intensely painful. The discomfort is exacerbated when the patient also suffers from a dry mouth. Such reactions may occur with both phenothiazine antipsychotic agents and TCAs, but are not specific to psychotropic medications. Lichenoid drug reactions have also been reported with a variety of antihypertensive medications and NSAIDs. An incisional biopsy should be performed to confirm the clinical diagnosis.

Treatment for lichenoid drug reactions should be directed toward switching to a medication that does not produce the reaction. If a medication change is not possible, symptomatic areas should be treated with topical corticosteroid agents. However, the use of topical corticosteroids in a dry mouth may predispose the patient to candidiasis. For some patients, it may be necessary to prescribe topical or systemic antifungal medications.

## EFFECT OF PSYCHOLOGICAL DISORDERS ON THE ORAL CAVITY

Many changes in the environment of the oral cavity can be directly related to certain psychological disorders. Common examples include the patient with a psychotic disorder who develops oral ulcers as a result of self-inflicted trauma, or the patient with an OCD who has severely abraded teeth caused by excessive brushing. In many other cases, although the relationship between the mental health condition and oral pathology is indirect, the results can be devastating and pervasive—as with dental caries or progressive periodontal disease. Recognition of and differentiation between direct and indirect disease-related and medication-related oral conditions will be important elements in developing such a patient's treatment plan.

### Xerostomia

Saliva serves many purposes in the oral cavity. Its components serve as lubricants, buffers, digestive aids, and antimicrobial agents. As salivary flow diminishes, and the beneficial effects of saliva also decrease, problems may develop in the oral cavity. Inadequate salivary flow may result in a sore, erythematous oral cavity in a matter of a few days. Patients may complain that they bite themselves, their dentures do not fit, and food does not taste the same. Some patients complain about slime, grit, or a foul taste associated with their saliva. This disparate group of complaints can be confusing to patient and clinician alike.

Although psychological disorders do not cause dental caries formation, because the consequences of and treatments for many of these disorders affect salivary composition and flow, as well as diet, the result may be a significantly increased number and rate of progression of carious lesions. The effect of xerostomia on other oral tissue is shown in Figure 15-4. A frequent side effect of most psychotropic medications, xerostomia can also result from numerous psychological disorders. Stress not only diminishes salivary flow, but also influences the components of saliva. Because salivary immunoglobulin A (IgA) levels and buffering capacity are diminished in patients experiencing high levels of stress or depressive events, an oral environment favorable to caries development may result (Figure 15-5). For patients with removable prostheses, inadequate saliva can affect denture retention and predispose the patient to denture injuries through inadequate lubrication of the oral tissue. Patients should be informed of the adverse effects of inadequate salivary flow before any extensive dental treatment.

**FIG 15-4** Furrowed tongue in patient complaining of dry mouth.

**FIG 15-5** Caries and hypomineralized smooth surface lesions in a patient with xerostomia, poor plaque control, and a diet high in refined carbohydrates.

Diminished salivary flow can be the result of many diseases and medications. Some patients may not complain of dry mouth even when it is apparent clinically that they produce little saliva. Conversely, others may report a dry mouth, whereas in the estimation of the clinician, saliva production is adequate. Both types of patient are managed similarly.

Management of dry mouth can be complex. It is best to begin with strategies that lend themselves to patient compliance. Adequate hydration is essential. Decreasing caffeine intake is helpful in alleviating the symptoms, although compliance can be a problem. Avoidance of alcohol-containing mouthwashes is also beneficial. If these interventions do not provide adequate relief, the next step is the use of artificial saliva. Patients need to use the saliva substitutes frequently (one to two times per waking hour) for the substitute to be effective. The dentist should provide the patient with several saliva substitute options (Box 15-11). Patients with xerostomia sometimes have an altered sense of taste and may not be compliant because of the flavoring in the substitutes. The next stage of therapy involves requesting that the patient's physician either alter the medication regimen or add

**BOX 15-11 Saliva Stimulants and Substitutes**

**Saliva Stimulants**

***Over-the-Counter***

SalivaSure tablets (Scandinavian formulas)

***Prescription***

Pilocarpine HCl tablets, ophthalmic drops
Cevimeline HCl capsules
Bethanechol tablets

**Saliva Substitutes**

***Over-the-Counter***

OralBalance Gel and Liquid (GSK)
Orajel Spray and Gel (Del Pharmaceuticals)
Salivart (Gebauer)
Mouth Kote (Parnell)
Entertainer's Secret (KLI Corp)

a cholinergic agent, such as pilocarpine, bethanechol, or cevimeline. In recalcitrant cases of xerostomia secondary to antipsychotic or antidepressant medications, it may be desirable to confer with the prescribing mental health therapist to determine whether a less-xerogenic medication can be used to control the disorder.

## Dental Caries

Because the patient is at risk for developing caries does not mean that he or she necessarily will develop rampant caries. Appropriate oral hygiene and the restriction of refined carbohydrates and acid exposure will in most cases control the carious process. Fluoride rinses are effective adjuncts to the oral hygiene regimen for any patient with the potential for a high caries rate. Excessive mouthwash use should be avoided and because the high alcohol content of many commercially available mouthwashes can exacerbate conditions created by a dry oral environment, mouthwashes that contain no alcohol should be recommended whenever possible.

Although mechanical and chemical plaque controls are important factors in controlling dental caries, patient motivation is perhaps the most important factor. A person who has no desire to get out of bed on most days usually will not have the motivation to engage in comprehensive dental care or do what is necessary to maintain oral health and prevent future disease. These patients must have demonstrated effective plaque control and should have an established caries control program in place (see Chapter 9) before elective definitive restorative dental procedures are begun. Removal of carious teeth may be the most appropriate treatment for a patient who cannot or will not maintain adequate plaque control.

## Periodontal Disease

The occurrence of necrotizing ulcerative gingivitis is an excellent example of the way in which anxiety and stress can be significant contributors to the development of disease in the oral cavity. There is little doubt that the psychological status of a patient has a significant effect on the immune status. Altered immunity may predispose a person to gingival inflammation and alveolar bone loss. In addition, the level of salivary IgA, which plays an important role in mucosal immune defense, is decreased during stress. Diminished salivary flow may lead to increased plaque formation because of decreased clearance of oral debris. These factors place the patient at an increased risk for periodontal disease. In most situations, periodontal disease can be controlled with professional care and adequate plaque control. The patient must be motivated to maintain adequate oral home care. If adequate care cannot be established, definitive dental treatment should be deferred. In acute situations, when the patient is unable to maintain adequate oral hygiene, the use of chlorhexidine rinses may be necessary to control plaque.

## Facial and Masticatory Muscle Pain and Bruxism

Although the relationship between facial pain and psychological disorders is well established, the nature of the relationship is often elusive. Any disorder in which anxiety is a component may lead to autonomic overarousal and muscle hyperactivity. Stressful events can increase the frequency of daytime clenching and bruxism. Facial pain also may become a chronic problem for many patients. Patients with chronic pain syndromes have a high incidence of depressive disorders. The patient must be educated about the relationship between his or her physical complaints and underlying psychological factors.

The risks and benefits of using muscle relaxants to manage the physical complaints should be considered because patients may already be taking medications that produce sedation or have anticholinergic effects. Splint therapy is appropriate as long as the patient maintains adequate oral hygiene and does not wear the splint 24 hours a day.

Simply treating the physical complaint will not provide effective treatment for muscle pain and bruxism. Altered masticatory function may result from a temporomandibular disorder or may be a manifestation of **conversion hysteria,** a mental disorder in which physical symptoms occur without apparent physical cause. One example is the patient who presents with the inability to open the mouth, but with no physical finding of muscle pain or joint dysfunction. Clinical examination associated with a complete history serves as a valuable diagnostic aid when conversion hysteria is considered in the differential diagnosis of a particular complaint.

Masticatory muscle pain and attendant dysfunction can result from the use of several classes of psychotropic medications. The signs and symptoms may mimic certain types of temporomandibular joint disorder. Muscle inflammation has been associated with the use of SSRIs. Muscle spasms also have been reported with use of MAOIs. Muscle tremors are listed as an adverse effect of lithium carbonate. Additionally, the extrapyramidal effects of many antipsychotic medications can affect the muscles of mastication. Careful history taking is essential in determining whether the onset of the patient's facial pain relates to medication use or some other underlying cause.

## CONCLUSION

Providing oral healthcare for patients with psychological problems presents a unique set of challenges and rewards for the dentist. Even the routine practice of taking accurate patient medical and medication histories may require special effort and carries with it particular importance. This group of patients is especially prone to developing oral disease—both because of and secondary to their psychological problems, and as a result of the drug therapy required to manage their problems. Establishing rapport and trust is essential for any professional clinical relationship but takes on heightened significance when treating patients with psychological problems. Many patients believe that a certain stigma is attached to having a psychological disorder and react negatively if it seems that the healthcare provider is adding to their feelings of being different. If, on the other hand, the dentist is able to convey to the patient that he or she will be treated fairly, respectfully, and compassionately, the opportunity for a successful therapeutic relationship is greatly improved.

Providing dental care for patients with psychological disorders can be stressful. At times, the patient will be less responsive and less compliant than the clinician wishes. Some patients may become resistive, argumentative, or even combative. It is important that the dentist not take the patient's behavior as a personal affront. Providing care for these patients requires good communication skills, perseverance, and flexibility—skills and characteristics that take time and focus to master and achieve. Learning to successfully manage these patients' often complex oral problems can be of inestimable value to the patients and their caregivers, and can be both satisfying and rewarding to the dentist and the entire dental team.

## REFERENCES


1. Kessler R, Chiu W, Demler O, et al: Prevalence, severity, and comorbidity of twelve-month DSM-IV disorders on the National Comorbidity Survey Replication (NCS-R), *Arch Gen Psychiatry* 62:617–627, 2005.
2. Substance Abuse and Mental Health Services Administration: *Results from the 2012 National Survey on Drug Use and Health: mental health findings, NSDUH Series H-47, HHS Publication No. (SMA) 13-4805*. Rockville, MD, 2013, Substance Abuse and Mental Health Services Administration.
3. American Psychiatric Association: *Diagnostic and statistical manual of mental disorders*, ed 5, Arlington, VA, 2013, American Psychiatric Publishing.
4. National Institute of Mental Health: Anxiety disorders, *NIH publication 09-3879*, 2009.
5. Melton ST, Kirkwood CK: Anxiety disorders I: generalized anxiety, panic, and social anxiety disorders. In DiPiro JT, et al, editors: *Pharmacotherapy: a pathophysiologic approach*, ed 9, New York, 2014, McGraw-Hill Education.
6. Katzman MA: Current considerations in the treatment of generalized anxiety disorder, *CNS Drugs* 23(2):103–120, 2009.
7. Elsevier/Gold Standard: *Clinical pharmacology* [database online]. https://www.clinicalpharmacology.com/. Accessed March 2014.
8. Wolters Kluwer Health: *Lexicomp online* [database online]. https://online.lexi.com/. Accessed September 22, 2015.
9. Teter CJ, Kando JC, Wells BG: Major depressive disorder. In DiPiro JT, et al, editors: *Pharmacotherapy: a pathophysiologic approach*, ed 9, New York, 2014, McGraw-Hill Education.
10. Offson M, Marcus S: National patterns in antidepressant medication treatment, *Arch Gen Psychiatry* 66:848–856, 2009.
11. Yagiela JA, Duffin SR, Hunt LM: Drug interactions and vasoconstrictors used in local anesthetic solutions, *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 59:565–571, 1985.
12. Brown N, Rhodus N: Epinephrine and local anesthesia revisited, *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 100:401–408, 2005.
13. Trivedi M, Maurizio F, Wisniewski S, et al: Medication augmentation after the failure of SSRIs for depression, *N Engl J Med* 354:1243–1252, 2006.
14. Muskens E, Eveleigh R, Lucassen P, et al: Prescribing antidepressants appropriately (PANDA): a cluster randomized controlled trial in primary care, *BMC Family Practice* 14:6, 2013.
15. Tanda G, Carboni E, Frau R, et al: Increase of extracellular dopamine in the prefrontal cortex: a trait of drug with antidepressant potential? *Psychopharmacology (Berl)* 115:285–288, 1994.
16. Bostwick JM, Jaffee MS: Buspirone as an antidote to SSRI-induced bruxism in 4 cases, *J Clin Psychiatry* 60:857–860, 1999.
17. Malamed SF: *Handbook of local anesthesia*, ed 6, St. Louis, 2012, Mosby.
18. Drayton SJ, Pelic CM: Bipolar disorder. In DiPiro JT, et al, editors: *Pharmacotherapy: a pathophysiologic approach*, ed 9, New York, 2014, McGraw-Hill Education.
19. National Institute of Mental Health: Schizophrenia, *NIH publication* 09-3517, 2009.
20. Crismon ML, Argo TR, Buckley PF: Schizophrenia. In DiPiro JT, et al, editors: *Pharmacotherapy: a pathophysiologic approach*, ed 9, New York, 2014, McGraw-Hill Education.
21. McCann K: *Assessment and management of dental patients with mental health issues*. http://www.oralhealthgroup.com/news/. Accessed February 18, 2014.
22. March JS, Foa E, Gammon P, et al: *Cognitive therapy for obsessive-compulsive disorder: a guide for professionals*, Oakland CA, 2006, New Harbinger Publications.
23. March JS, et al: Cognitive-behavior therapy, sertraline, and their combination for children and adolescents with obsessive-compulsive disorder, *JAMA* 292:1969–1976, 2004.
24. Kirkwood CK, Melton ST, Wells BG: Anxiety disorders II: posttraumatic stress disorder and obsessive-compulsive disorder. In DiPiro JT, et al, editors: *Pharmacotherapy: a pathophysiologic approach*, ed 9, New York, 2014, McGraw-Hill Education.
25. National Institute of Mental Health: Post-traumatic stress disorder (PTSD), *NIH publication* 08-6388, 2008.
26. Friedlander A, Friedlander I, Marder S: Posttraumatic stress disorder: Psychopathology, medical management and dental implications, *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 97:5–11, 2004.

27. Wright E, Thompson R, Paunovich E: Post-traumatic stress disorder: Considerations for dentistry, *Quintessence Int* 35:206–210, 2004.
28. Botko G: *Post-traumatic stress disorder. Understanding and treating patients with PTSD*, AGD Impact 24-27, December 2013.
29. Dopheide JA, Pliszka SR: Attention deficit/hyperactivity disorder. In DiPiro JT, et al, editors: *Pharmacotherapy: a pathophysiologic approach*, ed 9, New York, 2014, McGraw-Hill Education.
30. Tenzer JA, Orozco H: Traumatic glossectomy: report of two cases, *Oral Surg Oral Med Oral Pathol* 30:182–184, 1970.
31. Altom RL, DiAngelis AJ: Multiple autoextractions: oral self-mutilation reviewed, *Oral Surg Oral Med Oral Pathol* 67: 271–274, 1989.

16

# Adolescent Patients

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## OUTLINE

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**Oral Disease in the Adolescent**
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- Esthetics

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**Follow-Up and Maintenance**

**Conclusion**

Before reaching adulthood, every human individual passes through the stages of infancy, childhood, and adolescence. Adolescence is the developmental period between childhood and adulthood and is characterized by major physical, psychological, and social changes. Adolescence begins at the onset of puberty, a well-defined physiologic milestone that occurs as a result of increased levels of various hormones and results in significant physical growth and the development of secondary sexual characteristics. The timing of the initiation and completion of adolescence is highly variable among individuals. Humans have a prolonged adolescent development in which the conclusion is not defined by physiologic milestones, but rather by less-clear-cut sociologic parameters that may vary widely among different cultures and societies.

## THE ADOLESCENT IN THE WORLD

An adolescent must achieve several emotional or developmental milestones before becoming a psychologically normal functioning adult (Box 16-1). Erikson's psychosocial theory of development describes the identity crisis as the major event of adolescence. During this phase, the adolescent must discover who he or she is and develop a unique identity, separate from family and other adults. According to this theory, the attainment of a realistic self-identity is a milestone for the passage into adulthood.

### Stages of Adolescence

The psychosocial development of the adolescent can be divided into three distinct phases: early, middle, and late adolescence. During early adolescence, childhood roles are cast aside and dependent emotional ties with the family severed. In Western culture, the first signs of independence may occur when the adolescent becomes less involved and less interested in long-standing family activities and routines. It is common at this stage for the adolescent to bristle and become resistant when criticized or given unsolicited advice by adults or other authority figures. Within a short period, the once-obedient child may become rebellious and belligerent, heightening tensions and anxiety within the family. At times, the adolescent may be fearful of relinquishing the security of childhood and, when stressed, may revert to childlike behavior. To ease the transition into the early phase of adolescence, parents and other adults must recognize this assertion of independence as a part of normal development and, when possible, allow the teenager some degree of freedom of choice.

During the middle phase of adolescence, the teenager begins to seek a new identity through peer group involvement. New emotional ties with the peer group fill the psychological void left by the abandonment of childhood dependence on parents. Participation in peer group activities reinforces the sense of separation from parents and facilitates emotional separation from them. Adolescent groups may adopt outlandish clothes, hairstyles, piercings, tattoos,

**BOX 16-1 Adolescent Milestones**

- A realistic, stable, positive adult self-identity must be established.
- The adolescent must become emancipated from parents and other adults (often leading to the classic dependence-independence struggles that occur between adolescents and their parents).
- Skills for future economic independence must be acquired. During adolescence, much time is spent developing the skills and talents that will guide individual career and vocational plans.
- Psychosexual differentiation must occur, enabling function in adult sexual roles. Once the adolescent develops a stable self-identity with which he or she is confident, mature intimate relationships with other adults can be entered into without the fear of losing self-identity.

speech patterns, or other behaviors to clearly differentiate themselves from their parents and other adults. Paradoxically, peer groups discourage individuality and the development of self-identity. The adolescent must either conform to the ways of the peer group, or cease to be a member. At this stage, however, adolescents are not seeking a distinct identity but rather a *stable* one. Interpersonal relationships in the peer group are often superficial, and individual identity is highly compromised by pressures to conform to group standards. At the conclusion of middle adolescence, peer groups dissolve as individuality and self-identity increase. An adolescent with no friends, or poor peer group ties, may experience problems in facilitating the development of self-identity and independence.

In late adolescence, physical ties with the family are severed as the adolescent moves out of the home, becomes financially more self-sufficient, and accepts adult roles and responsibilities. With the eventual attainment of a stable self-identity and independence, the young adult accepts mature relationships with other adults without experiencing fear of losing control of his or her self-identity. Problems in these relationships may occur when an individual seeks to maintain peer group ties and/or family dependence.

Although these stages describe adolescent development in most North American and European families, considerable variation in the sequence may exist in other areas of the world. In many cultures, extended multigenerational families living together are the cultural norm. In some cultures, the passage into adulthood is clearly defined by a ritual passage or event. Once the adolescent has demonstrated completion of the rite of passage, acceptance as an adult member of the society occurs.

### Adolescent Population

Adolescents are a significant proportion of the U.S. population. In 2000, 14.5% of the total population, or 40.75 million persons, were between 10 and 19 years of age.[1] In 2010, the population of 10- to 19-year-olds increased by 6.6% to 42.68 million. Between 2010 and 2025, the total number of 13- to 18-year-olds is projected to show a modest increase, although decreasing slightly as a percentage of the total population.[2] These projections are based on the expectation of a relatively stable birth rate and an increased life expectancy, resulting in an increased number of persons older than 65 years of age (Table 16-1). As a result, the size of the adolescent population will remain relatively stable, but as more people live longer, the proportion of the total population who are adolescents will become smaller.

**TABLE 16-1 U.S. Population Trends**

| Year | Age Group (Yrs) | Total Population |
|---|---|---|
| 2020 | 14-17 | 4.97% |
| | 65 and older | 16.46% |
| 2040 | 14-17 | 4.85% |
| | 65 and older | 20.98% |
| 2060 | 14-17 | 4.71% |
| | 65 and older | 21.9% |

Adapted from U.S. Bureau of the Census: 2012 National Population Projections: Summary Tables. Available at: http://www.census.gov/population/projections/data/national/2012/summarytables.html. Accessed June 22, 2015.

The United Nations Population Division estimates that the percentage of 10- to 19-year-olds in the world population based on a medium fertility rate will decline from 16% in 2015 to 12% in 2100.[2a] In developing nations, because of higher birth rates and shorter life expectancy, a larger proportion of the population is composed of children and adolescents. The United Nations estimates that 23% of the population of the least-developed countries in the world will be comprised of 10- to 19-year-olds in 2015 and will decline to 14% by 2100. These estimates are based primarily on the increased life expectancy in these countries as a result of global health initiatives and medical innovations.

## LIFESTYLE ISSUES THAT MAY AFFECT ADOLESCENT HEALTH

### Diet and Nutrition

Significant physical growth occurs during the pubertal growth spurt. The age at which this spurt occurs varies among individuals. As a general rule, females tend to begin puberty and the growth spurt at a younger age than males. Proper nutrition is essential to ensure adequate development during this period and to maximize genetically determined growth potential. In response to rapid growth, total caloric intake may be increased significantly. Although a nutritionally balanced diet is important, teenagers may develop poor nutritional habits by filling the increased demand for calories with a diet high in refined carbohydrates, fats, and salt. Peer group pressures may influence the type of diet an adolescent maintains. Increased social, academic, and leisure demands also may limit the amount of time a

teenager has available to eat well-balanced meals in a home environment.

### At-Risk Behaviors

Rejection of adult authority may cause some adolescents to show reduced interest in or abandon both oral and general preventive health practices. Pressures from peer groups may encourage teenagers to take risks, such as experimenting with tobacco, alcohol, or drugs. Peer pressures to engage in dangerous risk-taking activities with automobiles, bicycles, or skateboards may lead to physical injury. Traumatic brain injury is the leading cause of death and disability among adolescents in the United States.[3]

Tattoos and body piercing have gained popularity among adolescents as a way of demonstrating independence and separation from the adult population. The jewelry associated with pierced tongue or lip may cause damage to teeth or create a source of intraoral infection. Some individuals may also go to extremes to modify the shape or appearance of the maxillary incisors. Radical changes in the shape of the incisors or the insertion of oversized poorly contoured metal crowns may increase the risk of periodontal disease and caries.

## PATIENT ASSESSMENT

### Confidentiality Issues

Practitioners must be aware that the relationship between dentist and adolescent patient is confidential, although, as with adults, situations may arise in which a breach of that confidentiality is ethically justified, such as when the patient poses an obvious threat to others or to him or herself. The discovery of information through history taking or physical examination may place the practitioner in an ethical dilemma with respect to the issue of disclosure to parents or legal guardians. In addition, during the course of treatment, the practitioner may gain information concerning sexually transmitted diseases, illicit drug use, pregnancy, or emotional disorders. In such situations, the dentist is not legally obligated to inform the parents or guardian of such findings. In some U.S. states, the law allows adolescents to receive treatment without parental consent for such conditions as sexually transmitted diseases and drug addictions.

To avoid the development of difficult situations, at the initial appointment the practitioner can discuss these confidentiality issues with the adolescent and parents or guardian. The adolescent can be informed that findings will not be disclosed without his or her knowledge, but that it may be in his or her best interest to disclose certain kinds of information to the parents so that they can be of support. The parents or guardian can then be advised that the practitioner is bound to respect the confidentiality of the dentist-patient relationship, unless an immediate direct threat to the well-being of the adolescent or others is present. If, in the judgment of the practitioner, the adolescent patient does become a threat to self or others and refuses to inform the parents or guardian, the practitioner must discuss the findings with the parents or guardian so that appropriate treatment or referral can be pursued.

If, at some point, disclosure of other confidential information would seem to be in the patient's best interest, the first step should be to frankly discuss with the patient the benefits of including the parents in planning for future treatment or referral. After this discussion, the adolescent should be encouraged to provide the information to parents or guardian. The dentist can offer to be present when the patient discusses these issues with the parent.

### Patient History

Although with pediatric dental patients, parents or guardians provide most if not all the information gathered during the health history, obtaining an accurate patient history for an adolescent requires the tactful involvement of both the parents or guardian and the adolescent. The parent or guardian can be asked to supply the majority of the historical recall of past medical history for an adolescent. Surprisingly, however, some pediatric and adolescent patients may have a more accurate recall of events than their parents, so it is wise to have both parties present during the history taking.

With this age group, it is important that the chief concern be clearly stated by both the adolescent and the parents or guardian. Ideally, the adolescent can be asked to articulate the chief concern and treatment expectations in his or her own words at a time or location apart from parents or guardian. A major discrepancy between the two versions may indicate differing expectations for treatment and treatment outcomes and, unless resolved, may lead to future conflicts between the parents or guardian, adolescent, and dentist.

The components of the patient history and process for obtaining the history in the adolescent patient are like those of the adult patient, and are described in detail in Chapter 1.

### Clinical Examination

As the patient evaluation process transitions from history taking to the physical examination, the dentist will typically gather information about recent growth changes and physical signs of puberty. The adolescent is asked to describe recent physical growth changes, and current height and weight can be plotted against normal growth curves or used to calculate an age and gender-adjusted body mass index (BMI) percentile to assess weight status.[4] The U.S. Centers for Disease Control and Prevention (CDC) defines the "overweight" child as having a BMI percentile between the eighty-fifth and ninety-fifth percentile, with a BMI percentile greater than the ninety-fifth percentile defined as "obese." Physical signs, such as voice changes, presence of facial hair, initiation of menstrual cycles, and breast development, can be used to evaluate whether puberty has begun or how advanced it is.

The physical examination process in the adolescent is similar to that for adult patients (see Chapter 1). Extraoral and intraoral examination of soft tissue is completed, along with an assessment of temporomandibular joint (TMJ) function and range of motion. The periodontal and dental examinations are

identical to those used for adults except that, in the adolescent, examination may reveal the presence of newly erupted teeth. To screen for the presence of aggressive periodontitis, periodontal probing is important, especially on first molars and incisors, the most commonly involved sites.

A radiographic survey for an adolescent patient with age-appropriate dentition and no clinical signs of periodontal disease or need for extensive restorative treatment includes a panoramic radiograph plus bite-wings. The panoramic image can be used to assess third molar development as well as the presence of any unerupted teeth. Bite-wings should be taken at appropriate intervals in the adolescent to assess the occurrence of proximal caries after posterior contacts have been established. During the transition period between the loss of primary teeth and the eruption of the permanent teeth in the posterior segments, bitewing radiographs are unnecessary if no proximal contacts exist.

Because most definitive orthodontics are completed in adolescence, general dentists should be well versed in assessing the need for such treatment in these patients. Visually evaluate the patient's antero-posterior and vertical skeletal relationships from the frontal and lateral positions. With the patient standing and looking forward, position the patient's head so that the Frankfort horizontal (line joining the external ear canal and infraorbital rim) is parallel to the floor. A vertical line dropped down from the nasal bridge (soft tissue nasion) can be used to assess maxillary and mandibular anteroposterior relationships (Figure 16-1). Discrepancies may indicate underlying skeletal disharmonies, which may require orthognathic surgery plus orthodontics to improve facial esthetics.

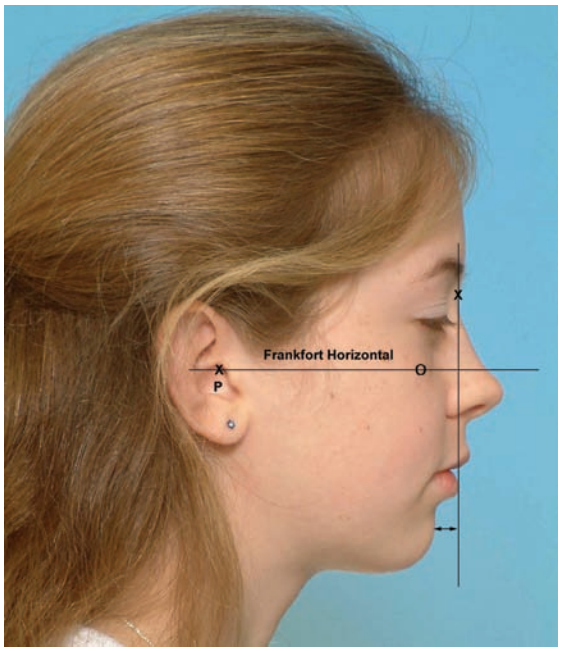


**FIG 16-1** Profile analysis using Frankfort horizontal (*P,* porion and *O,* orbitale) and the anteroposterior relationship of the mandible and maxilla in relation to a vertical reference line through the bridge of the nose.

Vertical skeletal relationships may also be evaluated at the same time. The mandibular plane angle (normal, 30 degrees) can be estimated by the angle formed by the lower border of the bony mandible and Frankfort horizontal. Assess the symmetry of structures from the frontal view. The position of the chin button relative to the midsagittal plane can identify significant mandibular skeletal asymmetry, whereas observing the dental midlines relative to the midsagittal plane can indicate any dental arch asymmetry. If lip incompetence at rest is more than 4 mm, a significant vertical skeletal discrepancy may be present or the incisors may be excessively proclined to accommodate the teeth in the dental arch. In such cases, extractions or orthognathic surgery may be necessary to reduce lip incompetence and incisor or gingival display.

Evaluate the dental arches for any overretained primary teeth, which may signify impacted or congenitally missing permanent teeth. The most commonly impacted teeth are the maxillary canines and the mandibular second premolars.

Overjet and overbite should be assessed. Excessive overjet usually indicates an underlying Class II skeletal relationship, whereas a negative overjet indicates a Class III skeletal relationship. A deep bite may result in stripping of palatal attached gingiva around the maxillary incisors, compromising their periodontal status. An anterior open bite usually indicates a skeletal vertical discrepancy that may require orthognathic surgery to correct if severity warrants.

Dental occlusion is then assessed as part of the orthodontic examination. Class II or Class III canine and molar relationships may indicate a skeletal discrepancy. In adolescents, dental malocclusions with an underlying mild skeletal discrepancy can be treated with growth modification or **camouflage.** Growth modification uses various appliances, such as headgear, to differentially control mandibular and maxillary growth. Camouflage relies on the extraction of permanent teeth to correct the dental malocclusion while masking the underlying minor skeletal discrepancy. To be effective, growth modification treatment for Class II patients requires a period of active growth. In late adolescence, if minimal further growth can be anticipated, treatment options may be limited to orthognathic surgery or extractions to camouflage the underlying Class II skeletal relationships. Treatment of patients with Class III malocclusion is usually delayed until skeletal growth is nearly complete. As mandibular growth does not cease until late adolescence or early adulthood, early treatment should be avoided, as patients may outgrow any final treatment results.

A posterior cross-bite with a functional shift of the mandible is indicative of a skeletal or dental transverse discrepancy. The correction of transverse problems is more easily accomplished with maxillary expansion appliances in early adolescence, as the midpalatal suture is less organized and less interdigitated than it will become in late adolescence or adulthood. After the suture has fused in adulthood, surgery is usually required to correct significant transverse problems.

If skeletal or dental disharmonies exist, early adolescence or the late mixed dentition is usually an appropriate time to

consider orthodontic referral and intervention. Whereas many general dentists may consider undertaking adjunctive or limited tooth movement orthodontic treatment, most will elect to refer patients with Class II or III dental and skeletal malocclusions or Class I malocclusions with severe tooth/arch discrepancies to an orthodontist. The Orthodontic Screening Referral Form (Figure 16-2) can be a helpful aid to the general dentist both in assessing the patient's orthodontic needs and in facilitating the referral to an orthodontist.

**Orthodontic Screening Referral Form**

Patient Name: _____

Parent/Guardian Name: _____

**Address:** _____

_____

**Phone: Daytime:** _____ **Evenings:** _____

Date of Birth: _____

---

**To be filled out by the referring dentist:**

**This patient has been in my (our) practice since:** _____

**Date of last examination:** _____

**Decay currently present: Yes:** _____ **No:** _____

If yes, is restorative treatment scheduled: Yes: _____ No: _____

Oral hygiene status: Excellent: _____ Good: _____ Fair: _____ Poor: _____

**Periodontal status:** _____

| | Right | Left |
|---|---|---|
| Molar Relationship (I, II, III) | _____ | _____ |
| Canine Relationship (I, II, III) | _____ | _____ |

Overjet _____ mm

Overbite _____ mm

Estimated Crowding: Upper Arch _____ mm, Lower Arch _____ mm

Missing Permanent Teeth: Yes _____ No _____

If yes, which teeth are missing: _____

What are your main concerns for treatment: _____

_____

_____

Name of Referring Dentist: _____

Address of Referring Dentist: _____

Office Phone Number: _____

Dentist Signature: _____ Date: _____

**FIG 16-2** Orthodontic screening referral form.

## ORAL DISEASE IN THE ADOLESCENT

### Dental Erosion

Dental erosion is widespread in adolescent population in the developed world, owing to the ubiquitous exposure to acidic foods, beverages, and condiments.[5] Common acidic substances for adolescents to ingest include sodas (carbonated soft drinks), both sugared and diet; energy drinks; sports drinks; citrus fruits and juices; ketchup; hot sauce; and other vinegar-based products. Wine can also be a contributing factor, as can (to a lesser extent) coffee.

Erosion causes loss of tooth enamel and tooth structure, and it can contribute to both occlusal attrition and cervical notching. Some of the significant problems associated with dental erosion include discoloration of the teeth (as the enamel thins and dentin is exposed), tooth sensitivity, pulpal pathology, and, in severe cases, the need for extensive restorative work.

The role of the dental team in managing this condition is threefold: prevention, mitigation of the symptoms, and restoration of the tooth defects. Prevention entails a detailed dietary analysis (see *In Clinical Practice: Diet and Nutritional Counseling for Adolescents* box), discerning what are the frequent acid exposures the patient is exposed to, and counseling the patient regarding how to minimize those exposures—especially between meals. Three simple recommendations are usually helpful in this regard:

- Minimize the frequency and duration of any between-meal acid exposures.
- Rinse with water immediately after any between-meal acid exposures.

### IN CLINICAL PRACTICE

#### Diet and Nutritional Counseling for Adolescents

The prevalence of overweight and obese teenagers in the United States has dramatically increased over the past few decades. A recent study of adolescents seen for orthodontic treatment found that 12% were judged to be obese, whereas 18% were categorized as at least overweight.[8] This trend appears to become established early, as a study in a similar population of 6- to 9-year-old children seen for a new patient dental examination found 13% to be obese and 15% to be at least overweight.[9] Overweight and obese children and adolescents are more likely to become overweight or obese adults who will be at risk for the development of such serious health conditions as cardiovascular disease, type 2 diabetes, hypertension, orthopedic problems, and sleep apnea.[10] Owing to demanding academic, sports, and social schedules, teenagers may develop poor dietary habits and be unaware of the potential hazards. Teens with weight, caries, or periodontal issues will benefit from dietary analysis and nutritional counseling.

##### *Dietary Analysis*

Ask the adolescent to keep a record of all food consumed during a 3- to 7-day period, including when and how much. Compare the number of food group servings consumed per day with the recommendations shown below. In particular, observe the extent of exposure to fermentable carbohydrates (sugars and sweets) and acids (citrus fruits and carbonated or other low PH beverages) with respect to the form (solution versus solid), time of ingestion (during meal, end of meal, or between meals), and length of exposure. Adolescents and their parents should be advised that minimizing exposure to fermentable carbohydrates, especially between meals, reduces acid production by cariogenic bacteria. Compliance and accuracy of diet records may be a problem, however, in adolescents who are not interested in the process.

##### *Nutritional Goals*

The recommended daily servings of each food group are as follows:
Milk group: 2 to 4 servings
Meat group: 2 to 3 servings
Vegetable group: 3 to 5 servings
Fruit group: 2 to 4 servings
Grain group: 6 to 11 servings
The total recommended caloric intake for adolescent boys and girls is 2200 to 2800 calories per day. Because of increased calcium demand, adolescents should receive 3 to 4 servings of milk per day, depending on the total caloric intake.

##### *Effecting Change*

Helping the patient to make behavioral changes, such as altering the diet, can be a challenging undertaking. But when effective strategies are purposefully engaged, the chances of success are good. Modifying the diet for an adolescent is more complex, as the dental team must take into account that meals are often prepared by a parent or other family member, many meals may be consumed away from the home setting, and there may be minimal time allowed for meal preparation. Many adolescents have virtually unlimited access to snack foods and beverages throughout the day. Any recommended change must be made in the context of what is appropriate for the patient's culture, religion, and family setting. Often, an effective beginning point is a straightforward conversation with the patient (and family member or other person who is the primary meal preparer) about perceptions of the benefit to be derived by the proposed change. This conversation must be open, candid, and tailored to the patient's and/or food preparer's education level and life experience. An important companion question is to ask, "What is the likelihood (on a scale of 0 to 10) that you will be able to carry out the desired diet changes?" Again, if the response suggests a low likelihood, further candid discussion about the barriers to change should take place. Often, it is helpful to set small, realistic goals for change, followed by sequential reinforcement of the progress and ratcheting upward to higher and more difficult-to-achieve goals. The patient needs to be a partner in this process of goal setting, and his or her efforts should be reaffirmed at each stage. Through this process, the adolescent can and should accept ownership of his or her own dietary choices and the consequences of those choices. As the adolescent experiences and comes to value the benefits of the change, it is more likely that the new pattern will become internalized and continue in the months and years to come.

- Refrain from brushing the teeth for 30 minutes after a known acid exposure.

If the teeth become symptomatic, most commonly becoming sensitive to cold, the dentist can usually provide relief with the application of fluoride varnish, Gluma, or other desensitizing product while the patient is in the dental office. Often, the use of a desensitizing dentifrice on a daily basis as part of the oral self-care regimen is beneficial as well.

Where cervical notching becomes unsightly to the patient, persistent sensitivity cannot be resolved with conservative means, or pulpal pathology or tooth fracture are thought to be imminent, a restoration may be needed.

## Dental Caries

Although dental caries have declined significantly in the adolescent population in the United States during the past two decades, some individuals continue to be susceptible. It is expected that the incidence of dental caries will increase in many developing countries as a result of an increase in the consumption of sugars and inadequate exposure to fluorides.[6] Although many adolescents present with no caries or with only isolated pit and fissure caries, some individuals will have rampant caries and will be at high risk for new lesions. This latter group can be a major treatment challenge.

Several explanations for adolescent caries risk can be identified. With the eruption of the permanent premolars and the permanent second molars, the number of susceptible occlusal and proximal tooth surfaces exposed to the oral environment increases. The crystalline structure and surface characteristics of these newly erupted teeth make them more susceptible both to the initiation of caries and to the rapid advancement of the lesions once formed. The fact that adolescents often consume cariogenic diets and may maintain less-than-adequate oral hygiene increases the risk of caries.[7]

Adequate plaque control is essential to the maintenance of good oral health. Effective oral self-care has the dual benefit of creating an environment that is less conducive to the formation of carious lesions and more favorable to the maintenance of optimum periodontal health. Oral health instruction must be provided in a tactful manner that the adolescent patient will readily accept and implement. Just as important, the patient must perceive the information to be relevant. The importance of good oral self-care can be emphasized through discussion of the microbiologic basis of dental caries and periodontal disease. Informing the patient about the possible sequelae of poor oral home care—including halitosis, painful teeth or gums, and unattractive or missing teeth—will reinforce the perception of the value of good oral self-care.

For the patient with a high caries rate history who is at risk for the development of new lesions, the dentist may recommend a diet analysis. The cooperation of both the parents and adolescent may be needed to obtain an accurate representation of dietary intake (see the box *In Clinical Practice: Diet and Nutritional Counseling for Adolescents*). If, after obtaining the diet history, it is determined that changes are needed, it is often necessary to counsel both the parents and adolescent to effect those changes.

Interim protective direct-fill restorations can be a valuable tool in the overall management of an active caries problem. By excavating gross caries and placing interim restorations, the dentist can help arrest the caries process, creating an environment in which a preventive program can be effective. Before placing definitive restorations, adequate oral self-care, diet control, and fluoride use must be established. Only after these key issues have been addressed should final restorative procedures be undertaken. If such an approach is not followed, in the near future the dentist will see an older adolescent or young adult returning with multiple recurrent and new lesions (see the *In Clinical Practice: Management of Adolescents with High Caries Rates* box).

### IN CLINICAL PRACTICE

**Management of Adolescents with High Caries Rates**

Multiple existing restorations and/or new or recurrent carious lesions are markers of adolescents who are at risk for the development of future caries. In particular, caries development on the proximal surfaces of lower incisors or the cervical areas of the facial and lingual surfaces indicates high risk. Individuals who continue to develop multiple new carious lesions between periodic visits also should be classified as high risk. The chronically ill or immune-compromised patient may develop increased significant caries risk as a result of the underlying systemic condition or therapy. An in-depth preventive program to control the caries process is an essential element in the treatment of the high-risk individual. The program must include all the elements described in the following paragraphs.

*Diet analysis and counseling:* Initially, the patient needs to be queried about sugar and acid exposures. If there is suspicion by the dental team that the patient is at elevated risk for dental caries or erosion, and that the diet is a contributing cause, then it is appropriate to do a formal diet analysis. The findings from that analysis will become the basis for counseling the patient about their diet and making recommendations for change.

*Oral self-care improvement:* Adequate plaque control measures must be instituted and maintained to reduce caries susceptibility. Proper, timely brushing and flossing are essential elements of any oral self-care regimen.

*Fluoride use:* Both professionally applied and self-applied topical fluoride can be helpful in preventing the development of new lesions and encouraging remineralization of decalcified surfaces. Daily rinses or self-applied gels in custom trays may be warranted.

*Restoration of all active lesions:* Active lesions should be excavated and provisional or definitive direct-fill restorations placed to stop the progression of caries. Reinforced zinc oxide eugenol (IRM) or glass-ionomer cements can be used effectively in these cases to stop the site-specific caries process. Restoration of lesions without an intensive preventive program will almost certainly result in new and recurrent carious lesions and treatment failure. (For additional management considerations, see Chapter 9.)

## Periodontal Diseases

Adolescents are at risk for the development of gingival and periodontal diseases. Identifiable risk factors for loss of periodontal support include gingival bleeding, calculus, abundance of certain microbial flora, decreased immune response or immune deficiencies, diabetes, and tobacco use.[11] Many periodontal problems, such as puberty-associated gingivitis, aggressive periodontitis, necrotizing ulcerative gingivitis (NUG), and pericoronitis, are more prevalent during adolescence. Most 14- to 17-year-olds in the United States have gingivitis, usually affecting the soft tissue supporting the maxillary molars and the mandibular incisors. The prevalence of gingivitis during adolescence is slightly higher in females than in males[12] and tends to decline with increasing age. Supragingival calculus is found on the maxillary molars and the mandibular canines in approximately one-fourth to one-third of adolescents. Gingival bleeding and periodontal pocketing are also prevalent in teenagers. When periodontal attachment loss occurs in the adolescent, it most often affects the maxillary molars and premolars, with the mandibular molars and canines the next-most-likely teeth to be involved.[13]

Proper sequencing of periodontal treatment is essential to ensure optimal periodontal health in adolescents. Initial periodontal therapy (see Chapter 9) should emphasize conservative measures, including the institution and maintenance of good oral self-care and reduction of microbial flora. Hopelessly involved teeth that will compromise adjacent healthy teeth should be extracted in the disease control phase. It is essential that active periodontal disease be managed effectively before the initiation of comprehensive orthodontic treatment or definitive indirect restorative procedures.

After initial therapy, patients should be reevaluated to determine whether additional periodontal therapy would be beneficial or necessary (see *Periodontal Reevaluation* section in Chapter 9). Patients with aggressive periodontitis, mucogingival involvement, or insufficient attached gingiva may require surgical intervention to eliminate unresolved active disease and/or establish a state of periodontal health. Patients with minimal attached gingiva may be at risk for further loss of attachment resulting from the combined effects of orthodontic treatment and poor oral hygiene practices. Gingival grafting may be necessary in areas of insufficiently attached gingiva.

### Puberty-Associated Gingivitis

The increase in gingival inflammation that occurs during puberty has been called **puberty-associated gingivitis** and is a generalized form of gingivitis characterized by inflamed, enlarged gingival papillae that are susceptible to bleeding (Figure 16-3). Clinical findings are typically more profound than would normally be expected based on the magnitude of existing local factors, such as plaque, calculus, or caries. The **papillary-bleeding index,** a measure of sites with gingival bleeding during periodontal probing, has been shown to increase significantly at the onset of puberty and to decrease after the age of 14 years in both males and females. Both the papillary bleeding index and the percentage of interdental sites with bleeding have been found to correlate with the development of secondary sexual characteristics.[14] Increased levels of sex hormones may lead to the development of an aggravated form of gingivitis, with increased inflammatory response and altered microbiology.[15,16]

**FIG 16-3** A 14-year-old male with puberty-associated gingivitis involving the maxillary and mandibular incisors. (Courtesy Dr. M. Roberts, Chapel Hill, N.C.)

Treatment of puberty-associated gingivitis involves the removal of any local irritants, such as plaque or calculus. The level of gingival inflammation can be reduced with normal oral hygiene procedures, such as tooth brushing and flossing. In some patients, however, inflammation may persist even with meticulous oral hygiene. The presence of orthodontic appliances may complicate the maintenance of adequate oral self-care and increase the risk of puberty-associated gingivitis. Fortunately, the process is usually self-limiting and does not cause permanent damage to the periodontium. The use of topical or systemic antibiotics usually is not indicated.

### Eruption Gingivitis

Gingival inflammation and enlargement are common with the emergence of the early permanent dentition around 6 to 7 years of age, and young adolescents may develop eruption gingivitis during emergence of the premolars and permanent second molars. Because the gingival margins receive no protection from the coronal contours of partially erupted teeth, food impingement on the gingiva can cause a localized inflammation of the tissue. Animal studies have confirmed that plaque accumulation at the newly formed gingival margins is responsible for leukocyte infiltration and the changes in vascular morphology associated with gingivitis.[17] Once the permanent tooth has fully erupted and plaque control measures are instituted, eruption gingivitis usually resolves without intervention.

## Aggressive Periodontitis

Aggressive periodontitis[18] (before 1999 identified as **early-onset periodontitis**) is characterized by rapid attachment loss and bone destruction in otherwise clinically healthy patients (Figure 16-4). This condition may occur even in the presence of good oral hygiene. Bone loss occurs in two distinct patterns: (1) a generalized form, in which all teeth are affected, or (2) a localized form, commonly involving the permanent molars and incisors. If left untreated, deep narrow periodontal pockets with extensive vertical bony defects may progress to a generalized loss of clinical attachment and alveolar bone.

Bacteria, such as *Aggregatibacter actinomycetemcomitans,* have been implicated in its development and progression, as well as a neutrophil function disorder in the inflammatory

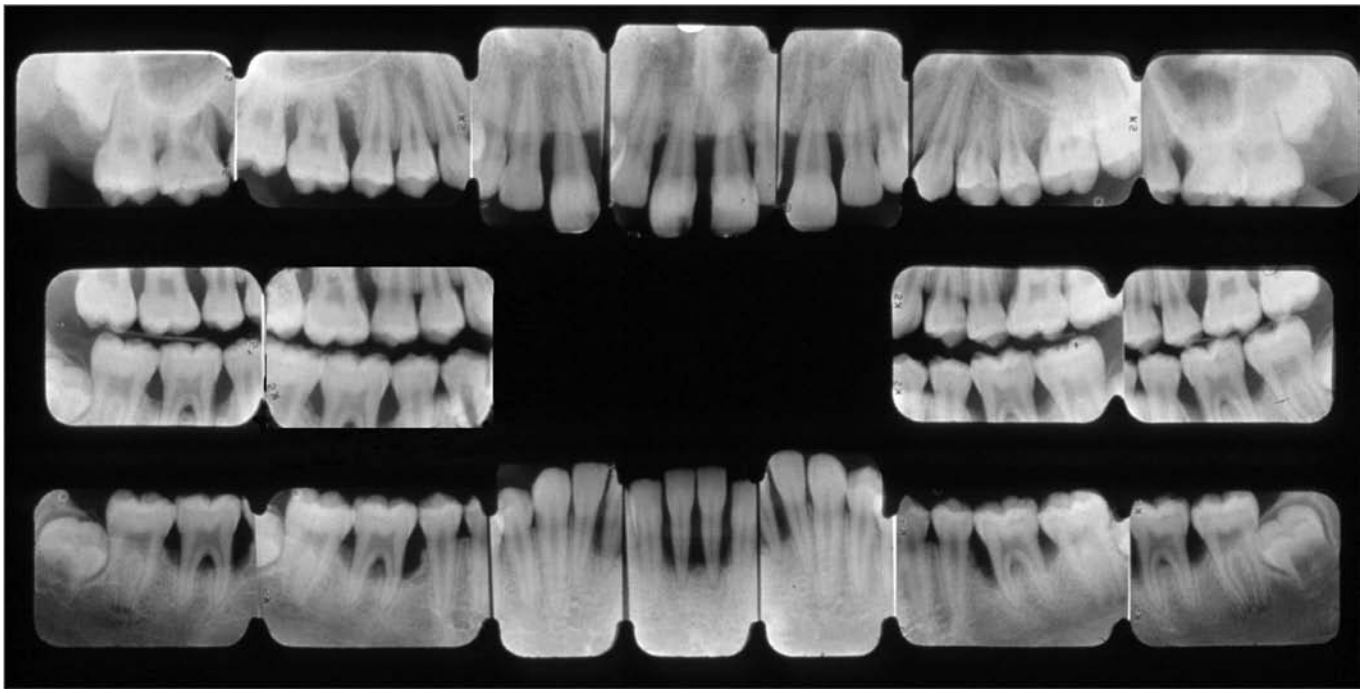

**FIG 16-4** Intraoral radiographs of an adolescent patient with aggressive periodontitis showing vertical bone loss in the molar and incisor regions. (Courtesy Dr. John Moriarty, Cary, N.C.)

response. A familial tendency for aggressive periodontitis, and the fact that it can be found in conjunction with specific syndromes (palmar plantar hyperkeratosis or Papillon-Lefèvre syndrome) suggest a possible genetic basis for the condition.

In the past, this disorder was thought to affect females more commonly than males at a ratio of approximately 3:1. Recently, as previous studies have been revisited and new epidemiologic analysis performed, this gender-related predilection has been challenged. Older adolescent and young adults are more commonly affected compared with younger adolescents. The prevalence in African populations and their descendants is between 1% and 5%, whereas it is 0.1% to 0.2% for Caucasians living in North America.[19]

Treatment of aggressive periodontitis is aimed at reducing chronically inflamed tissue and the number of microbes in the deep vertical periodontal pockets. As with other periodontal diseases, initial therapy begins with the establishment of good oral self-care. A regimen of scaling and root planing and the administration of systemic antibiotics has been successful in treating patients with high levels of *A. actinomycetemcomitans*. Surgical treatment in conjunction with systemic antibiotic therapy has been found effective in more advanced cases, in the presence of *A. actinomycetemcomitans* and *Bacteroides*.[20] Systemic tetracycline, minocycline, and metronidazole have been shown to be effective nonsurgical treatments,[21-23] as has the combination of amoxicillin and metronidazole.[24,25]

In addition to its antimicrobial effects, minocycline has been a useful treatment because of its inhibition of collagenase activity.[26] In cases in which surgical intervention is indicated, periodontal regeneration has been shown to be effective. It is usually advisable to refer an adolescent patient with aggressive periodontitis to a periodontist for treatment.

## Necrotizing Ulcerative Gingivitis

NUG can be found in adolescents and young adults. Along with this age predilection, several classic risk factors can be cited, including low socioeconomic status, poor nutrition, poor oral hygiene, preexisting marginal gingivitis, cigarette smoking, and increased psychosocial stress. Not uncommonly, college students at examination time and new military recruits are sometimes afflicted. Signs and symptoms may include fever and malaise, accompanied by a loss of appetite. Gingival tissues are inflamed, enlarged, and painful, and bleed easily. The interproximal gingiva tends to be more involved than other soft tissue areas and may show signs of necrosis and ulceration. The tips of the papillae often are missing or blunted, and may be covered with a gray pseudomembrane (Figure 16-5). The necrotic tissue results in a fetid odor from the oral cavity. Plaque from these patients often contains large numbers of spirochetes and fusiform bacteria. An association between the disorder and a generalized viral infection, specifically cytomegalovirus, also has been proposed.[27]

Treatment includes removal of plaque and calculus, and local debridement of the diseased tissues using hand or ultrasonic instrumentation. Significant resolution is usually seen after the initial local therapy. Penicillin, metronidazole, and/or chlorhexidine rinses are effective in severe cases when the patient is debilitated.

**FIG 16-5** Adolescent with necrotizing ulcerative gingivitis showing gingival enlargement with pseudomembrane. (Courtesy Dr. J. Moriarty, Chapel Hill, N.C.)

Eliminating predisposing factors, such as poor nutrition, smoking, or stress and establishing good oral self-care practices shortens the clinical course of NUG. When gingival health has been restored, corrective periodontal procedures, such as a gingivectomy, may be required to reestablish normal gingival contours.[28,29]

## Pericoronitis

Pericoronitis is a localized inflammation of the tissue surrounding an erupting tooth (Figure 16-6). As the tooth erupts, an operculum of tissue overlaying the distal portion of the occlusal surface may form. The operculum becomes inflamed, enlarged, and painful because of the accumulation of debris and microorganisms under the tissue. Trauma caused by mastication can lead to further irritation of the sensitive tissues. During adolescence, the most commonly involved teeth tend to be the

**FIG 16-6** Pericoronitis associated with an erupting mandibular molar. (Courtesy Dr. M. Roberts, Chapel Hill, N.C.)

mandibular third molars, but occasionally mandibular second molars are involved. Typically, patients present with localized tenderness of the surrounding tissue and some degree of trismus. More severely affected patients are febrile and show signs of facial cellulitis. Treatment depends on the degree of involvement and clinical signs and symptoms. Local measures, such as analgesics and irrigation of the involved tissue, are usually effective in reducing symptoms. In some cases, an operculectomy on the involved tooth, or extraction of an opposing tooth, may provide moderate to long-term relief. In more involved cases with signs of overt infection of the soft tissues, antibiotics may be recommended. When symptoms subside, extraction of partially erupted or impacted third molars may be indicated to prevent recurrence.

## Malocclusion

Malocclusion is seen in many adolescents. A large-scale survey in the United States found that approximately 15% of subjects had severe malocclusion that could affect social acceptability or function.[30] Most comprehensive orthodontic treatment is carried out during adolescence. With the eruption of the permanent canines and premolars, dental crowding becomes more evident. Significant maxillary crowding may lead to labial eruption of the canines into highly visible and unesthetic positions. During this period, adolescents and parents become more aware of esthetics and self-image. Skeletal discrepancies may become more obvious as a result of accelerated growth. Excessive mandibular or vertical growth may accentuate existing relationships, such as mandibular prognathism or excessive facial height. Comprehensive orthodontic treatment that relies on growth modification procedures must be carried out during a phase of active growth.

The desire on the part of the patient (and the family unit) to treat a malocclusion can vary greatly and is dependent on cultural and societal norms. Malocclusions rarely result in functional issues that interfere with speech or mastication, whereas esthetics and self-image usually influence the decision to pursue treatment. The cost of treatment may preclude treatment for some adolescents with significant malocclusions, whereas more economically advantaged teens with minor treatment needs obtain treatment owing to peer pressure and the perception in some cultures that orthodontic treatment in adolescence is a necessity.

Without proper patient cooperation, comprehensive orthodontics is destined to fail. Meticulous oral self-care and plaque control are essential to prevent the decalcification of tooth surfaces and development of periodontal problems. Lack of compliance with the use of extraoral and intraoral appliances may compromise the final treatment result. The necessary degree of cooperation may be difficult to achieve, particularly in early adolescence, when parent-teen confrontations are common. Practitioners must persuade the teenager to appreciate the benefits of treatment and accept responsibility for daily oral self-care and the maintenance of appliances. Offering some degree of participation in the treatment planning and some control in the direction of treatment can encourage this. An autocratic approach by the practitioner often is met with resistance by the patient and is more likely to fail.

## Tobacco-Related Problems

Tobacco use among adolescents is a major public health concern. Intense peer pressures are placed on teenagers to use tobacco. Curiosity and a desire to be different from one's parents also may drive teenagers to experiment with tobacco use. In addition to these pressures, adolescents are bombarded with well-funded multimedia advertising glamorizing tobacco use. The use of smokeless tobacco by high-profile professional athletes sends the message to adolescents that tobacco use is acceptable and that success in sports is associated with its use. Federally mandated warning labels on cigarette packages have been shown to be ineffective in curtailing tobacco use among teenagers and paradoxically may be associated with an increase in smoking rather than the expected reduction.[31]

The oral sequelae of smoking and smokeless tobacco use are well documented. Tobacco products can lead to gingival recession and staining of dental enamel. Soft tissue changes, such as hyperkeratosis and oral leukoplakia, can result and have the potential to undergo malignant transformation into squamous cell carcinoma (Figure 16-7). Patients with suspected malignant or premalignant changes require a biopsy by the general dentist or an appropriate specialist.

Parents and dentists should counsel teenagers to avoid the use of tobacco products. Once regular use has been established, the addiction can be very difficult to break. The tactics used to approach the issue are crucial if success is to be achieved. A nonauthoritarian, informative approach that allows the teenager to actively participate in the process offers the best chance of success. Discussion should address the negative implications of tobacco use: significant health risks, including lung cancer, emphysema, chronic bronchitis, and heart disease; addiction; financial cost; reduced esthetics; and poor physical performance. The parent or dentist should convey a degree of empathy and concern for the teenager at this crucial decision point. One must realize that teenagers are under enormous

**FIG 16-7** Tobacco pouch keratosis; also known as snuff pouch. (Neville BW, Damm DD, Allen CM, et al: *Oral and maxillofacial pathology,* ed 4, St. Louis, 2016, Elsevier.)

pressure to fit into a routine, behavior, and appearance prescribed by peer groups. The prospect of exclusion from a peer group and the potential loss of friends may inhibit the adolescent from giving up smoking or tobacco use. Counseling may be more effective if the deeper meaning of friendship is stressed, including reminders of the minor role that appearance and behavior play in true friendship. "If they are your real friends, they will still like you if you do not smoke."

Major public health initiatives are required to reduce the number of teenagers who use tobacco and discourage the development of new users in this age group. If progress is not made, the healthcare system will be further strained by future generations of adults who suffer from serious tobacco-related conditions arising from long-standing habits acquired in adolescence. Dentists, as part of the healthcare system, must accept the responsibility of becoming active in counseling adolescent patients against the use of tobacco (see Chapter 9).

## Alcohol and Substance Abuse

Along with tobacco use, abuse of alcohol and a widening array of illegal street drugs is a major problem in some segments of the adolescent population. Glamorous advertising campaigns associate alcohol consumption with feelings of power, control, attractiveness, freedom, comfort, and "being cool." Peer pressure, natural curiosity, and presentations in written, visual, and audio media act as strong inducements for adolescent experimentation with alcohol and drugs. A large U.S. national study showed that 34.1% of surveyed adolescents reported either early use of both alcohol and marijuana or early use of alcohol, marijuana, and cigarettes.[32] Extreme binge drinking (more than 15 alcoholic drinks in a single sitting) was reported by 5.6% of U.S. high school seniors surveyed nationally.[33]

During the initial examination, and at subsequent visits, the dentist should be alert to potential physical and behavioral signs of substance abuse. Patients may exhibit a wide range of behaviors, from excitation to central nervous system (CNS) depression, depending on the type of agent used. Intravenous drug use may be confirmed by the presence of multiple venipuncture sites. Solvent abuse and inhalation of cocaine or other drugs can lead to chronic rhinitis and inflammatory changes of the nasal mucosa. Pupillary constriction, hypertension, and tachycardia may indicate current use of narcotic drugs such as cocaine. Changes in behavior, such as depression, impulsiveness, lack of motivation, unresponsiveness, or concealment, may accompany drug abuse. Altered sleeping patterns and eating habits or weight loss may be indicative of substance abuse. Many of these changes may be mistakenly identified as part of the normal psychological development of teenagers.

As with tobacco, if the practitioner suspects that the patient is a substance abuser, he or she has a professional responsibility to intervene (see Chapter 13). When interacting with patients who are minors, the dentist may be faced with the dilemma of breaching patient-dentist confidentiality to inform the parents of probable substance abuse. If the abuse is significant, and if referral for treatment or counseling is appropriate, the latter will be difficult to accomplish if the parents are not informed. One approach can be for the dentist to describe the suspicions and concerns to the teenager. After this, the dentist can ask permission to inform the teenager's parents of the suspicions. Informing the parents without the teenager's input will certainly have a negative effect on the patient-dentist relationship and may produce a long-term distrust of dentists by the patient. Therefore, this step should be taken only after careful weighing of the benefits and potential problems. In general, this is a last resort that should be pursued only when the patient's substance use/abuse is thought to be potentially life threatening.

## Anorexia Nervosa and Bulimia

**Anorexia nervosa** and **bulimia** are unfortunately common in the adolescent age group, especially among females. Anorexia nervosa is defined as a pathologic psychosocial disorder characterized by extreme aversion to food and the intense fear of gaining weight. Inordinate attention is given to efforts to lose weight, even when the individual is already below a normal body weight. Bulimia is defined as episodic binge eating followed by purging in an attempt to prevent weight gain. The process of purging most often takes the form of self-induced vomiting but can also involve the use of laxatives and diuretics. A significant number of anorexic patients may also practice bulimic behavior. In Western cultures, it has been found that 2% of young women suffer from bulimia, whereas 0.5% suffer from anorexia nervosa. Both anorexia nervosa and bulimia in males of the same age group are approximately one-tenth as common as in females.[34]

Psychological profiles of anorexic patients reveal some common features. These individuals tend to have a distorted self-image, perceiving themselves as overweight even when they are emaciated. Compulsive physical activity may be pursued to further reduce body weight. Affected individuals tend to be overachievers who set high performance standards for themselves—for example, in academic pursuits. The individual may be guilt ridden and irritable while at the same time maintaining a steadfast denial of any physical or emotional problems (Box 16-2).

The dentist should be alert to potential physical changes that may be apparent on examination. Several clinical findings can result from significant weight loss:

- Amenorrhea (the cessation of menstruation in females)
- No detectable body fat
- **Bradycardia** and **hypotension** resulting from electrolyte imbalances
- **Hypothermia** as a result of the lack of insulating body fat

Orofacial manifestations can include the following:

- Decreased salivary flow and lowered salivary pH
- Increased dental caries, primarily because of salivary changes
- Increased incidence and severity of gingivitis, resulting from vitamin deficiencies and xerostomia

Bulimia, like anorexia, tends to occur in young adult females who have a history of dieting and a fear of obesity. In their compulsion to maintain a normal or near-normal body weight, purging follows binge-eating episodes (Box 16-3).

**BOX 16-2 Common Signs of Anorexia Nervosa***

- Conscious restriction of food intake leading to a significant low body weight relative to developmental norms.
- Intense fear of gaining weight or becoming fat.
- Distorted self-image based on body shape and weight.
- Inability to recognize a significant low body weight relative to developmental norms.

*Comprehensive diagnostic criteria are located in the American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, 5th Edition [DSM-V]. Arlington, VA, American Psychiatric Association, 2013.
Reprinted with permission from the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, (Copyright 2013). American Psychiatric Association.

**BOX 16-3 Common Signs of Bulimia Nervosa***

- Recurrent episodes of binge eating.
- Self-induced vomiting.
- Misuse of laxatives, diuretics, or other medications in an attempt to lose weight.
- Fasting.
- Excessive exercise.
- The behaviors listed above occur, on average, at least once a week for 3 months.
- Distorted self-image based on body shape and weight.

*Comprehensive diagnostic criteria are located in the American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, 5th Edition [DSM-V]. Arlington, VA, American Psychiatric Association, 2013.
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**FIG 16-8** Early perimolysis involving the lingual surfaces of the maxillary incisors of a patient with bulimia. (Roberts MW, Tylenda CA: Dental aspects of anorexia and bulimia nervosa, *Pediatrician* 16(3-4):178-184, 1989. Reprinted with permission of S. Karger AG, Basel.)

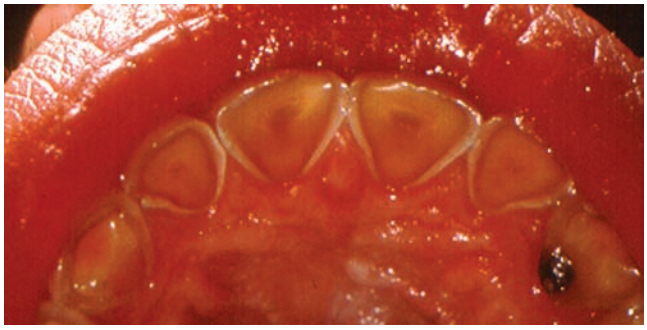

**FIG 16-9** Advanced perimolysis of the maxillary incisors in which the pulp chambers of the teeth are visible. (From Johnson GH, Powell LV, Gordon GE: Dentin bonding systems: a review of current products and techniques. *J Am Dent Assoc* 122(7):37-41, 1991.)

During episodes of binge eating, bulimics may have extremely high caloric intakes, approaching 20,000 to 50,000 calories per day, depending on the food ingested. Favored binge foods tend to be those that require little chewing and are high in carbohydrates, starches, fats, and calories. Significant electrolyte disturbances can result from the loss of gastric hydrochloric acid during vomiting. This disruption can lead to serious sequelae, such as metabolic acidosis, muscle weakness, and cardiac abnormalities. As with anorexia, bulimia often has significant orofacial manifestations. The palatal and pharyngeal oral mucosa may exhibit signs of trauma, erosion, ulceration, and inflammation as a result of self-induced gagging and exposure to stomach acid. The lingual surfaces of the maxillary incisors and the occlusal surfaces of the posterior teeth may exhibit **perimolysis,** a characteristic type of enamel erosion caused by a decreased oral pH resulting from the reflux of acidic stomach contents (Figures 16-8 and 16-9). In this form of erosion, dental restorations appear to stand out from the tooth surface because of the notable discrepancy between the eroded enamel surface and the restoration surface. **Cheilitis** of the lips may result from acid irritation and vitamin B deficiencies. Salivary gland enlargement and xerostomia can occur. Enlargement of the parotid gland can make the patient appear to have cherub-like cheeks, which may trigger additional, more-intense episodes of bulimic behavior, thereby exacerbating an already-serious condition.

The dental treatment of anorexic and bulimic patients can be challenging and complex. The patient should be encouraged to seek psychiatric help to control the disorder. Initial dental treatment should include oral self-care instruction and diet counseling. The use of sodium bicarbonate mouth rinses can be prescribed to reduce oral acidity after episodes of vomiting. Patient-applied neutral (not acidulated) fluoride gels in custom trays can also be used to reduce enamel solubility and enamel erosion. Prescribing increased fluid intake, artificial saliva, or sugarless gums or mints can reduce xerostomia. In cases of rampant caries, initial restorative care should be aimed at caries control through the use of protective (or definitive) direct-fill restorations. Only after the condition has stabilized should indirect definitive restorations be placed. (See Chapter 9 for more specifics on management of the caries active patient.)

## TREATMENT PLANNING FOR THE ADOLESCENT PATIENT

### Informed Consent

When performing any treatment on a patient who is under the legal age of consent, practitioners must first obtain permission from the parent or legal guardian to complete diagnostic procedures, including radiographs, and any treatment procedures. Although it is not unusual for another relative, such as a grandparent, to accompany a younger adolescent to a dental appointment, the dentist must remember that grandparents are usually not the legal guardians and cannot provide valid consent to proceed. When an individual telephones to make a new patient examination appointment for an adolescent, staff must remind the caller that a parent or guardian must accompany the patient to the initial examination appointment to provide valid consent. In some jurisdictions, an exception to this rule is allowed for **emancipated minors**—persons under the legal age of consent who function as independent adults, living apart from their parents and supporting themselves. In such instances, the emancipated teenager may give valid consent to proceed with the chosen treatment. Once a formal plan of care has been established and consented to by the parent or guardian, subsequent treatment that is on the plan of care can be rendered without the parent or guardian's being present.

Although parents or legal guardians must give consent for treatment of adolescents, the adolescent should also be involved in the treatment planning process (see the *Ethics in Dentistry* box). All treatment options and the associated risks and benefits for each option should be explained to both the parents and patient. To ensure successful outcomes, adolescents should actively participate in the selection of the appropriate treatment plan and assent to the agreed-on treatment.

### Restorative Issues

In adolescents, the design of cavity preparations may need to be modified to accommodate certain oral conditions that are normal in this age group. Because pulp chambers in newly erupted teeth are comparatively larger than those of more mature adult teeth, in which secondary dentin has been deposited, cavity preparations should be modified to prevent noncarious exposures of the pulp. Gingival tissue height on the teeth of adolescents is more coronally placed than in adults. Also, because clinical crowns in adolescents may be shorter as a result of partial eruption of the teeth, establishing adequate apical extension of intracoronal restorations can be difficult. The design of restorations may also need to be modified because of inadequate oral self-care. In Class II and III preparations, cavosurface margins may need to be extended into self-cleansing areas to reduce the chance of recurrent caries. The use of fluoride-releasing restorative materials may aid in the prevention of recurrent caries in high-risk adolescents (see discussion of this topic in Chapter 9).

With the eruption of the second permanent molars and premolars, the number of susceptible occlusal surfaces increases. Recently erupted premolars and molars with deep pits and fissures can be susceptible to decay and should receive pit and fissure sealants when it has been determined that the individual is at risk for occlusal caries. Second molars tend to have less-well-defined occlusal fissures than the first permanent molars, but they also should receive sealants when the patient is at risk for caries. Appropriate placement of pit and fissure sealants during adolescence can help these individuals transition into and through adulthood caries free or with fewer restorations than would otherwise have been needed.

For patients with congenitally missing permanent teeth, a definitive treatment plan should be developed during adolescence. In these situations, two basic treatment choices exist. One option is to maintain the space for a prosthetic replacement, such as a removable or fixed partial denture or an implant. The second option is to consider using orthodontic appliances to close the space, thus eliminating the need for a future prosthesis. If comprehensive orthodontics with extractions are already indicated, the latter treatment plan may be more cost effective.

Esthetic restorations may be required on anterior teeth that have been traumatically fractured or that have enamel hypoplasia. With the advent of enamel and dentin bonding techniques, restoring these teeth with composite resin materials can provide good esthetic results. These materials can

### ETHICS IN DENTISTRY

**Assent for Treatment by an Adolescent Patient**

Most dental care requires a degree of cooperation from the child or adolescent patient, which can be obtained by including the patient in the decision-making process. The American Academy of Pediatrics (AAP)[1] advocates for the inclusion of children and adolescents in decision making "commensurate with their development." Although parents or legal guardians must provide informed permission for evaluation and treatment, clinicians should also make every attempt to obtain agreement or assent from the child or teen.

The AAP provides specific guidelines for the clinician to obtain assent from a child or adolescent for tests and treatment. These guidelines can be summarized as follows: (1) explain the condition requiring treatment, (2) tell the patient what to expect, (3) assess the patient's ability to understand the situation, (4) be aware of pressures to agree to tests or treatments, and (5) obtain agreement from the child or adolescent. The process of obtaining assent from the patient aids in developing a shared approach to clinical decision making that the individual will carry into adulthood.

When parent and patient disagree, further discussion is necessary to resolve the disagreement. In such situations, the AAP recommends deferring any decisions for nonurgent care and avoiding coercion whenever possible.

**Reference**

1. Committee on Bioethics: Informed consent, parental permission, and assent in pediatric practice, *Pediatrics* 95:314–317, 1995.

also provide an acceptable interim alternative to full-coverage restorations. When a full-coverage restoration is required, it is often preferable to delay the process for a period of months or years to reduce the likelihood of encroachment on the pulp and to allow the age-related migration of the gingival attachment to occur.

In adolescents, posterior teeth requiring full-coverage restoration may also present restorative challenges. Short clinical crowns and high gingival attachment may compromise the retention of onlays or crowns. Interim restorations, such as stainless steel crowns, may need to be used until gingival tissue height has stabilized and an adequate level of plaque control has been established. Care must be taken, however, because the use of improperly adapted stainless steel crowns for long periods of time may compromise the long-term gingival or periodontal health of these teeth.

### Esthetics

Esthetics are particularly important to the adolescent patient, caught between the conformist world in which he or she is expected to maintain the behavior and appearances of childhood, and the rebellious world in which alternative appearances are essential to seeking new identities. In the majority of cases, adolescents remain acutely aware of their own physical appearance and wish to achieve and maintain good oral and dental health. In fact, heightened awareness of the opposite sex during puberty may motivate teenagers to pay more attention to physical appearance, including the appearance of their teeth.

Techniques such as resin bonding, veneers, and orthodontics offer adolescents the opportunity to improve oral health and appearance and encourage development of a healthy and positive self-image. Resin bonding and veneers can provide an esthetic and functional reconstruction for teeth marred by developmental or traumatic defects. Orthodontic treatment has also become a widely accepted part of dental treatment during adolescence.

## TREATING THE ADOLESCENT PATIENT

The adolescent patient should be treated as an individual, unique and separate from his or her parents. During appointments, the dentist should try to focus on the patient and his or her desires rather than on the parents. If the parents are present during the dental visits, the dentist should avoid spending an inordinate amount of time relating to them. Successful dialogue and interactions are easier to establish if the dental team shows interest in topics that the adolescent regards as important. Such simple gestures as providing Internet access in the office and video selection in the waiting room, or offering the adolescent the opportunity to select the type of music to listen to during the appointment, can be an effective means of improving rapport. If the office has a website or social media interface, posting invitations specifically to adolescent patients and links to educational materials geared to their needs can be helpful in making the adolescent patient feel accepted and valued for who they are.

Wide-ranging behaviors may be encountered among adolescents, depending on their developmental phase. Unlike young children, adolescents are capable of understanding the scientific basis of disease. Knowledge of biology and science gained from the school curriculum allows the adolescent to comprehend the microbiologic basis of caries and periodontal disease. As a result, most adolescents are aware of the importance of good oral hygiene and the sequelae of failing to comply with such practices. To encourage good oral self-care in younger adolescents, parents can offer a choice of a regular toothbrush versus an electric toothbrush with the premise that the decision to brush or not to brush is not debatable, but that other options are under the young person's control.

At the same time, as a normal part of development, adolescents tend to question or reject adult authority. In the dental setting, the adolescent may relate poorly to the dental team because of this conflict. The acceptance or rejection of dental counseling and treatment may depend on the manner in which the information is conveyed. An authoritarian approach is more apt to be a "turnoff" and to impede the development of a trusting and positive dentist-patient relationship. A nonthreatening, understanding approach that conveys respect for the individual's approaching maturity and allows some freedom of choice increases the chances for successful communication. Oral hygiene and diet instruction should be discussed in a straightforward and factual manner, rather than with a threatening or demanding tone. Instead of making appointments for adolescents, parents can give the teenager a choice of dates and allow them to choose the one that works best for them.

With advances in technology, teenagers are more accustomed to communicating digitally using text messaging and online chat rooms. An explosion of social networking sites allows teenagers to communicate and share common interests on a global level. Smartphones and computers allow instant access to the content of the World Wide Web and all its resources, whether good or bad. Modern dentists must be digital savvy and willing to use these electronic resources to their advantage to educate and motivate technologically connected teenagers. Text messages or office social media sites can be used to stress healthy lifestyles and the importance of good oral hygiene.

## FOLLOW-UP AND MAINTENANCE

As with adult patients, adequate follow-up and maintenance are crucial to the success of the adolescent's treatment plan. Periodic visits are essential to ensure that previous treatment has been effective, assess the patient's current condition, and develop strategies to address new and continuing oral health needs.

Issues relating to planning for and executing the recall visits, discussed in Chapter 11, are equally applicable to the adolescent patient. Because of the changing physiology, metabolism, self-image, and lifestyle that characterize this group, the need for regular periodic dental visits takes on an added

dimension. Dental disease—most notably dental caries—can initiate and progress extremely rapidly. Significant occlusal changes occur as a result of growth and development. Periodic visits provide an opportunity to manage these and other emerging oral health problems proactively and effectively. The patient's interest in oral health and receptivity to oral healthcare instructions may rise or fall throughout adolescence. At periodic visits, the dental team can provide positive reinforcement in good times, and provide encouragement when the patient's enthusiasm has flagged. The team can also use these periodic visits as opportunities to explore new strategies—recognizing that previous methods and techniques may no longer be effective, and that other, more-adult strategies may now be relevant and useful. As the adolescent patient's interests, motivation, and perspectives change, so too will desires and expectations concerning oral function and appearance. Periodic visits provide the ideal opportunity to revisit or raise new treatment options to improve on oral esthetics, correct malocclusion, and permanently restore or replace individual teeth.

## CONCLUSION

This chapter has outlined some of the problems the dentist is likely to encounter in planning treatment for adolescents. Although many of the disease processes encountered in adolescents are not unique to this age group, and procedures that are followed during diagnosis and treatment planning parallel those used in adults, the psychosocial and physical changes that occur during this period of development may require modification of routine clinical techniques. Lack of motivation and compliance are frequently encountered as adolescents seek to establish an autonomous, stable self-identity. Open communication and understanding of these issues are essential requirements for successful interaction with and treatment of the adolescent patient.

## REVIEW QUESTIONS

- What are the three phases of psychosocial development in the adolescent? How might each phase influence the adolescent's view of dentistry and expectations regarding dental treatment?
- List some lifestyle issues that may have an effect on the adolescent's oral condition and dental treatment.
- How does patient-dentist confidentiality affect the dentist-adolescent-parent relationship?
- Why are many adolescents attracted to using tobacco, alcohol, and other substances?
- What oral problems can these behaviors create? How might alcohol or substance abuse affect the delivery of dental care?
- Why are some adolescents highly caries prone?
- What forms of periodontal disease are found in the adolescent? How are these diseases treated?
- Delineate common occlusal problems in the adolescent. How are they identified? How are they treated?
- What are the signs of anorexia and bulimia? Why are adolescents more at risk for developing these disorders? How are they treated?
- Are the processes of developing a plan of care and achieving consent different in the adolescent and the adult patient? If so, how?

## SUGGESTED PROJECTS

- Develop a management strategy for adolescents at high caries risk.
- Develop an office protocol for identifying and managing patients in your practice who are at risk for obesity.

## REFERENCES


1. United States Bureau of the Census: *Census Gateway*, 2000. http://www.census.gov/topics/population.html. Accessed June 22, 2015.
2. Day JC: *Population projections of the United States, age, sex, race, and Hispanic origin: 1993 to 2050, US Bureau of the Census, current population reports, P25-1104*, Washington, DC, 1993, U.S. Government Printing Office.

2a. United Nations Population Division: http://www.un.org/en/development/desa/population/. Accessed June 22, 2015.

3. Asemota AO, George BP, Bowman SM, et al: Causes and trends in traumatic brain injury for United States adolescents, *J Neurotrauma* 30(2):67–75, 2013.
4. Centers for Disease Control and Prevention: *Adult BMI calculator*. http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/english_bmicalculator/bmi_calculator.html. Accessed September 7, 2015.
5. Okunseri C, Okunseri E, Gonzalez C, et al: Erosive tooth wear and consumption of beverages among children in the United States, *Caries Res* 45(2):130–135, 2011.
6. World Health Organization: *What is the burden of oral disease?* http://www.who.int/oral_health/disease_burden/global/en/. Accessed June 22, 2015.
7. Kallestal C: The effect of five years' implementation of caries-preventive methods in Swedish high risk adolescents, *Caries Res* 39:20–26, 2005.
8. Mack KB, Phillips C, Jain N, Koroluk LD: Relationship between body mass index percentile and skeletal maturation and dental development in orthodontic patients, *Am J Orthod Dentofacial Orthop* 143:228–234, 2013.

9. Werner SL, Phillips C, Koroluk LD: Association between childhood obesity and dental caries, *Pediatr Dent* 34:546–550, 2012.
10. Wardle J: Understanding the aetiology of childhood obesity: Implications for treatment, *Proc Nutr Soc* 64:73–79, 2005.
11. Caplan DJ, Weintraub JA: The oral health burden in the United States: a summary of recent epidemiological studies, *J Dent Educ* 57:853–862, 1993.
12. Bhat M: Periodontal health of 14-17-year-old United States schoolchildren, *J Public Health Dent* 51:5–11, 1991.
13. Brown L, Brunelle J, Kingman A: Periodontal status in the United States, 1988-91: Prevalence, extent and demographic variations, *J Dent Res* 75:672–683, 1996.
14. Mombelli A, et al: Gingival health and gingivitis development during puberty, *J Clin Periodontol* 16:451–456, 1989.
15. Nakagawa S, et al: A longitudinal study from prepuberty to puberty of gingivitis, *J Clin Periodontol* 21:658–665, 1994.
16. Mombelli A, et al: Microbiological changes associated with the development of puberty gingivitis, *J Periodontal Res* 25: 331–338, 1990.
17. Hock J: Gingival vasculature around erupting deciduous teeth of dogs and cats, *J Clin Periodontol* 2:44–50, 1975.
18. Albandar JM: Aggressive periodontitis: case definition and diagnostic criteria, *Periodontology 2000* 65:13–26, 2014.
19. Susin C, Albandar JM: Epidemiology and demographics of aggressive periodontitis, *Periodontology 2000* 65:27–45, 2014.
20. Kornman KS, Robertson PB: Clinical and microbiological evaluation of therapy for juvenile periodontitis, *J Periodontol* 56(8):443–446, 1985.
21. Palmer RM, Watts TL, Wilson RF: A double-blind trial of tetracycline in the management of early onset periodontitis, *J Clin Periodontol* 23(7):670–674, 1996.
22. Krill DB, Fry HR: Treatment of localized juvenile periodontitis (periodontosis), *J Periodontol* 58:1–8, 1987.
23. Efeoglu E, Sandalli P: A 14-year study of localized juvenile periodontitis treated by scaling and root planing, systemic metronidazole, and subgingival curettage, a case report, *Periodont Clin Invest* 18(2):6–12, 1996.
24. Sgolastra F, Petrucci A, Gatto R, Monaco A: Effectiveness of systemic amoxicillin/metronidazole as an adjunctive therapy to full-mouth scaling and root planing in the treatment of aggressive periodontitis: a systematic review and meta-analysis, *J Periodontol* 83:731–743, 2012.
25. Mombelli A, Cionca N, Almaghlouth A, et al: Are there specific benefits of amoxicillin plus metronidazole in Aggregatibacter actinomycetemcomitans-associated periodontitis? Double-masked, randomized clinical trial of efficacy and safety, *J Periodontol* 84:715–724, 2013.
26. Golub LM, et al: Minocycline therapy inhibits the abnormal gingival collagenolytic activity during experimental diabetes: preliminary observations, *J Dent Res* 62:290, 1983, (abstract 1085).
27. Sabiston CB: A review and proposal for the etiology of acute necrotizing gingivitis, *J Clin Periodontol* 13(8):727–734, 1986.
28. Wade DN: Acute necrotizing ulcerative gingivitis-periodontitis: a literature review, *Military Med* 163:337–342, 1988.
29. Hodgdon A: Dental and related infections, *Emerg Med Clin North Am* 31:465–480, 2013.
30. Proffit WR, Fields HW Jr, Moray LJ: Prevalence of malocclusion and orthodontic treatment need in the United States: estimates from the NHANES III survey, *Int J Adult Orthodon Orthognath Surg* 13(2):97–106, 1998.
31. Robinson TN, Killen JD: Do cigarette warning labels reduce smoking? Paradoxical effects among adolescents, *Arch Pediatr Adolesc Med* 151:267–272, 1997.
32. Moss HB, Chen CM, Hsiao-ye Y: Early adolescent patterns of alcohol, cigarettes, and marijuana polysubstance use and young adult substance use outcomes in a nationally representative sample, *Drug Alcohol Depend* 136:51–62, 2014.
33. Patrick ME, Schulenberg JE, Martz ME, et al: Extreme binge drinking among 12th-grade students in the United States: prevalence and predictors, *JAMA Pediatr* 167:1019–1025, 2013.
34. Hsu LK: Epidemiology of eating disorders, *Psychiatr Clin North Am* 19(4):681–700, 1996.


## SUGGESTED READINGS


Casamassimo PS, Fields HW, McTigue DJ, Nowak A: *Pediatric dentistry: infancy through adolescence*, ed 5, St. Louis, 2013, Saunders.

Holder A: *Legal issues in pediatrics and adolescent medicine*, ed 2, New Haven, Conn, 1985, Yale University Press.

McDonald RE, Avery DR: *Dentistry for the child and adolescent,* ed 9, St Louis, 2010, Mosby.

17

# Geriatric Patients

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## OUTLINE

**Oral Health in the Aging Population**
- Changing Needs and Values

**Evaluation of the Older Patient**
- Patient Interview
- Patient's Health History
- Medication History
- Examination
- Risk Assessment
- Identifying Health Problems That May Affect Dental Treatment

**Systemic Phase Dental Treatment Planning**
- Cardiac Disease
- Neurologic Disorders
- Cerebrovascular Accident
- Late-Life Depression
- Oral Cancer and Other Malignant Neoplasms

**Disease Control Phase and Prevention Strategies**
- Management of Xerostomia
- Oral Physiotherapy
- Toothbrushes and Interdental Cleaning Aids
- Chemotherapeutic Agents
- Dietary Modification

**Definitive Treatment Planning for Older Adults**
- Treatment Planning for Active and Independent Elderly
- Treatment Planning for Frail Elderly

**Maintenance Phase Treatment Planning**

**Conclusion**

An increase in the number of elderly people is a worldwide phenomenon. The United Nations estimates that there are currently 810 million persons older than 60 years in the world today. This number is estimated to increase to 2 billion by 2050, when the number of individuals who are older than age 60 will outnumber children between ages 0 and 14 for the first time in history.[1]

Table 17-1 shows the percentage of the population who are older than age 65 in countries throughout the world. The proportion of the population older than age 65 is greater in the developed regions, with Japan leading the world with 24% older than age 65.[2] Many countries on the European continent have populations at or approximating 20% older than age 65. In Australia, Canada, Russia, and the United States, 13% to 15% of the populations are older than age 65 years.

Even the less-developed regions of the world are experiencing aging populations. In Mexico and India, currently 5% to 6% of the populations are older than age 65.[2] It must be noted, however, that 5% of India's population represents more than 50 million adults who are older than age 65, more than the entire population of Canada. China's "one child" policy and a rapidly increasing older population has resulted in 9% of the total population who are older than age 65. Taken together, this global data suggests that oral healthcare for an increasingly large number of older adults will be a fact of life for dentists everywhere.

In 1900, life expectancy at birth in the United States was approximately 47 years. By the beginning of the twenty-first century, life expectancy had increased to almost 80 years. The average citizen of the United States now has more parents and grandparents than children, and older people are the fastest-growing segment of the U.S. population.[3] Currently, 14% (41 million) of the U.S. population is older than age 65, and this number will increase throughout the twenty-first century. By the middle of the twenty-first century, the number of centenarians in the United States is expected to reach 1 million[4] as the oldest of the older population ages. Currently, the segment of the population older than age 80 accounts for 14% of individuals in the over-sixty group. This proportion is projected to increase to 20% by 2050.

In the United States and throughout the world, most older adults (85%) are healthy and live in community settings. In the United States, approximately 10% are described as homebound (i.e., able to leave their homes only with great difficulty), and 5% of U.S. seniors (1.5 million) reside in nursing homes. In the United States, people older than age 65 have a one in four chance of spending some time in a nursing home during their lifetimes. The proportion of older adults living in nursing homes varies by age, with only 2% of the 65- to 74-year-old group living in nursing home settings, compared with 6% of those 75 to 84 years old, and 22% of those older than age 85. As will be discussed later in this chapter, access to oral healthcare can be difficult for nursing home residents,

**TABLE 17-1 Global Aging, 2009-2013**

| Country | Estimated % of the Population ≥ 65 yrs |
|---|---|
| Australia | 14 |
| Canada | 15 |
| China | 9 |
| Greece | 19 |
| India | 5 |
| Ireland | 12 |
| Israel | 11 |
| Italy | 21 |
| Japan | 24 |
| Korea | 9 |
| Mexico | 6 |
| Peru | 6 |
| Russian Federation | 13 |
| Singapore | 10 |
| Sweden | 19 |
| United States | 14 |

World Bank: *UN Population Division's World Population.* Available at: http://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS/. Accessed September 8, 2014.

as well as for health-compromised homebound persons, and the provision of treatment may become more complex as a result of chronic systemic illnesses.

Because of the differential in life expectancies between men and women, aging sometimes is described as a women's issue. As the population ages, the ratio (number of men to women) decreases. In 2012 globally, in the age 60 and older population, there were 84 men per 100 women and, at age 80 and older, only 61 men for every 100 women. The ratio of men to women at ages 60 and older in the more-developed regions is 89 men to 100 women. Globally, older men are more likely to be married (81%) compared with older women (50%).[1] Older women are more likely to be single, divorced, or widowed, and they are more likely to live in poverty. Although poverty rates overall are lower for older adults than for children, since 2005, poverty rates among retirees have been increasing.[5] The poverty rate for adults ages 65 to 74 years increased from 7.9% in 2005 to 9.4% in 2009. Poverty rates in older adults vary by gender, race, and ethnic background. The rate also increases with age, with the older-than-85 retirees having the greatest financial needs, with 14.6% living below the poverty line.

This chapter will discuss treatment-planning issues that have particular relevance to this distinct group. The terms "senior," "geriatric," and "older adult" are used interchangeably, all referring to persons older than age 65. Although the authors recognize the arbitrariness of this designation, age 65 has become a common marker for retirement and therefore serves as a standard and convenient reference.

## ORAL HEALTH IN THE AGING POPULATION

Oral health can be both a benchmark for, and a determinant of, the quality of life. Currently, for example, people in the United States who are 85 years old can expect to have at least another 5 years of life, but more important than the length of life span will be the quality of life that can be afforded to individuals in those later years. In the United States over the past 20 years, the oral health of older adults has improved considerably, from that of a generation that was predominantly edentulous to one in which each individual in that age group has an average of 20 teeth.

Perhaps as a result, older adults in the United States have greater dental needs, use dental services at higher rates, and incur higher average costs per visit than do younger people. A recent report by the American Dental Association's (ADA's) Health Policy and Research Division noted that although adjusted per patient dental expenditures were flat among children, they had increased among adults, especially older adults and higher-income adults. The authors concluded that "due to the aging of the baby boomers, the percent of the population over age 65 will grow and dental expenditures among this segment of the population could buoy up the dental economy for years to come."[6]

On the less-optimistic side, it must be noted that most U.S. dental insurance benefits cease when retirement begins, and, with the exception of some Advantage plans, Medicare includes almost no dental benefits. Dental offices may need to alert baby boomers planning for their retirement to this upcoming change in their dental benefit status.

For the affluent elderly, dental expenditures will continue to be made from discretionary or expendable income, but for the low-income elderly in the United States, financial options to pay for dental care are limited. Medicaid, available to some, varies from state to state both in the types of dental care reimbursed and in the age groups covered. Even when the patient does qualify, few services are covered beyond basic preventive therapy, direct-fill restorations, extractions, and dentures. A mechanism does exist for using Supplemental Social Security Income to pay for needed dental services if the patient resides in a long-term care facility, termed Incurred Medical Expenses (IME). (See *Suggested Readings and Resources* at the end of this chapter.)

Two-thirds of those seniors who are considered poor are not eligible for any type of Medicaid dental coverage. For those persons, the prospects for receiving good-quality, definitive care are limited.

The trend worldwide is for individuals to live longer and retain more of their natural teeth; as a result, there are more older adults with more complex dental needs. Access to dental care for homebound elderly and nursing home residents can be problematic, even in countries with national healthcare systems. Developed countries with national health systems that include dental care have seen increased costs as their population ages. As oral health costs have increased for aging populations, some governments have examined new ways of preventing oral diseases, particularly root caries.

### Changing Needs and Values

In their book *Successful Aging,* Rowe and Kahn suggest that lifestyle choices may be more important to the aging process

than genes.[7] Globally, attitudes about oral health in older adulthood vary considerably. In some regions, edentulism may be viewed as simply an inevitable fact of aging. In other areas, good oral health is considered essential to successful aging. Japan, for example, has undertaken a health promotion program called "20 by 80."[7a] The goal of this program is for Japanese adults to retain 20 teeth by the time they reach age 80. In the United States, the baby boomers' approach to aging differs dramatically from that of their parents and grandparents. They are the best-educated age group in the U.S. population (almost 25% have attended college), and with more leisure time, discretionary income, knowledge of wellness issues, and opportunity to engage in healthful activities, this group is expected to live longer and have greater expectations for their health than did their parents. They are demonstrating an increasing demand for discretionary healthcare services, particularly plastic surgery. Similarly, the cosmetic services that dentistry can provide have increased popularity with this group. As the first generation to benefit from the widespread fluoridation of water supplies and availability of fluoride toothpaste, boomers generally have a strong appreciation for the benefits of preventive oral healthcare. Already using dental services at a relatively high rate, they are predicted to seek out, and benefit from high-quality oral healthcare. As the baby boom generation ages further, many in that segment will reach older adulthood with a relatively complete dentition.

Although the expectations for what older individuals want and can afford in dental care can and do vary widely, there are also commonalties. Many health problems—both oral and systemic—are more likely to occur in this population. How are these problems recognized and diagnosed? How are they managed? What are the specific dental treatment needs of the elderly, and how is dental treatment planning shaped by the characteristics of aging? These questions are the focus of this chapter.

## EVALUATION OF THE OLDER PATIENT

Geriatric patients in general, and the frail elderly in particular, will need very individualized plans for care. Simply looking in the mouth and at radiographs will not be sufficient for determining a treatment plan. Many factors must be considered in the decision-making process, and these factors hold much more significance than with any other age group. The best time to determine whether these factors apply, and how significant they may be, is during the patient evaluation. Some important factors that may affect treatment plans for the elderly include the living situation (e.g., independent community living, assisted living, nursing home), the patient's hand skills and coordination, the cognitive ability of the patient, the need for and availability of a caregiver to assist with oral hygiene, distance traveled to the office, type of transportation required, social schedule, consistency of the diet (e.g., regular, soft, mechanical soft, pureed), the constituents of the diet (amount of carbohydrates and sugars), health history and medications, the patient's vision and auditory status, and volume and quality of saliva present. A comprehensive understanding of the patient will be needed to formulate the best treatment plan.

### Patient Interview

To develop a good relationship with the patient and an appropriate treatment plan, it is also important to recognize social issues associated with the elderly. If these issues are discussed during the original patient interview, both treatment planning and scheduling of future appointments can be more effectively facilitated. For instance, although retired, many seniors, especially the younger members of this age group, find themselves with as complex a schedule as they had while working; with involvement in organizations, volunteer work, travel, and hobbies filling busy days and weeks. In addition, many older adults have become full-time caregivers for an aging spouse or other family members. Such caregiving can be time consuming and exhausting, and may lead to difficulty finding time to devote to their own personal health needs. This, in turn, can result in infrequent and/or shorter dental appointments for these patients. Many older adults still place a high priority on punctuality and expect the dentist to respect their time. Some older adults spend winter or summer in different locales, which may affect the continuity of both medical and dental care.

Age-related memory loss is a part of the lives of many seniors. Appointment reminders become more important, and some elderly persons may wish to involve another family member, such as a spouse or adult child, in treatment-planning decisions. It will be appropriate to ask the patient if he or she would like to discuss treatment options with another family member before making a decision, simultaneously acknowledging the patient's autonomy.

With increasing frailty may come special transportation requirements. The clinician should not hesitate to raise these issues during the patient interview. If the individual depends on a family member to provide transportation to appointments, the frequency or length of visits may become a treatment-planning modifier. Some patients may require a taxi, adding to the expense of the treatment, or require appointments to be scheduled at particular times to accommodate public transportation schedules. Treatment sequencing may need to be altered to accommodate such special situations.

Because the older-than-65 segment of the population spans several generations, individual perceptions of dental needs and treatment choices will differ, based in part on past experiences. It is useful to ask about past dental care and what the patient's expectations are for their teeth and their oral health overall. Based on their previous experiences, some may have low expectations. Providing information about the more recent alternatives in dentistry may help enlighten patients about available options. As a group, baby boomers may be more likely to have higher expectations than those individuals in previous generations.

Visual and auditory disabilities are among the most common chronic conditions reported by seniors. Although the office staff should never assume that a patient is unable to see

or hear well, it is wise to be aware that these conditions may be present. If the patient has removed his or her glasses for the examination, they should be returned before any written materials are reviewed. Black print on a white background is the most easily read. Developing health history forms and written take-home instruction materials in slightly larger print will be helpful.

Close contact with a hearing aid can occur during the initial examination or dental treatment and may cause unpleasant ringing in the patient's ear. The patient may turn off the hearing aid during treatment, so a reminder to turn the aid back on may be needed before beginning any discussion. Written treatment plans or postoperative instructions can assist in the presentation of the information and can be shared with family or friends later.

Alterations in mastication, swallowing, and sensory function occur with age. Mastication and swallowing difficulties can also occur as sequelae of systemic diseases seen more frequently in older adults, such as stroke or Parkinson's disease, or as the result of prolonged use of antipsychotic medications causing involuntary and uncontrollable muscle spasms. The sense of taste (salt, sweet, bitter, sour) appears to undergo few age-related alterations but is commonly affected by chemotherapy, opioids, and antibiotics. The sense of smell, however, appears to decrease with age, and that change is thought to account for loss of flavor perception in older adults.

## Patient's Health History

Because older adults are more likely to have chronic health problems, more time is generally required to obtain a thorough and accurate health history. Questioning is necessary to gather additional information about each positive response on the health history form. If a comprehensive health history form is used (see Chapter 1), an ideal format includes space both for patient responses and for the dentist to record notes pertaining to each affirmative answer. It is advisable to assume that the patient can provide a reliable health history until otherwise demonstrated. If the patient seems unable to supply the necessary information, a tactful request for assistance should be made to family or caregivers. It may also be advisable to obtain a verbal or written consultation from the patient's physician.

The following guidelines should be observed when obtaining health-related information about the patient from caregivers or healthcare providers:

- Be attentive to federal Health Insurance Portability and Accountability Act (HIPAA) or any applicable confidentiality regulations that may apply (see Chapter 6). Obtain permission from the patient (or guardian or Health Care Power of Attorney [HCPOA]) to seek information from a caregiver or healthcare provider and document that consent.
- Use *specific* open-ended questions when seeking further information from a guardian or healthcare provider in response to positive answers on the health history. For example, "Mr. Smith reports having a heart problem, can you tell me more about that?" A general, "Is there anything I need to know?" query is less likely to elicit all the important or relevant information needed to safely carry out dental treatment.
- If the patient has a diagnosed illness, but the presentation is unusual, or if the patient develops new manifestations or conditions, a consultation with the physician should be requested.
- Contact the correct physician or specialist. Many older patients see more than one healthcare provider. When in doubt, it is often best to begin with the internist, family physician, or geriatric specialist, because the individuals in these disciplines often serve as the medical care coordinators.
- Copies of any laboratory results needed should be obtained during the data collection phase and before the initiation of treatment. If the patient is undergoing anticoagulation (Coumadin) therapy, a recent prothrombin level or international normalized ratio (INR) measurement is needed. Diabetic patients should obtain copies of their most recent hemoglobin A1c values. Patients with chronic kidney disease will need a recent glomerular filtration rate (GFR) before prescribing medications. For patients receiving radiation therapy or chemotherapy, it should be determined whether the patient has been given an antiresorptive agent, like an intravenous bisphosphonate, or for patients receiving radiation, the total amount and location of radiation should be documented. Reported laboratory values need to be evaluated carefully, because "normal" may vary more in seniors, and an addendum or additional normal range for older patients may be listed on the report.

## Medication History

Medications play an important role in maintaining the health and quality of life for many older patients. More than 88% of older patients take at least one prescription medication, and approximately 37% of older adults take 5 or more.[8] The patient should be instructed to bring the medications to the appointment, or the physician or pharmacy may have supplied a printed list the patient can bring. "Over-the-counter" remedies can affect the patient's mood, coagulation rate, or oral condition, so ask for a list of those as well.

A thorough review of the patient's medication list is an essential component of the health history review and a requisite for the formulation of a comprehensive diagnosis and plan of care. A complete understanding of the types and dosages of the older dental patient's medications can aid in the differential diagnosis of oral conditions or lesions and can be a useful indicator of the level of severity of a specific disease. Such information may alert the dentist to potential medical emergencies that may arise during treatment. Because the patient's medical status and the types and dosages of medications can change frequently, it is often helpful to have the patient or care provider bring a list (or the medication containers

themselves) at least once a year to update the medication history.

It is important to ask if the medications are being used according to the physician's directions. For various reasons, including cost, side effects, and difficulty with the timing of multiple medications, patients may not be compliant with the prescribed regimen. If the patient is taking multiple medications, he or she may become confused and simply forget to take one or more. In any of these situations, the dentist should advise the patient and/or the caregiver to share this information with the patient's physician. In addition, the dental team should be watchful for signs of under- or overmedication. For example, if the patient has chosen to lower the dose of a hypertension medication because of side effects, the dentist should closely monitor the patient's blood pressure, particularly during a stressful dental procedure. As dentists, some of the issues that we should be aware of include hypotension associated with nifedipine, as well as falls and delirium that can be induced by benzodiazepines or narcotics.

For older patients, overmedication can be an issue, and the law of multiples applies when reviewing or adding medications for these patients. In other words, multiple medications from multiple providers and even multiple pharmacies can lead to poor compliance and adverse drug interactions. The Beers Criteria, developed by the American Geriatric Society, is a published list of medications that can be dangerous for older adults.[9] (See *Suggested Readings and Resources* at the end of this chapter.)

This panel of geriatricians and pharmacists made a point of urging caution when prescribing any of the more than 50 medications that have strong anticholinergic effects. These include many antihistamines, antidepressants, antipsychotics, and muscle relaxants. Such medications can have a significant effect on oral health, owing to their high xerostomic potential.

## Examination

A careful initial interview ensures that the dentist becomes familiar with the patient's health history and is primed to look for signs of any reported diseases or conditions during the examination. Procedures for the oral examination, and radiographic selection criteria, are the same for the older person as for any adult patient, but certain aspects of the examination are more important for this group.

A complete oral examination requires a thorough evaluation of both extraoral and intraoral structures. Because skin cancer is more prevalent in the older population, the examination must always include evaluation of the face, neck and all exposed skin surfaces. Important findings include basal cell carcinomas, or melanomas of the skin; or solar cheilosis, carcinoma-in-situ or squamous cell carcinoma of the lower lip. Oral cancer is predominantly a disorder of the elderly, with the median age of diagnosis at 64 years.[10] Therefore, it is important to monitor older adults carefully and frequently for signs of such disease.

Radiographic examinations can show evidence of osteoporosis, and panoramic images can reveal carotid calcifications—both common abnormalities in the elderly.

Part of the oral examination should include a thorough evaluation of salivary function. Salivary gland dysfunction is more common in seniors than in younger patients. Signs of chronic xerostomia include a desiccated mucosa; a red, fissured, denuded, or shiny tongue; caries around the gingival margins and cusps of teeth; demineralization around the gingival margins, even without obvious caries; bubbly saliva; frequency of soft tissue trauma; and adherence of a gloved finger or mouth mirror to the buccal mucosa. Salivary glands should always be palpated extraorally while viewing the duct to make sure an adequate flow of saliva occurs when the glands are massaged.[11] Patients also should be questioned about any history of pain or swelling in the glandular areas that could indicate infection, blockage, or neoplasm.

## Risk Assessment

As James Beck has noted, the relative importance of risk factors changes as people age.[12] For older adults, systemic disease and medications play a far greater role in oral health than is true of younger adults. A key to geriatric treatment planning is an understanding of the concept of multimorbidity and how this concept should be incorporated into treatment planning. This concept reflects the fact that older adults often present with multiple chronic conditions, with 50% of older adults having at least 3 or more.[9] Once these chronic conditions have been identified, it is common for the patient to remain afflicted, or at least to remain at risk. The older adult who has been identified as at high risk for caries or periodontal disease, for example, will need aggressive preventive therapy and careful monitoring for the condition for the remainder of his or her life.

Several questions are important to ask during the treatment planning process:

- What is the severity level of each chronic medical condition and how might that affect the patient's oral health and oral care?
- What is the likelihood that any of these chronic conditions will worsen in the next 12 months, and how can I prevent decline in oral health if it does?
- How do the patient's aspirations and expectations for his or her oral health fit in the context of the individual's general health?

Frailty is defined as increased vulnerability as a result of a decline in the individual's reserve capacity. In the dental setting, frailty means that the patient's ability to access dental care, tolerate dental procedures, and manage the home care required after treatment may all be compromised. One surrogate for frailty is the patient's level of dependency. Using previous systemic definitions of dependency, a large group of geriatric dentists from around the world developed and published a list of five levels of dependency to help the dentist determine the appropriate clinical pathway or necessary care modifications for geriatric patients.[13]

These ranged from no dependency, which requires really no change in care decisions, through pre, low, medium, or

high dependency. As the level of dependency rises, the modifications that must be considered in assessment, prevention, and even communication will also rise.

As discussed in this chapter (and in Chapter 3), chronic medical conditions are risk factors and may be contributing factors in oral health problems for the elderly. Type 2 diabetes, for example, is a known risk factor for periodontal disease. Periodontal disease has also been implicated as a possible risk factor for atherosclerosis. For example, studies have shown that improvement or reduction in periodontal microbes can be linked to slower progression of atherosclerosis, compared with individuals with uncontrolled periodontitis.[14]

In particular, the frail elderly are much more susceptible to a full range of oral health disorders. In the presence of diminished mental capacity, a weakened physical condition, poor nutritional intake, dehydration, need for a soft diet, and inability to engage in effective oral self-care and other activities of daily living (ADL), these patients are much more vulnerable to the ravages of caries, periodontal disease, and other forms of oral pathology.

Even in the active and independent elderly, changes to both hard and soft oral tissues occur in the oral cavity. Age-related alterations to tooth and soft tissue morphology and integrity are risk factors for oral problems. Physiologic changes in the teeth include a decrease in pulpal size, decreased pulpal cellularity, and loss of enamel from functional, chemical, and mechanical forces. As the pulp recedes, teeth typically darken in color, may become more brittle, and are at increased risk for fracture. Attrition, a natural function of aging, leaves the affected teeth more vulnerable to dentinal sensitivity, erosion, caries, and fractures. Gingival recession is common in the elderly and is a risk factor for root sensitivity, periodontal disease, root caries, and pulpal necrosis.

The oral mucosa continues to play a critical role as a barrier organ for the body throughout life. Although there is little change in the thickness of stratified squamous epithelium on the surface (except under dentures), the connective tissue layer below becomes thinner and loses elasticity, decreasing the effectiveness of the barrier function. In addition, a reduced immune response may increase the vulnerability of oral tissues to infection and trauma. The incidence of oral mucosal disorders increases with advancing age. Such diseases include vesiculobullous disorders, ulcerative lesions secondary to medication use, and lichenoid, infectious, or malignant lesions.

Box 17-1 provides a list of oral problems more common among older patients.

When risk factors have been identified, risk reduction strategies can be designed to reduce or eliminate their effect. Figure 17-1 illustrates an Oral Diseases Risk Analysis form. This form serves to identify and categorize risk factors so that strategies can be developed to prevent the occurrence or recurrence of disease. Although not all such factors can be eliminated (e.g., systemic diseases such as Alzheimer's disease or hemiparesis as a result of cerebrovascular accident), identifying the risk factors enables both the dentist and the patient to work on creative ways to reduce their effect. For patients with multiple risk factors, column four of the form enables the dental team member to annotate discussion of the reduction strategy and to note observations on the patient's progress. Patients, in turn, can decide which problems they wish to address and in what sequence, thus empowering them to take responsibility for their own oral health.

**BOX 17-1 Common Oral Problems in Older Adults by Disease Category**

**Medication-Related Problems**
Xerostomia (medication or radiation induced)
Gingival hyperplasia (mediation induced)

**Infectious Conditions**
Caries
Periodontal disease

**Inflammatory Conditions**
Sjögren's syndrome
Pemphigoid
Lichen planus

**Neoplastic Disease**
Oral cancer
Oral complications of cancer therapy

## Identifying Health Problems that may Affect Dental Treatment

As described earlier, there is an intimate relationship between oral and systemic health. Treatment planning must therefore include an assessment of any chronic conditions and the likelihood that such conditions will increase the patient's risk for oral disease. For example, a systemic disease that compromises the immune system may result in a *Candida* infection in the oral cavity. Patients with chronic gastrointestinal problems may have a lower oral pH because of constant acid reflux, leading to increased risk of oral disease or an unusual pattern of oral disease (Figure 17-2). Each time an older patient's health history is reviewed, the dentist must consider what effect any new illness may have on the patient's oral cavity.

Box 17-2 lists the most likely chronic conditions with which an older patient will present to an examining dentist, many of which can have a direct effect on oral health and dental care. Arthritis may affect an individual's ability to perform daily brushing or flossing. Uncontrolled diabetics are more prone to severe periodontal disease.

Because senior patients are more likely to be taking medications, they are also more likely to develop medication-related oral changes. Patients taking medications for high blood pressure, depression, or antipsychotic disorders may suffer from dry mouth. An online medication database (examples: *Mosby's Dental Drug Reference* and *Lexicomp Online for Dentistry*) can be used by the dental team to identify the oral side effects of medications, and a printout of that information can be given to the patient.

## ORAL DISEASES RISK ANALYSIS©

| DATA | RISK FACTORS IDENTIFIED | RISK REDUCTION STRATEGIES/ PREVENTIVE SERVICES | PT GOALS/ PRIORITIES |
|---|---|---|---|
| **HEALTH HISTORY**<br>Systemic illness<br>ASA category<br>Current medication<br><br>Tobacco use<br>Alcohol use | | | |
| **DENTAL HISTORY**<br>Chief complaint<br>Use of services<br>Fluoride history | | | |
| **SELF-CARE EVALUATION**<br>Aware oral health/ disease etiology?<br>Oral health practices and products<br>Technique evaluation<br>Interests/beliefs<br>Expectations of care?<br>Ready for change? | | | |
| **PSYCHOSOCIAL**<br>Education/occupation<br>Family/lifestyle<br>Recreation<br>Satisfact w/ prior care<br>Emotions w/ dent care<br>Economic concerns | | | |
| **ORAL EXAM**<br>Lesion follow-up<br>Salivary function<br>Oral habits<br>Occlusal factors | | | |
| **DENTAL EXAM**<br>Primary caries<br>Secondary caries<br>Severity of caries<br>Prior caries<br>Occlusal morphology<br>Unrestored molars<br>Regressive alterations<br>Appliance/prostheses | CL I surfs: Smooth surfs: Root surfs: | | |
| **PERIO EXAM**<br>Perio type<br>Plaque amount<br>Calculus/stain<br>Special problems | | | |
| **DIET PRACTICES**<br>Daily water intake<br>Coffee/tea<br>Soda/juice<br>Meals per day<br>Between meal snacks<br>Gum/mints | | | |

| RISK ASSESSMENT | | | | |
|---|---|---|---|---|
| | **CORONAL CARIES** Low Mod High<br>**ROOT CARIES** Low Mod High | **PERIO DISEASES** Low Mod High<br>**ORAL CANCER** Low Mod High | **OROFACIAL TRAUMA** Low Mod High<br>**DENTAL TRAUMA** Low Mod High | **MED EMERGENCY** Low Mod High<br>**INFECTION** Low Mod High |

*The student has informed me of my risk factors for oral diseases and the preventive services that are available to reduce the risk.*

Patient signature Date

Student signature Date

Faculty signature Date

*© Baylor College of Dentistry, Texas A&M University System, Dallas, Texas*

**FIG 17-1** Oral disease risk analysis form.

**FIG 17-2** Patient with oral problems caused by severe acid reflux. The effect of systemic disease can be devastating to the oral cavity. This patient, who was diagnosed with severe gastroesophageal reflux, exhibits a high caries rate around the gum line and on the cusps because of the low pH in the oral cavity.

**BOX 17-2 Top 10 Chronic Conditions in Older Adults**

High blood pressure
High cholesterol
Ischemic heart disease
Arthritis
Diabetes
Heart failure
Chronic kidney disease
Depression
Chronic obstructive pulmonary disease
Alzheimer's disease and dementia

Source: Center for Medicare and Medicaid Services: Chronic conditions among Medicare beneficiaries chartbook: 2012 Edition.

**TABLE 17-2 Possible Adverse Drug Reactions and Drug-Drug Interactions**

| Drug or Drug Class or Interaction | Possible Adverse Drug Reaction |
|---|---|
| Aspirin | May reduce platelet aggregation or increase warfarin levels, resulting in possible excessive bleeding |
| Antibiotics (long term—7 days or more) | May reduce intrinsic intestinal bacteria levels with resultant reduced absorption of vitamin K; may increase warfarin levels, resulting in a deficiency of certain clotting factors |
| Anticoagulants | Excessive bleeding, especially with periodontal disease |
| Bisphosphonates | Risk of osteonecrosis of the jaw |
| Benzodiazepines | Taken with other CNS depressants (codeine, alcohol, antihistamines), can cause excessive CNS depression, sedation, respiratory depression, and loss of consciousness |
| Narcotics | Nausea, constipation, risk of falls |
| Nonsteroidal antiinflammatory drugs (NSAIDs) | May increase warfarin levels, resulting in excessive bleeding; may reduce effects of hypertension medications |
| Warfarin | Reduction of production of vitamin K clotting factors; risk of excessive bleeding |

Adapted from Hersh EV, Moore PA: Adverse drug reactions in dentistry, *Periodontol* 46:109-142, 2000.

As more medications are taken, the potential for drug-drug interactions increases. It is estimated that 50% of patients taking at least four medications will have some type of drug-drug interaction. Qato and colleagues[15] concluded that approximately one in every 25 older adults was taking concurrent drugs with the potential for harm from serious drug-drug interactions. A significant portion of these interactions occurs with antibiotics, analgesics, and sedatives—medications that are all commonly prescribed by dentists. Most side effects and interactions are mild, and many go unnoticed. Nevertheless, it is important for the clinician to be alert to the possibility of this type of problem. Table 17-2 lists some of the common adverse drug reactions and drug-drug interactions seen with medications frequently prescribed in dentistry.

## Need for Antibiotic Premedication

Treatment planning and pretreatment evaluation of any patient requires the dentist to assess the need for antibiotic premedication. Although the American Heart Association (AHA) now recommends premedication for fewer patients than in the past, more than one-half of all cases of infective endocarditis in the United States occur in persons older than age 60, and 42% of institutionalized elderly may have at least one cardiac risk factor for infective endocarditis.[16,17] Highest risk conditions specified by the AHA include:

- Artificial heart valves.
- Valve problems in cardiac transplant patients.
- Patients who have had previous infective endocarditis.
- Certain congenital heart conditions, such as unrepaired or incompletely repaired cyanotic congenital heart disease, a completely repaired congenital heart defect with prosthetic material or device within the last 6 months, or any repaired congenital heart defect with residual defect at the site or adjacent to the site of a prosthetic patch or a prosthetic device.[18]

For those highest-risk patients, the AHA Guidelines recommend the use of antibiotic premedication (2 g amoxicillin taken by mouth 30 to 60 minutes) before any dental procedures that include tissue manipulation.

Other countries around the world have implemented even more restrictive guidelines. For example, since 2008, the United Kingdom's National Institute for Health and Care Excellence guidelines no longer recommend antibiotic premedication for infective endocarditis. Since this change has been implemented, the country has not seen an increase in

cases of infective endocarditis, and a significant reduction in the frequency of antibiotics being prescribed has occurred. Research in the United States has produced mixed evidence as to whether antibiotics can prevent infective endocarditis. Some evidence suggests patients experience bacteremias during basic daily activities such as chewing, brushing, and flossing without any adverse effect. This brings the need for premedication before dental treatment into question because it would, at best, protect against bacteremias in the narrow window of the prophylaxis and do nothing during the myriad yearly exposures caused by mastication and typical oral physiotherapy (home care procedures).[18] It is recognized, however, that some dentists will still prescribe antibiotics, even if it is no longer indicated because they personally feel the patient is still at risk.[19] If the dentist recommends the use of antibiotic premedication for endocarditis prevention, and the patient agrees to take it, it would seem prudent to do so only for highest-risk medical conditions and for dental procedures in which a bacteremia is anticipated at a significantly higher level than what would be induced by routine oral function and physiotherapy.

The presence of a prosthetic joint replacement is often cited as an indication for antibiotic premedication before an invasive dental procedure. This practice is controversial, however. The issue is significant because repeated use of antibiotics is not without consequence. The potential exists for adverse effects, including an increased risk of allergic reaction to the medication and an increase in the selection of antibiotic-resistant microorganisms. The evidence linking dental procedures to the failure of prosthetic joints is circumstantial at best. In the United States, 2% of prosthetic joint replacements become infected every year. Although most transient bacteremias secondary to dental manipulation result from streptococcal infection, culturing infections that develop around a failing joint prosthesis has demonstrated that most of these infections involve staphylococcal organisms. There is also some question as to which antibiotic is best to use for premedication. Penicillin is the drug of choice to treat a dentally induced bacteremia, but physicians most often choose a first-generation cephalosporin for prevention of hematogenous prosthetic joint infections.[20]

In 2013, the ADA and the American Academy of Orthopaedic Surgeons (AAOS) published evidence-based guidelines concerning antibiotic premedication for patients with artificial joints. The guidelines state "the practitioner might consider discontinuing the practice of routinely prescribing prophylactic antibiotics for patients with hip and knee prosthetic joint implants undergoing dental procedures." This recommendation is listed as has having "limited" strength in terms of supporting data. The evidence used to formulate this recommendation generally supported the conclusion that dental procedures have not been demonstrated to be risk factors for subsequent orthopedic implant infections, and that antibiotic prophylaxis before dental procedures does not reduce the risk of implant infection. The evidence also shows that there is a "lack of convincing evidence" that antibiotic prophylaxis before dental appointments reduces the risk of bacteremias after treatment.[21] It must be noted, however, that bacteremias do occur on a daily basis as a result of normal daily activities, such as toothbrushing or chewing. Although it has generally been believed that transient bacteremias can lead to joint infections, the evidence has not been definitive.[22] Nevertheless, some orthopedists may still recommend lifetime antibiotic premedication for their patients who have had hip or knee replacements.

Unfortunately, at the time of this publication, there is no definitive protocol on this topic. Practitioners are therefore urged to discuss these issues thoroughly with their patients who have had a major joint replacement. Using the best available evidence, and taking into consideration the patient's individual risk factors for prosthetic joint infection (such as immune compromise or poorly controlled diabetes), the dentist and patient can arrive at a mutual decision with the full informed consent of the patient. That decision and the consent discussion must be documented in the patient's record. In light of the uncertainty surrounding this issue, many dentists choose to defer to the patient's orthopedic surgeon and, if the surgeon recommends premedication, have the surgeon prescribe the antibiotic for the patient.

## SYSTEMIC PHASE DENTAL TREATMENT PLANNING

The leading causes of death in U.S. adults older than age 65 include heart disease, cancer, stroke, and Alzheimer's disease. Approximately four of five patients older than age 65 who present for oral healthcare suffer from at least one chronic systemic condition. The following sections include brief discussions of the more common chronic systemic diseases and their potential effect on the dental treatment plan.

### Cardiac Disease

Cardiac conditions of varying degrees not only are the most common type of chronic disease among seniors but are also the most likely to be the cause of death. The standard of care requires an initial assessment of the patient's blood pressure in the dental office. Stage 1 hypertension is defined as a blood pressure reading greater than 140/90. With the most recent hypertension guidelines a systolic blood pressure of 120 to 139 or diastolic blood pressure of 80 to 89 is classified as prehypertension.[23] A discussion of blood pressure measurement and implications for referral is presented in Chapter 7. Often, individuals are unaware of the gradual onset of hypertension, and several studies have shown that with a large number of people, this condition may not be well controlled. Every older patient's blood pressure should be checked at each visit. A preoperative blood pressure reading is mandatory if a scheduled procedure can be anticipated as stressful, or if the patient has a known history of hypertension, or if drugs such as a local anesthetic will be administered.

**Congestive heart failure (CHF),** in simplest terms, is failure of the heart to pump blood adequately. This condition has various causes and varying degrees of severity. An affirmative

answer to any of the following questions signals that the patient's condition warrants special consideration.

- Do you become out of breath easily while walking or performing light household chores?
- Do you need to rest if you are climbing even one flight of stairs?
- Do you have trouble breathing at night or need to prop yourself up in the bed to sleep?

For patients with CHF, adaptations in treatment planning and the provision of dental care will commonly include strategies to maintain comfort during treatment and reduce stress. The patient may be unable to tolerate a reclining position in the dental chair. Appointments should be kept relatively short, and a particular effort should be made to control anxiety. Supplemental oxygen must be available in preparation for a possible medical emergency.

Coronary artery disease results from the development of atherosclerotic lesions affecting the blood supply to cardiac muscle. The onset is usually slow and may go unnoticed until it becomes severe enough to cause an episode of pain or discomfort. Coronary artery disease can lead to **angina, myocardial infarction (MI),** or sudden death. Patients who present with a diagnosis of angina should be assessed during treatment planning to determine the severity of their disease. Does the patient experience angina during times of rest or only in times of activity? The frequency of use of nitroglycerin tablets and the size of doses used will provide clues about the stability of the condition. The patient should be reminded to bring this medication to each appointment. Anginal pain sometimes radiates to the jaw, and on occasion will produce the sensation of a toothache. When the patient reports pain radiating from the neck to the lower angle of the jaw, or lower jaw pain for which the dentist cannot discern a dental or oral source, the possibility of a cardiac problem should be included in the differential diagnosis.

More worrisome in the aging population is the frequent absence of pain during an MI. Studies of nursing home residents found that, unlike younger adults, more than 50% did not experience pain during an MI (referred to as a "silent" MI). In some instances, minimal symptoms such as hiccups were the only sign of an MI. Current research has shown that although heart disease is the number-one killer of older women, symptoms of cardiac disease often go unrecognized in women, and the disease tends to be treated less aggressively than it is in men.

Most authorities suggest that patients should not undergo elective outpatient dental care until at least 6 months after an MI because of the increased risk for severe arrhythmia, angina, or another MI while in the dental chair.[24] After any severe systemic episode, consultation with the patient's physician provides the most appropriate way to determine when the patient is ready to undergo dental treatment. The physician's response should be documented in the patient's record.

## Neurologic Disorders

Neurologic disorders encompass abnormalities of the brain or nervous system. Common neurologic problems of significance in the dental setting are diseases of memory loss or other long-term cognitive issues. In older patients, acute situations such as infections or medication side effects can also cause a state of confusion, which is typically temporary and can be managed without complication. In the dental setting, it is important to keep this in mind if an older patient presents with an acute oral infection *and* an obvious change in cognitive function.

### Alzheimer's Disease

Alzheimer's disease (AD) is marked by a slow decline in mental status, particularly in the cognitive functions of the affected person. One in nine individuals older than age 65 currently has AD in the United States, and with the increased number of aging individuals in the population, this number can be expected to rise rapidly. Women with AD outnumber men 2:1, and older African-Americans and Hispanics are disproportionately more likely to have the disease.[25] The two main risk factors are age older than 65 and a genetic predisposition.

Dental treatment planning for patients with AD must take into account the following issues:

- *Stage and trajectory of AD.* When dental treatment planning and treatment are undertaken in the earliest stage of the disease, the dentist is afforded the opportunity for long-range planning. The dentist, patient, and caregiver all need to recognize that invasive treatment will be easiest at this stage. It must be anticipated that the patient will, over time, have a diminished capacity to undergo treatment and perform effective oral home care. It should be assumed that eventually the teeth, periodontium, and any restorations or prostheses will have to be cleaned and maintained by a caregiver. Therefore, the preferable course will involve recommendations for treatment that involves simple, prosthetic devices that are easy to insert and remove, are easy to clean, require minimal maintenance, are relatively caries and periodontal disease resistant, and have a good long-term prognosis. This often means recommending a removable rather than a fixed prosthesis if the latter would include crown margins or bridge work that must be meticulously cared for.

  The patient's ability to cooperate during dental care in the midstages of AD is unpredictable. Appointments should be short, and midmorning versus later afternoon is better, to avoid "sun downing" or increased agitation as the day wears on. Treatment options should focus on maintaining or improving the patient's quality of life, which often means ensuring that the individual is free from pain and infection and can chew as well as possible.

  In the final stages of AD, patients will no longer be able to voice their oral health concerns. This will necessitate a scheduled dental evaluation at regular intervals to make sure any potential problems are identified and addressed early. Treatment planning at this stage of AD will focus primarily on relief of pain.

- *Dietary issues and caries risk.* For patients with AD, oral care becomes more difficult to perform and/or provide as the disease progresses. At the same time, AD patients often have an increased appetite for foods and beverages containing high amounts of refined sugar. Because eating is a function that many AD patients still enjoy, caregivers often make these foods available for consumption throughout the day. Although few of us would have the heart to remove this pleasure, one option may be to suggest that the caregiver/long-term care staff dispense this type of food only two to three times per day and that the patient be encouraged to drink water afterward to help reduce the length of the oral acid assault.

### Parkinson's Disease

Parkinson's disease (PD) is a chronic disorder that progresses slowly. Approximately 1% of persons between the ages of 50 and 65 develop Parkinson's. The disease affects the nerve cells in the midbrain that control body movement. Movements become jerky, and the individual develops a shuffling gate, along with a resting tremor. In the later stages, the voice is often reduced to a whisper, swallowing problems occur, and the face takes on a masklike appearance as the body becomes increasingly rigid. When treatment planning dental care for patients with PD, it is helpful to keep the following issues in mind:

- Stage and trajectory of the disease. Like AD, PD is a condition that will worsen with time. Although there are treatments to limit the effects of the disease, there is no cure for it. It will be imperative that, for all treatment options weighed, postdelivery care be taken into consideration. Patients with PD will have periods in which they have difficulty using their hands to manipulate a toothbrush and, as with AD, there will likely come a time when the dental team will need to train a caregiver in daily oral care for the PD patient. An electric toothbrush and two-times-daily use of a prescription fluoride toothpaste is frequently recommended for such patients.
- Swallowing disorders and compliance during dental visits. Patients in the later stages of PD may exhibit reduced swallowing ability or dysphagia. No treatment should begin until the dentist has established whether this is an issue for the patient. Treatment planning can accommodate the condition if required. Strategies for treatment decisions involving dysphagia are shown in Box 17-3. Use of a bite block may be helpful during dental treatment, as will use of a rubber dam if the patient has a swallowing disorder. Midmorning appointments can be more accommodating for PD patients. Timing treatment to occur approximately 1 hour after the patient has taken an antiparkinson medication may be helpful. Shorter visits may also be preferable.
- Understanding the effect medications may have on both PD and the oral cavity. Medications prescribed for the disease, such as L-dopa, may become ineffective over time, allowing the physical symptoms to worsen. In addition, medications for this disease are often associated with dry mouth, which, if not managed effectively, can have devastating oral consequences.

**BOX 17-3 Treatment Recommendations for Patients with Dysphagia**

Use a minimum volume of oral irrigation. A dental assistant should always be available to provide diligent suction if water is required during treatment.

Keep the patient in an upright position during treatment to reduce the risk of aspiration.

Use a pretreatment antimicrobial rinse, such as chlorhexidine gluconate, to reduce the oral flora as much as possible in the event a small amount of aspirated fluid reaches the patient's respiratory system.

Allow frequent breaks during treatment and encourage the patient to cough or clear the throat.

Avoid use of an ultrasonic scaler to prevent generating an oral aerosol.

Use a slow-speed handpiece to the extent possible rather than high speed with aerosol.

If possible, use a rubber dam during restorative procedures.

## Cerebrovascular Accident

**Cerebrovascular accident (CVA),** or stroke, is the third-leading cause of death and a major cause of disability among persons older than age 65.[24] A stroke is defined as the sudden onset of a neurologic deficit. In approximately 80% of cases, the deficit results from an ischemic event—that is, a blockage of blood flow to the brain. Risk factors include hypertension and a previous history of a stroke, or ministrokes, known as **transient ischemic attacks (TIAs).** Stroke is the leading cause of long-term disability in the United States. Fourteen percent of those who survive a first stroke or TIA will have another within 1 year.

For those who survive a stroke, the effects can be both devastating and long lasting. The residual effects can result in oral disease, and any previous levels of oral dysfunction may be intensified. As a general rule, it is best to wait at least 6 months after a stroke before beginning any elective dental treatment. This allows for optimum recovery of oral and facial musculature if providing a new prosthesis. The wait time will also reduce the risk of recurrence, which could be precipitated by the anxiety associated with dental treatment. A consult with the patient's physician is the optimal way to assess when the individual is ready to undergo dental care. Such consultation can provide the dentist with information about the patient's rehabilitation and help frame a timetable for resumption of urgent as well as definitive dental treatment.

Muscle weakness often follows a stroke and may affect the muscles in and around the oral cavity. If the facial nerve is involved, the muscles of facial expression may be impaired. An affected trigeminal nerve results in weakness in the muscles of mastication, causing pouching or food packing in the oral cavity. In addition, the stroke patient may lose the ability to clear food with the tongue on the affected side. As a result,

**FIG 17-3** Food packing on the denture of a stroke patient. Poststroke patients may exhibit areas of food packing around the buccal surfaces of the affected side. (Courtesy Dr. Gretchen Gibson.)

heavy debris may build up on the affected side, resulting in an oral environment susceptible to bacterial overgrowth (Figure 17-3). When considering replacement of a removable prosthesis, delaying until maximum muscle strength has returned will help ensure a better fit.

Patients may come in for dental treatment before the completion of rehabilitation. For these patients, the primary goals of an interim treatment plan are to help maintain the ability to consume a healthy diet and to ensure prevention of oral infection and pain. The following are common strategies:

- If an existing removable prosthesis no longer fits well, tissue conditioning or a temporary reline may provide a better fit and improved comfort. Often, the patient complains that a denture fit well before the stroke but is now unusable. The most likely explanation is loss of control of oral muscles that before the illness had helped retain marginally fitting dentures.
- If the patient has lost some or all use of the dominant hand, provide both patient and caregiver with instruction in modified oral home care techniques.
- Prescribe an antimicrobial rinse for use during the first few months to mitigate periodontal disease, prevent oral infection, and promote a healthy oral environment.
- Instruct the patient to rinse after each meal to clear any food and debris that may result from pouching.

Two other important after-effects of stroke, **aphasia** and **dysphagia,** must be considered when providing a dental treatment plan for the post-CVA patient. Aphasia is defined as a deficiency in the ability to understand or communicate the spoken or written word. Dysphagia involves difficulty in swallowing and may be indicative of ninth, tenth, and/or twelfth cranial nerve damage. Strategies for planning treatment for patients with either of these disabilities are discussed in Box 17-3 and Box 17-4.

Poststroke patients benefit from an interdisciplinary approach to treatment planning (see Chapter 5). The dentist should not hesitate to confer with the physician and any rehabilitation therapists to determine when the patient has achieved the maximum level of rehabilitation possible. The speech pathologist may be able to provide information about a swallowing or speech disorder after a stroke and may provide suggestions on how best to communicate with the patient.

**BOX 17-4 Communication Recommendations for Patients with Aphasia**

Keep questions and instructions simple, addressing only one task or topic at a time.

Begin the session with two or three yes-or-no questions for which you know the answer. This will allow you to assess whether the patient is able to respond appropriately. If he or she can answer with an appropriate head nod, phrase questions in the yes-or-no format.

Give the aphasic patient extra time to respond, but do not persist if he or she cannot respond. A different form of communication, such as writing, may be an option. If the patient tries to speak but cannot, ask if written responses can be made.

Do not overreact if the patient swears or cries. These responses are common after a stroke and are usually not directed toward the healthcare provider, but simply reflect the frustration the patient feels because of the inability to communicate.

Remember that communication is also visual. If the patient does not seem to understand a request, such as "Stick out your tongue," use a visual cue. Lower your mask and ask the patient again; then demonstrate the movement yourself. This may trigger the correct response.

## Late-Life Depression

The elderly experience many types of loss, which naturally may elicit sadness. When this sadness persists beyond a normal time period for grieving, the condition may be defined as late-life depression. Common among seniors, depression, unfortunately, is underdiagnosed in many primary care settings. Although the rate of depression among all age groups is approximately 18%, at least 20% of those older than age 65 suffer from this affective disorder. Because dental professionals often schedule longer clinical visits with patients than do physicians, they may be the first to recognize depression. As a result, taking note of changes in the patient's attitudes and demeanor that could represent symptoms of depression and making appropriate referrals become critical responsibilities. In general terms, seniors suffering from depression may resist comforting, display irritability, and express feelings of hopelessness, low self-esteem, and guilt. Suicide is one of the most devastating results of depression. Currently, the rate of suicide among the elderly is higher than in any other age group.[26] In the United States, elderly white men have the highest risk for suicide, and the elderly in general are the most likely population group to actually follow through with a suicide attempt.[27,28] Fortunately, depression is treatable, and appropriate referrals may be lifesaving.

During the treatment planning phase and in the course of delivering dental care, the dental team must be able to recognize clinical depression and be prepared to use

strategies to mitigate its effect. Because dental treatment can result in positive changes that are visible to the patient, the prospect of improved oral health and appearance can sometimes serve as an incentive for the patient to comply with treatment recommendations. In some cases, it can also become an antidote to the depression. In instances of severe depression, however, it may be appropriate to simply strive to maintain the patient's current level of oral health, postponing more aggressive treatment until the depression has lifted.

### Oral Cancer and Other Malignant Neoplasms

Oral cancer causes serious morbidity and mortality in older adults. The treatment and resulting oral disabilities are devastating, and 50% of patients with diagnosed oral cancer die within 5 years. This 5-year survival rate has not dramatically improved for the past 50 years. Like most cancers, survival rates are linked to stage of disease at the time of diagnosis. Lip cancers have the best survival rates because they are more readily seen and diagnosed. Most oral cancers (90%) are squamous cell carcinoma (SCC), and the average age at diagnosis is approximately 60 years, making this an important issue in the geriatric population.

Twenty-five percent of oral cancer lesions are not associated with the typical risk factors of tobacco and alcohol. Research on risk factors is demonstrating important new information about the link between SCC and human papillomavirus (HPV). Cleveland et al note that HPV-associated oropharyngeal cancers are increasing, whereas other head and neck cancers are decreasing.[29] HPV-positive lesions appear to have a better prognosis than those that are negative.

Because the prognosis depends on the stage of the malignancy at the time of diagnosis, early detection represents the most significant contribution the dentist can make in the treatment of oral cancer. Although, like skin, the oral cavity provides an easily accessible site for identification of a cancerous lesion, oral cancers often are not diagnosed until the lesion is quite large and has metastasized to the lymph nodes or other regions.

Oral cancer lesions are believed to occur most often in areas of frequent trauma and where saliva pools. Common sites include the lateral border of the tongue, the floor of the mouth, the retromolar area, and the soft palate. Having the patient fully extend the tongue, grasping it with gauze, and viewing the posterior lateral borders is an essential component of an oral soft tissue examination in the geriatric patient. Good lighting, gauze, and a mouth mirror or tongue depressor are the only instruments required for this potentially lifesaving screening examination.

Patients should be encouraged to conduct a self-examination at regular intervals in conjunction with daily oral care. Oral lesions are common in older patients, most times related to trauma. However, all patients should be taught how and what to look for in their mouths. They can be advised that anything that does not appear normal, is not seen on both sides of the mouth, and does not go away within 7 to 10 days warrants a check by the individual's dental professional.

## DISEASE CONTROL PHASE AND PREVENTION STRATEGIES

The objectives of the disease control phase in this age group are the same as with any adult population: to eradicate active disease and reduce or eliminate the risk of new or recurrent disease (see Chapter 9). However, because older adults have more systemic illnesses, use more medications, and are at higher risk for new and recurring oral disease, the management of disease control issues is more complex. Definitive treatment, if it is to be provided, often proceeds in the presence of ongoing medical problems and, in some cases, in the presence of oral disease. Understanding the stage and trajectory of the patient's systemic conditions is critical and will aid the dentist in formulating the disease control phase. Furthermore, the dentist must be vigilant in monitoring the effects of these changes and be willing to alter the original treatment plan accordingly. For some patients, the goals, objectives, and nature of the treatment must be changed significantly on more than one occasion.

Future generations of older adults can be expected to retain more of their teeth and thus to have more tooth-related treatment needs. Because they do not have the physical capacity or stamina that they had when they were 20, 30, or 40 years of age, older people understand the concept of functional decline. Many of these individuals will have a strong desire to resist that trend and will work hard to maintain their teeth and a healthy oral condition. Furthermore, virtually all older adults with normal cognitive function will strive to remain pain and infection free, and most will seek regular preventive care so long as it is within their means to pay for it.

### Management of Xerostomia

Xerostomia has long been thought to be a natural part of aging. We now know that although changes associated with aging occur in the salivary glands in healthy older adults, normally, adequate salivary flow is maintained throughout life.[30] Salivary hypofunction is the diagnosed loss of salivary flow. Generally, flow will be decreased by at least 50% before the person becomes symptomatic or complains of oral dryness. Treatment planning for older adults must address the complaint of xerostomia by identifying the underlying causes of the condition and include strategies to mitigate or cope with the problem.

More than 400 medications can cause xerostomia or dry mouth. Sedatives, antipsychotics, antidepressants, antihistamines, diuretics, and some hypertension medications are among the most frequently cited offenders. The actual mechanisms for xerostomia associated with medication use vary and are not always well understood. Medications with anticholinergic activity neurologically reduce saliva flow. Other drugs may dehydrate the oral tissues, causing the sensation of oral dryness.

**BOX 17-5 Conditions Frequently Associated with Xerostomia**

- Alcoholism
- Medication side effects
- Autoimmune disorders
- Parkinson's disease
- Cognitive impairment
- Psychological disorders
- Dehydration
- Radiation of salivary glands
- Diabetes
- Sjögren's syndrome
- Habitual oral breathing
- Surgery affecting salivary glands

Box 17-5 lists some of the most common conditions associated with xerostomia. Medication side effect is the most frequently cited cause, but in the differential diagnosis, many systemic diseases may also contribute to the problem. As with many other geriatric issues, the underlying cause may prove to be a combination of multiple issues. Some systemic diseases, such as Sjögren's syndrome, actually damage the glands and preclude any stimulated flow. This chronic inflammatory autoimmune disorder affects primarily the salivary and lacrimal glands. Glandular tissue is permanently destroyed by lymphocytic infiltration. The disease is often associated with other autoimmune disorders and is accompanied by systemic symptoms, such as dryness of pulmonary, genital, and dermal tissue; dry eyes; and/or dry mouth.

Many insulin-dependent diabetic patients are xerostomic, but the literature to date has been inconclusive as to whether salivary gland function is reduced in all diabetics. For many diabetic patients, poor glycemic control and subsequent dehydration may be the underlying cause of the hyposalivation.

Generalized dehydration is also more common in the senior population and probably contributes more to xerostomia than previously understood. With aging comes a decrease in the sense of thirst, increasing the chance of dehydration and subsequently decreasing fluid output of all types.

Radiation treatment for head and neck malignancies destroys salivary gland tissue within the radiation field. Oral dryness can begin as early as 2 weeks into the radiation treatment. The remaining salivary flow is often described as being "thick," and it is frequently associated with an alteration in the sense of taste. Serous acini are more susceptible to radiation than the mucinous acini, so the affected glands produce more viscous and mucinous saliva. Reduced saliva production has devastating consequences in the oral cavity. Without the protection of adequate saliva flow, the mouth lacks minerals and fluoride to remineralize hard tissues and the ability to clear debris. As a result, bacterial overgrowth occurs and can lead to rampant postradiation caries as early as 3 months after radiation therapy.[31]

Without proper lubrication, patients may complain frequently about biting the cheek. Inadequate saliva can also lead to a chief complaint of heightened sensitivity of the oral tissues. Rough or broken restorations are more likely to cause trauma or discomfort. Oral prostheses are more likely to be uncomfortable without salivary lubrication to the underlying soft tissue, and because of the reduction in surface tension, retention of a maxillary denture may be greatly reduced.

Treatment for xerostomia can be divided into two categories: (1) treatment of hyposalivation, aimed at increasing the flow of saliva from the gland, and (2) palliative treatment, aimed at relieving the symptoms caused by xerostomia. Treatment for hyposalivation includes use of medications such as pilocarpine, as well as direct stimulation resulting from chewing sugarless gum or sucking on sugarless candies or lozenges, such as SalivaSure tablets. Proper hydration of the whole body is also important. Saliva is mostly composed of water, and if the patient is dehydrated, as may be the case with many elderly persons, salivary output will be diminished.

Palliative treatment provides comfort for the patient during oral dryness. Salivary substitutes are manufactured in a wide variety of formulations and are available in liquid, spray, and gel forms. All are designed to enhance lubrication and relieve the sensation of dryness in the mouth. Dentifrices have been formulated for use by xerostomic patients that will clean the teeth without drying the mucosa. It is important for patients to avoid toothpastes containing sodium lauryl sulfate, which will remove the mucous layer from the mucosal surface. Topical gels, in addition to temporarily lubricating the mucosa, may temporarily help with retention of complete dentures.

Patients should also limit ingesting foods and beverages that contain caffeine and products containing alcohol, which are dehydrating to the body. It is important to avoid sipping acidic beverages, and instead to sip water throughout the day. Salivary stimulants, alcohol-free chlorhexidine rinses, prescription concentration fluoride toothpastes or gels (1.1% sodium fluoride = 5000 ppm fluoride), and fluoride varnishes on root surfaces used separately, sequentially, or in combination can negate the cariogenic potential of xerostomia.

Treatment planning for patients with long-term xerostomia should include frequent evaluation for candidiasis, a common comorbidity with hyposalivation. This infection can exacerbate the symptoms of oral dryness. In addition, if the xerostomia continues, the *Candida* infection may recur, even after it has been successfully treated. Table 17-3 lists various prescription regimens that may be used to manage an oral candidiasis infection. Most often, topical treatment, such as nystatin, will be the best choice. If this treatment is insufficient, or if the infection has spread down into the esophageal passage, a systemic antifungal, such as fluconazole, may be necessary. Although nystatin oral suspension is frequently prescribed, it contains nearly 50% sugar and is not recommended for patients who have a natural dentition and would need to use this medication repeatedly.

## Oral Physiotherapy

**Oral physiotherapy** is defined as the use of aids such as toothbrush, floss, or other adjunctive armamentaria to maintain the oral health. Older adults should be given advice and assistance in support of their continued efforts to adequately maintain good oral home care. This can be accomplished by

**TABLE 17-3 Therapeutic Agents for Management of Oral Candidosis**

| Description | Comments |
|---|---|
| **TOPICAL SUSPENSIONS** | |
| *RX:* Nystatin oral suspension 100,000 U/mL<br>*Disp:* 14-day supply (300 mL)<br>*Sig:* Rinse with 5 mL for 1 min and expectorate 4 times daily PC (after meals) and HS (before retiring). NPO ½ hr after use | • Products usually contain 30%-50% sucrose<br>• Sulfurlike aftertaste may not be palatable to some patients<br>• Not a first-line choice<br>• Ineffective as a denture soak |
| **OINTMENTS AND CREAMS** | |
| *RX:* Nystatin ointment 100,000 U/g<br>*Disp:* 15 g<br>*Sig:* Apply thin film to inner surfaces of dentures and angles of mouth 3-4 times daily, PC & HS; NPO ½ hr after use | • Inexpensive<br>• Can be applied to tissue surface of dentures for localized effect<br>• Bright yellow color may be objectionable for some patients for treatment of angular cheilitis |
| *RX:* Clotrimazole 1% cream (Lotrimin, g –Rx, Lotrimin AF, g – OTC)<br>*Disp:* 15 g Rx or 12 g OTC<br>*Sig:* Apply thin film to inner surface of denture and angles of mouth 2-4 times daily; NPO ½ hr after using | • Less expensive than ketoconazole cream<br>• Has some activity against *Staphyloccus aureus* and *Streptococcus pyogenes*<br>• Good choice for angular cheilitis<br>• Available OTC, but labeled for athletes foot and jock itch, which may cause some patients to hesitate |
| **LOZENGES** | |
| *RX:* Clotrimazole 10 mg oral troches<br>*Disp:* 70 tabs<br>*Sig:* Dissolve 1 tab in mouth every 3 hrs while awake (5 tabs per day) for 14 days; NPO ½ hr after using | • Compliance problems<br>• Patients must be instructed to dissolve tablets slowly in mouth—not to chew<br>• Does not work well in patients with severe xerostomia |
| **SYSTEMIC** | |
| *RX:* Fluconazole 100-mg tablets (Diflucan, g)<br>*Disp:* #15 tablets<br>*Sig:* Take 2 tablets on day 1, then take 1 tablet daily for 14 days | • Inhibitor of CYP2C9 and CYP3A4 isoenzymes; ALWAYS check for drug interaction before prescribing<br>• Clinical symptoms resolve in 3-4 days; longer therapy decreases relapse rate |
| *RX:* Itraconazole 10mg/mL oral solution (Sporanox)<br>*Disp:* 150 mL<br>*Sig:* Rinse with 10 mL for 20 seconds two times daily. Swish solution vigorously in mouth and swallow. | • Capsules should not be used for oral candidosis<br>• If possible, administer in fasting condition to improve bioavailability<br>• Multiple drug interactions<br>• May require 14 days of therapy<br>• Expensive |

g, Generic. Courtesy Cindy L. Marek, PharmD.

providing each patient with the tools, knowledge, and skills required to maintain a healthy oral environment. To be successful, it is crucial to offer oral health education (more than simply brushing and flossing instruction) in a manner that respects the patient's autonomy and is not embarrassing because of any disease-related impairment. For those patients who are unable to engage in effective oral self-care, it is essential to inform the caregiver about the importance of effective plaque control and provide specific instruction and demonstration on how to assist with or perform oral physiotherapy on the patient.

## Toothbrushes and Interdental Cleaning Aids

Because many older adults have difficulty achieving effective daily plaque control, manufacturers have developed, produced, and marketed several different toothbrushes designed to facilitate tooth cleaning. Various bristle and handle designs are available in either manual or powered (electric or sonic) brushes. Powered brushes have heads that clean groups of teeth (traditional brush head) or one tooth surface at a time and may be very effective for some patients. The use of a powered toothbrush may help to reduce plaque in the older adult with compromised oral hygiene. A systematic review of 29 trials found that powered toothbrushes with a rotation oscillation action (brush head rotates in one direction and then the other), used more than 3 months, reduced plaque by 7% and gingivitis by 17%.[32] In a study of individuals ages 68 to 85 years, the powered toothbrush was more effective than a regular manual toothbrush in removing plaque and controlling gingivitis.[33] In a study of 40- to 90-year-old long-term-care facility residents, a powered toothbrush was superior to a manual toothbrush in removing plaque when oral hygiene was performed on a regular basis by a caregiver.[34] Not all elderly individuals can tolerate the stimulation of an electric toothbrush, and the cost and availability must also be taken in account when recommending powered toothbrushes to the elderly.

For patients with difficulty holding a toothbrush because of arthritis or stroke, devices are available to facilitate brushing. An occupational therapist can assist the dentist in identifying grips that will make oral care easier for patients. Wider floss, Teflon-coated floss, floss holders, proximal brushes, and even an electric flosser are now available. When prescribing any of these aids, it is important that someone on the dental team take the time to demonstrate the product and to be sure that the patient can use it safely and effectively. Adaptive aids are available for the patient who lacks manual dexterity and needs to be able to clean a removable prosthesis (Figure 17-4).

## Chemotherapeutic Agents

Older adults are more susceptible to dental caries for multiple reasons. Gingival recession often occurs in the elderly, leaving root surfaces exposed. Many elders take medications for hypertension or psychological disorders with side effects of decreased saliva flow, altered saliva composition, and dry mouth, leading to a higher caries rate.[35,36] The decade of the 1980s provided strong scientific evidence that fluoride benefits older adults. Those with lifelong residence in a community with water fluoridation have experienced reduced incidence of root caries and tooth loss compared with those who have lived in communities with nonfluoridated water supplies.[37]

Topically applied fluoride in many forms is important, not only to prevent new carious lesions from developing but also to arrest developing carious lesions. Studies have shown that two effective over-the-counter (OTC) agents or combinations of agents for prevention of root caries are a 1100-ppm NaF triclosan toothpaste (e.g., Colgate Total) used daily or an amorphous calcium phosphate (ACP) toothpaste (Recaldent) used in combination with 250-ppm NaF mouthrise (ACT) applied daily. Both of these recommendations showed a nearly twofold increase in effectiveness compared with 1100-ppm NaF toothpaste used daily.[37] This study also found yearly professionally applied silver diamine fluoride to be the best treatment choice for prevention of root caries. Although silver diamine fluoride is not approved for use in the United States, it can be found in many countries worldwide. Research regarding prescription agents for arresting carious lesions has shown the best agents to be 22,500-ppm NaF varnish professionally applied every 3 months or self-applied 4500- to 5000-ppm NaF toothpaste or gel used daily.[38]

**FIG 17-4** Suction brush placed in the sink. This can be used by patients with only one functioning hand to clean dental prostheses. (Courtesy North Coast Medical Inc., Gilroy, Calif.)

For patients with gingivitis or gingival overgrowth secondary to medication use, chlorhexidine may be indicated. Chlorhexidine has been shown to have bacteriocidal, fungicidal, and some virus-killing properties. Chlorhexidine has also been shown to have a preventive effect on caries in older adults, although it does not appear to be as beneficial as NaF varnish or silver diamine fluoride.[39] Many dentists prescribe chlorhexidine for elderly patients who are at risk of aspiration pneumonia. Although research in this area is limited, some studies have shown it to be beneficial in preventing aspiration pneumonia in patients who are on ventilators in hospital settings, as well as for improving the cough reflex.[40] Many practitioners prescribe chlorhexidine for patients after tooth extractions or for patients undergoing immunosuppressive treatment. Use of chlorhexidine can range from simply swabbing the buccal mucosa, using it in place of a dentifrice when brushing, or using it as a mouthrinse. Chronic use of chlorhexidine may cause an unpleasant staining of the teeth, however.

## Dietary Modification

Dietary assessment must be included as a part of the caries risk analysis. Older adults often increase their intake of refined carbohydrates, thereby increasing the risk for caries. Assessment of refined carbohydrate consumption should include a review of any possible hidden sugars, including those found in OTC medications. Patients are often unaware that many of these compounds, such as antacid tablets, contain a high sugar content. Esophageal reflux can increase on lying down, so patients may place an antacid in their mouth at night and allow it to dissolve through the night, when saliva is at its lowest. This and other sugar-based substances should be reduced as much as possible. When it is not possible or practical to eliminate these sources, less-cariogenic alternatives can be suggested.

As noted earlier in this chapter, as the individual ages, thirst may decrease, resulting in dehydration. Therefore, older adults should be encouraged to drink water and stay away from acidic and sugary beverages. Increased hydration has multiple health benefits, including decreased caries risk.

Research, mostly in children, has also shown a reduction in caries rates with the use of xylitol as a sugar substitute. Patients at high risk for caries who also suffer from salivary dysfunction are known to benefit from chewing a xylitol-containing chewing gum or xylitol candies or lozenges. For effective caries prevention, it is recommended that a patient be exposed to 6 g of xylitol daily divided into three or more consumption periods. Products on the market such as Spry gum contain 0.72 g of xylitol per piece so that the patient

would need to chew nine pieces daily to have the optimal exposure. It should also be noted that chewing gum stimulates saliva, thus adding another layer of prevention. Caution should be used, as higher amounts of xylitol may cause gastrointestinal disturbance in some patients. Owing to the risk of choking, caution should be used when recommending xylitol gum or lozenges in patients with neurologic or swallowing disorders.

## DEFINITIVE TREATMENT PLANNING FOR OLDER ADULTS

### Treatment Planning for Active and Independent Elderly

#### General Principles for Devising Plan of Care

Although dental treatment planning for the elderly, as with other age groups, is patient-specific, the following general guidelines may be helpful:

- Chronologic age is not indicative of biologic health. The dentist should not make assumptions about the patient's dental treatment needs based on age alone. The average 85-year-old who has another 5 years of life expectancy may be quite interested in, and benefit from, elective dental treatment.
- The dentist should not make judgments about what treatment the patient wants to have or can afford without discussion. Treatment should be planned with the goal of achieving optimal oral health, and the patient should be given the opportunity to select the best of all feasible treatment options.
- In planning treatment, the dentist should make every effort to "do no harm." The benefits of the oral healthcare provided should always outweigh the risks. An internal question for the oral healthcare provider should be whether the proposed treatment will improve or maintain the patient's quality of life. When dental treatment becomes more of a problem than a solution, it is time to reevaluate the treatment. In some cases, it is acceptable to do less rather than more. Palliative care for patients who are terminally ill may be more humane than dental treatment that causes the patient more inconvenience and suffering.
- The treatment plan should be devised to ensure success. If extensive restorative treatment will be provided, a predetermination must be made that the patient can maintain it. If the patient needs additional help with oral home care, maintenance visits should be scheduled at more frequent intervals to assess compliance, and the help of family and caregivers should be enlisted, if necessary.

Treatment options for senior patients with periodontal disease do not differ from those for a younger patient, but the optimal choices and the manner in which treatment is provided may differ. For example, periodontal surgery may be contraindicated because of poor systemic health and the possibility that poor healing will compromise the outcome. Locally, topically, or systemically administered antimicrobials offer a less-invasive option for the patient who needs, but is not a candidate for surgery. Other typical strategies include more frequent appointments for scaling (e.g., every 3 to 4 months) and helping the patient find better ways to improve daily oral care. As with any patient, the dentist must work with the individual to eliminate or control risk factors—for example, avoiding tobacco use or implementing effective daily oral home care.

In theory, all restorative care options should be available to the patient regardless of age, but in reality, the oral and systemic health of the patient may require the dentist to alter the usual treatment protocol. Matching the properties of restorative materials to patient needs is one key to successful dental treatment in senior patients. In recent years, the range of available materials has expanded to permit more specific and appropriate matching of patient and restoration. For example, in restoring root caries, which is primarily a disease of the elderly, several options are available. The adhesive properties and potential for fluoride release with glass ionomer make this material an effective option for restoring root surface lesions. Although the true glass ionomer materials offer the potential for the greatest amount of fluoride release, glass ionomer–resin hybrid materials provide better esthetics and may be a more appealing option in visible areas of the mouth. Full-coverage restorations are always an option if extensive tooth structure is missing. Amalgam can be used in areas in which moisture control is poor or when the patient is unable to cooperate.

#### Presentation of Treatment Options

The presentation of a treatment plan can be as important as the formulation of the plan itself. When presenting the treatment plan to an older adult, the dentist must respect the patient's autonomy as the decision maker, even in the presence of an adult child, spouse, or other caregiver. It should not be assumed that the patient has hearing or visual problems, but neither should the dentist hesitate to ask questions to be sure that the patient can read all materials, including the consent form, and understand what is being said. If the patient fails to comprehend the treatment needs or options, informed consent cannot be achieved.

In addition to possible hearing or vision deficits, it is important to assess whether the patient is capable of making an informed decision about the treatment plan. Such cues as a spouse or adult child's always accompanying the patient to appointments, someone else's taking care of the financial matters relating to dental treatment, or the patient's inability to discuss the treatment options may suggest that another responsible person should be included in the discussion to help make the decisions (see the *Ethics in Dentistry* box). If the mental disabilities are severe, special informed consent may be required. Especially in practices in which the elderly constitute a substantial portion of the patient population, the dentist may consider including an additional line to the treatment plan so that, along with the patient's signature, a legal guardian can also provide consent.

## ETHICS IN DENTISTRY

### Surrogate Decision Making for the Elderly

If an adult patient lacks the capacity to make decisions, the dentist must determine who the appropriate surrogate decision maker should be. Although it is often easiest to turn to the person accompanying the patient, this may not be the person the patient trusts to make important health decisions. Many countries provide a formal mechanism that allows people to name a proxy (or surrogate) decision maker. For example, in the United States, an adult can complete a Durable Power of Attorney for Health Care form naming another person to serve as decision maker for all health-related decisions. The surrogate decision maker assumes that role *only* if the patient becomes unable to participate in decision making.

Written advance directives are typically kept on file in care facilities by the primary care physician and by family members. Dental health professionals may not routinely receive copies of these documents but should make it a common practice to inquire whether an adult patient has written directives. If the patient has not named a decision maker, the dentist should ask the individual to identify a primary contact for the dentist to consult with if he or she is ever unable to participate in the clinical decision-making process. This step is particularly helpful when patients have a condition, such as dementia, in which capacity may fluctuate or be expected to diminish over time. However, any adult can sustain an acute neurologic injury, such as stroke, that can temporarily or permanently reduce their decision-making skills. If the dentist has already documented the patient's preference for a surrogate decision maker to authorize treatment decisions and consult with the dentist, this can reduce uncertainty about who should make decisions on behalf of the patient.

If a patient lacks decision-making ability and no clear surrogate has been identified, then decisions usually default to "next of kin." Some jurisdictions have formalized a hierarchy for identifying decision makers as follows: legal guardian, spouse, adult child, parent, adult sibling, adult grandchild, close friend, and last, the guardian of the patient's estate.[1]

**Reference**

1. State of Illinois Health Care Surrogate Act, 755 ILCS 40/1.

### Delivery of Care

Dental care for the active and independent elderly is very similar to dental care for younger adults, and treatment can be delivered in much of the same way. Dentists will need to take into consideration any systemic diseases present and be able to manage treatment side effects, as well as determining whether the systemic disease is likely to affect the patient's oral health in the future. The goal is for the patient to maintain his or her current functional status for as long as possible. However, as you provide treatment, it is also important to plan for failure. Dental professionals should understand that the patient's current oral hygiene and caries risk may change for the worse. This recognition allows the dentist to make some adjustments in the delivery of care. For instance, if a removable partial denture is being fabricated, it can be designed in a way that will allow the addition of teeth at a later time if further extractions are required.

It is important to be aware that the transition from being an active and independent elderly person to becoming a frail and dependent elderly person can happen rather quickly. In an aging population, a patient can have good oral hygiene and keep regular dental visits and then suddenly stop coming to the dentist. This may be because the patient has experienced a significant medical event affecting mobility and/or dependency, such as a heart attack, stroke, or fall resulting in a fractured bone. The patient's spouse may fall ill, and the patient may become a full-time caregiver. Such events may prevent the patient from attending dental appointments as scheduled. The difficulties that arise from this change can create an added burden on daily life and can start the patient on the downward slope to poor oral hygiene and infrequent professional dental care visits. It is not possible to predict that such an event will occur, but it is important to recognize that when a regularly scheduled patient misses his or her recall appointments, a follow-up with the patient to determine any new barriers to care can facilitate a discussion with the patient and the family concerning future oral disease risk and the best preventive measures.

## Treatment Planning for Frail Elderly

Long-term care patients and those who are homebound may be defined as functionally independent or dependent. One of the primary ways function is assessed is in terms of the capability to perform the ADLs (see Chapter 12), the tasks that must be performed to maintain daily life. The ADLs include eating, bathing, dressing, transferring, and toileting. A person's ability to perform these tasks will be established by a healthcare provider, usually a physical or occupational therapist. The results of this evaluation will help establish how much intervention will be required on a daily basis and whether the person can continue to reside at home or must have more constant care in a nursing home.

### Options for Delivering Care

Although the science of dentistry has seen considerable advances, the old-fashioned concept of the house call is returning. The use of mobile and portable dental care is slowly increasing across the United States, although not always quickly enough to meet the growing needs of patients. Two distinct categories of elderly patients require dental care outside the usual confines of the traditional practice setting: (1) residents of long-term care facilities and (2) homebound seniors, those who still live in their own homes but are unable to leave without great difficulty. Residents of long-term care facilities often cannot travel to a dental office except in an ambulance or specially designed wheelchair-accessible van, and the transporting may upset both the mental and systemic health of the frail elderly patient.

Varying levels of dental treatment can be provided in alternative settings. The dentist must decide before undertaking such a practice what services he or she wishes to provide. Some dentists make portable dental care a full-time endeavor, purchasing a complete portable dental unit that includes handpieces, air, suction, water, and a separate portable radiographic unit. The scope of service that can be provided with this type

of equipment includes preventive care, restorative care, extractions, removable prostheses, and, in warranted cases, limited fixed prostheses.

The "black bag" approach is a minimalist method of providing this type of care on an as-needed basis and usually only for patients of record. Here the dentist transports the dental supplies and equipment necessary for immediate care to a residential or other nonresidential institutional setting (Figure 17-5). For more complex procedures, the patient is brought to the dental office. Even this type of approach offers an opportunity to provide a moderate range of services. Dentures can be fabricated without a traditional dental unit. Portable lights, such as fiberoptic headlamps or portable fiberoptic lighted mirrors, are available. Portable ultrasonic units with their own irrigation source can be acquired. All long-term care facilities have portable suction units that can be pushed into the patient's room or into a makeshift operatory, often the beauty parlor or space provided for the podiatrist. Some restorative dentistry can be performed using hand instruments and self-curing glass ionomer material. Many extractions can be performed with minimal instruments, as long as the root anatomy is confirmed radiographically in advance.

Another form of mobile care uses a portable operatory that can be quickly broken down and carried from house to house or room to room, to be set up in small spaces within a nursing home facility (Figure 17-6). Provision of this type of

**FIG 17-5** "Black bag" dental supplies and equipment to treat a patient of record in a residential setting.

**FIG 17-6** Dental operatory equipment designed for easy transport to nursing homes or assisted living facilities. (AMC-20 Mobile Dental Cart shown. Courtesy Aseptico, Inc., Woodinville, WA.)

**FIG 17-7** Mobile dental van.

practice removes the barriers to accessing dental care for the frail elderly. Implementation requires additional time to drive from place to place and set up the portable equipment. Additional expenditures of time are also necessary to properly transfer the patient from bed to chair and to gather and assess a more lengthy health history. These expenditures must be reflected in the cost of dental care to this special population.

The highest level of care can be provided in a fully equipped self-contained dental operatory housed in a bus or truck built for that purpose (Figure 17-7). This format has the advantage of providing all of the necessary infrastructure required to support a complete range of dental services and allows moving the operatory from one distant site to another at will. In this venue, the patient need only be transported to the dental van or bus, which is typically driven to the parking lot at the care facility. Disadvantages of this approach include the high initial cost, necessity of transporting patients through various weather conditions (rain, snow, and ice) into the vehicle, patient's access up into the vehicle via steps, ramps, or wheelchair lifts, and limited space inside to accommodate wheelchairs and walkers. As a result of these limitations, the dental van approach has been used predominantly by institutions whose mission is to serve patients in multiple locations using multiple care providers (including dental students). Some individual practitioners have also used this venue, particularly in urban areas where there is higher demand and less travel time is required. As a full-time endeavor, the dental entrepreneur can make this an effective cost center.

Providing care in alternative practice settings can be complex but offers significant rewards, including the opportunity to function as a vital part of an interdisciplinary healthcare team and the satisfaction gained in improving the quality of life for a challenging group of patients.

## Interdisciplinary Geriatric Healthcare Team

Even a general dentist in a private practice has the opportunity to participate in the delivery of dental treatment to elderly patients as part of an interdisciplinary healthcare team. Many nondental disciplines have a vested interest in the oral health of their patients. As more and more physicians and other professionals understand the links between oral health, systemic health and the quality of life, they will be prepared to refer patients and to work with dental professionals during treatment planning to identify and clarify systemic issues that may affect the delivery of treatment.

Occupational therapists, trained to help patients learn alternative approaches to daily activities, can assist the patient with tasks such as tooth brushing, denture cleaning, and denture insertion and removal. This assistance can significantly augment the limited teaching opportunities the dental team may have with the patient. Speech pathologists can assess the patient's swallowing ability and may be the first to consult the dentist if the patient has speech problems during therapy because of a poor-fitting prosthesis. Others on the team, including the nursing staff, psychologists, physical therapists, and social workers, can offer valuable information on the patient's health and progress, as well as on the scope of the individual's abilities to perform tasks of daily living and the long-term prognosis. (See Chapter 5 for more information.)

## Documentation Requirements

Documentation of findings in a traditional private setting for healthy older patients will not differ from those concepts described in previous chapters. Frail elderly seen in a nursing home, home, or hospital setting, however, will require more data evaluation and documentation. Provision of care to patients in any of these settings requires a thorough evaluation of the individual's systemic and mental health, and an assessment of other social issues. Although the health history for a patient in a long-term care facility may be lengthy, it is also easily accessible. Each patient has a chart that can be found at the facility's nursing station. The chart can be expected to include the following information:

- A written health history, including documentation of any predisposing conditions for endocarditis
- A current list of all medications and documentation of any known drug allergies
- A problem list (list of all current medical and psychological diagnoses)
- A personal contact if the patient requires follow-up for consent to treatment
- Progress notes documenting recent changes in the patient's health
- A description of the type of diet the patient receives (e.g., pureed versus soft mechanical versus regular consistency)

Regulations that apply to documentation of patient assessment and care in the traditional acute care hospital setting also apply in long-term care facilities. The patient's chart should be reviewed at each visit to learn whether any changes have occurred since the previous visit. After each dental visit, the dentist must provide a written record of any findings and the treatment provided in the care facility's patient chart. This can be accomplished by putting the original oral health evaluation sheet in the chart and retaining a copy for the dentist's own records. A progress note is required for all subsequent dental treatment and is most appropriately written in the form of a SOAP note (*S*ubjective findings, *O*bjective findings, an *A*ssessment, and a *P*lan), the common format used by the medical profession. (For a more complete discussion of the SOAP note format, see Chapter 8.) Because long-term-care patients have serious systemic health problems and receive healthcare from various health professionals, the oral health history, dental treatment plan, and progress notes serve to inform and educate

all of the patient's health professionals about the role of oral health and dental care in the patient's overall care.

Homebound patients will not have such easily accessible health information. Discussions with caregivers, the patient's physicians, or the family social worker are advisable before any invasive dental treatment. If the verbal health history provided by the homebound patient raises questions in the clinician's mind, periodic calls to the geriatrician or primary care physician may be necessary before invasive care is provided to rule out any significant limitations or contraindications to the proposed dental treatment. The mode of documentation for treatment rendered to the patient is comparable to that carried out in a conventional dental setting.

### Treatment Planning in Alternative Settings

Oral home care for the frail elderly person is an important and frequently neglected service. Providing daily oral physiotherapy to long-term care residents is often considered an unpleasant task and is delegated to nursing auxiliaries, who have even less oral health training than the registered nursing staff. The dentist delivering care in a long-term care setting must take a leadership role in educating the staff about the importance of good daily oral care for their patients. Annual oral health in-service training and continuous communication with nursing staff, once positive rapport has been established, help ensure compliance with recommended therapy. Often, providing the staff with oral disease prevention information for themselves and their families may help increase interest in oral care for their patients.

In the United States, the Omnibus Budget and Reconciliation Act of 1987 (OBRA) contained legislative language intended to ensure that long-term care patients receive adequate care to live to their full potential. Included in the act is the requirement that all such patients, if covered at least in part by either Medicare or Medicaid programs, undergo a comprehensive needs evaluation. The result of the evaluation determines the services the patient will receive. Box 17-6 illustrates Section L of the Minimum Data Set, the oral assessment instrument, which is included in that evaluation. The nurse answers the dental questions in Section L, which are rudimentary at best; completes the form; and determines whether follow-up oral care is required. Recently, efforts have been undertaken to educate those who monitor nursing home care to help identify obvious neglect of oral health needs. Recognition of the patient's oral health needs by the nursing home staff is the first step in developing solutions for the widespread unmet dental needs of long-term residents.

Although providing dental care for the frail elderly can be difficult, the quality of the care should never be compromised. Often, treatment planning calls for a kind of creativity and ingenuity not required for less-debilitated patients. Extensive dental work that cannot or will not be maintained should be avoided. Use of restorative materials with preventive benefits, such as glass ionomer, may be warranted. Although esthetics may be sacrificed compared with use of a composite, the fluoride-releasing ability may be more important for the patient with high oral disease and poor oral hygiene.

For the homebound patient, daily oral self-care may require the assistance of a family member or other caregiver and/or the use of aids designed for patients with disabilities. For the patient who only has use of one hand or for whom a conventional flossing technique is not feasible, large-handled toothbrushes, large Y flossers, and/or denture brushes with suction on the bottom (see Figure 17-4) may be useful.

The provision of dental care for the frail elderly necessitates forethought about emergency situations that may arise during treatment. A thorough knowledge of the patient's systemic health history and medication use will assist in preventing such situations. This highlights the need for all staff to be familiar with the office protocol for emergencies. The dentist should become familiar with the emergency protocol at each long-term care facility and the location of the "crash" or emergency cart. During home visits, the dentist should always carry an emergency kit and a small portable oxygen unit. The risk of adverse events exists with all patients. Frail patients and their families must be made aware of such risks before initiating treatment. Treatment planning for this group requires recognition that the benefits of dental treatment must be weighed against the risks to the health of the patient.

**BOX 17-6 Section L of the Minimum Data Set for Long-Term Care Patients (Version 3.0)**

Intent: This item is intended to record any dental problems present in the 7-day look-back period.

L0200: Dental

↓ Check all that apply:

- ☐ A. Broken or loosely fitting full or partial denture (chipped, cracked, uncleanable or loose).
- ☐ B. No natural teeth or tooth fragments (edentulous).
- ☐ C. Abnormal mouth soft tissue (ulcers, masses, oral lesions, including under denture or partial denture).
- ☐ D. Obvious or likely cavity or broken natural teeth.
- ☐ E. Inflamed or bleeding gums or loose natural teeth.
- ☐ F. Mouth or facial pain, discomfort or difficulty with chewing.
- ☐ G. Unable to examine.
- ☐ Z. None of the above was present.

## MAINTENANCE PHASE TREATMENT PLANNING

Assessment of daily oral care for senior patients should be an ongoing process for the dental treatment team. It is important to assess the patient's oral hygiene and then to ask the patient what movements or tasks are becoming difficult and why. Such disabilities may be episodic—for example, as a result of a recent hospital stay or because of intermittent pain from osteoarthritis in the upper extremities that limits oral care. Based on this assessment, the dental team can tailor recommendations to the particular situation. Examples include proximal brushes and automated flossing devices that require less dexterity than traditional dental floss. Automated toothbrushes, even the least expensive, will help reduce the amount of arm movement required and circumvent dexterity problems that may preclude effective use of a manual brush.

In seeking solutions to daily oral care problems, autonomy is always a goal. Recommendations by the dental team should be focused on helping the patient to maintain his or her own oral care whenever possible.

As patients become more debilitated or dependent on caregivers, the dental team may be required to train the caregiver in providing good daily oral hygiene for the patient. Because the day of a caregiver is long and can be difficult, the simpler the regimen, the better. Again, automated toothbrushes are desirable because they require less effort or movement on the caregiver's part. Use of a prescription high-fluoride toothpaste may be recommended, especially when the oral care is provided by a busy caregiver and performed no more than once per day. Unfortunately, the additional cost of a prescription toothpaste may be prohibitive for some patients. Oral rinses, such as chlorhexidine, can be recommended after brushing as well, if gingivitis or high caries risk has been diagnosed. It should be stressed to caregivers, however, that rinses are an adjunct and rarely a replacement for brushing.

## CONCLUSION

Because seniors span such a wide age range (65 years to older than 100 years), it is difficult to make social or health generalizations. Many older adults view themselves as youthful, energetic, and forward looking. They prefer to be referred to as adults or seniors. Older adults visit their dentists more frequently than in the past, and expect higher levels of oral health throughout their lives. A general guideline for treatment planning that is especially appropriate for the older individual is to "give the patient the opportunity to say yes" to a full range of treatment options. But no matter how simple or extensive the treatment plan, it should be designed to establish and maintain optimum oral health.

To treatment plan appropriately, you must know your patients and their goals. Then you will need to consider the medical/dental indications, patient preferences, quality of life issues, and factors within the contextual scope of their current life situation. It is often helpful to end each treatment planning session by making sure you have answered the following questions:

- Does the treatment we have planned fit with the patient's goals and expectations for his or her oral health?
- Did I make sure I appropriately addressed the issue of informed consent for the treatment we have planned?
- Can the patient physically and mentally go through all the treatment steps to reach our final goal?
- What are any potential adverse outcomes to the planned treatment, and have I addressed them to the extent possible?
- Can the patient or caregiver realistically take care of the outcome or prosthesis we have planned?

Affirmative answers to each of these questions helps ensure that you will have addressed both the immediate needs and the long-term best interests of your patient.

## REVIEW QUESTIONS

- Describe demographic oral health characteristics of the elderly patient population.
- Describe the aspirations of healthy older adults regarding their oral health.
- Describe the oral health needs and desires of the frail elderly.
- Do interview and examination procedures differ for the elderly patient? If so, how?
- List three common systemic conditions that occur in older adults and the implications these health issues may have on the person's dental care.
- What medications contribute to xerostomia in older adults?
- What medications are used to treat oral candidiasis?
- How do strategies for oral disease control and prevention differ for the aging population compared with younger cohorts?
- Does restorative treatment planning in the elderly differ from that for younger patients? If so, how?
- In what ways will the treatment plan presentation differ for older patients?
- What dental services might you provide to elderly persons who are homebound or in nursing homes?

## REFERENCES


1. United Nations, Population Division, Department of Economic and Social Affairs: *Population Ageing and Development*, 2012. http://www.un.org/esa/population/publications/2012WorldPopAgeingDev_Chart/2012PopAgeingandDev_WallChart.pdf/. Accessed February 25, 2015.
2. The World Bank: *Population ages 65 and above*. http://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS/. Accessed February 25, 2015.
3. Dychtwald K: *Age wave: the challenges and opportunities of aging America*, Los Angeles, 1989, JP Tarcher.
4. Federal Interagency Forum on Aging-Related Statistics: *Older Americans 2012: Key Indicators of Well-Being*. http://www.agingstats.gov/agingstatsdotnet/Main_Site/default.aspx. Accessed February 25, 2015.
5. Brandon E: Poverty increasing among retirees: the gap between the wealthiest and the poorest retirees is growing, *U.S. News and World Report,* May 21, 2012.
6. Wall T, Nasseh K, Vujicic M: Per-patient dental expenditure rising driven by baby boomers, *American Dental Association Health Policy Institute,* March 2013. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_0313_2.ashx/. Accessed February 25, 2015.
7. Rowe JW, Kahn RL: Successful aging, *Aging (Milano)* 10(2):142–144, 1998.

7a. Shinsho F: New strategy for better geriatric oral health in Japan:80/20 movement and Healthy Japan 21. *Int Dental J* 51(3Suppl):200–206, 2001.

8. Gu Q, Dillon CF, Burt VL: Prescription drug use continues to increase: U.S. prescription drug data for 2007-2008, *NCHS Data Brief* (42):1–8, 2010.

9. Panel, A.G.S.E: Guiding principles for the care of older adults with multimorbidity: an approach for clinicians, *J Am Geriatr Soc* 60(E):1–25, 2012.
10. Oral health in America: a report of the Surgeon General, *J Calif Dent Assoc* 28(9):685–695, 2000.
11. Gibson G: Identifying and treating xerostomia in restorative patients, *J Esthet Dent* 10(5):253–264, 1998.
12. Beck JD: Periodontal implications: older adults, *Ann Periodontol* 1(1):322–357, 1996.
13. Pretty IA, et al: The Seattle Care Pathway for securing oral health in older patients, *Gerodontology* 31(Suppl 1):77–87, 2014.
14. Desvarieux M, et al: Changes in clinical and microbiological periodontal profiles relate to progression of carotid intima-media thickness: the oral infections and vascular disease epidemiology study, *J Am Heart Assoc* 2(6):e000254, 2013.
15. Qato DM, Alexander GC, Conti RM, et al: Use of prescription and over-the-counter medication and dietary supplements among older adults in the United States, *J Am Medical Assoc* 300(24):2867–2878, 2008.
16. Harris SI: Definitions and demographics characteristics. In Kaye D, editor: *Infective endocarditis*, New York, 1992, Raven Press.
17. Felder RS, Nardone D, Palac R: Prevalence of predisposing factors for endocarditis among an elderly institutionalized population, *Oral Surg Oral Med Oral Pathol* 73(1):30–34, 1992.
18. Wilson W, et al: Prevention of infective endocarditis: guidelines from the American Heart Association: a guideline from the American Heart Association Rheumatic Fever, Endocarditis and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group, *J Am Dent Assoc* 139(Suppl):S3–S24, 2008.
19. Dayer MJ, et al: NICE guidance on antibiotic prophylaxis to prevent infective endocarditis: a survey of clinicians' attitudes, *QJM* 106(3):237–243, 2013.
20. Jaspers MT, Little JW: Prophylactic antibiotic coverage in patients with total arthroplasty: current practice, *J Am Dent Assoc* 111(6):943–948, 1985.
21. American Dental Association: *Antibiotic prophylaxis*. http://www.ada.org/en/member-center/oral-health-topics/antibiotic-prophylaxis. Accessed February 26, 2015.
22. American Academy of Orthopaedic Surgeons: *Prevention of orthopaedic implant infection in patients undergoing dental procedures: Evidence-based guideline and evidence report*. http://www.aaos.org/Research/guidelines/PUDP/PUDP_guideline.pdf/. Accessed February 25, 2015.
23. Herman WW, et al: New national guidelines on hypertension: a summary for dentistry, *J Am Dent Assoc* 135(5):576–584; quiz 653–654, 2004.
24. Little JW, Falace DA, Miller CS, et al: *Dental Management of the Medically Compromised Patient*, ed 8, St. Louis, 2012, Mosby.
25. Alzheimer's Association: *Alzheimer's disease facts and figures*. http://www.alz.org/alzheimers_disease_facts_and_figures.asp/. Accessed February 25, 2015.
26. Niessen LC, Jones JA: Alzheimer's disease: a guide for dental professionals, *Spec Care Dentist* 6(1):6–12, 1986.
27. Murphy SL, Xu JQ, Kochanek KD: Deaths: Final data for 2010, National Vital Statistics Report 61(4), 2012. http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_04.pdf/. Accessed November 14, 2014.
28. Center for Disease Control and Prevention: *National Center for Injury Prevention and Control. Web-based inquiry statistics query and reporting system (WISQARS)*. http://www.cdc.gov/injury/wisqars. Accessed June 30, 2015.
29. Cleveland JL, et al: The connection between human papillomavirus and oropharyngeal squamous cell carcinomas in the United States: implications for dentistry, *J Am Dent Assoc* 142(8):915–924, 2011.
30. Dawes C: Physiological factors affecting salivary flow rate, oral sugar clearance, and the sensation of dry mouth in man, *J Dent Res* 66(Spec No):648–653, 1987.
31. Dreizen S, et al: Prevention of xerostomia-related dental caries in irradiated cancer patients, *J Dent Res* 56(2):99–104, 1977.
32. Heanue M, et al: Manual versus powered toothbrushing for oral health, *Cochrane Database Syst Rev* (1):CD002281, 2003.
33. Verma S, Bhat KM: Acceptability of powered toothbrushes for elderly individuals, *J Public Health Dent* 64(2):115–117, 2004.
34. Day J, Martin MD, Chin M: Efficacy of a sonic toothbrush for plaque removal by caregivers in a special needs population, *Spec Care Dentist* 18(5):202–206, 1998.
35. Sreebny LM, Schwartz SS: A reference guide to drugs and dry mouth—2nd edition, *Gerodontology* 14(1):33–47, 1997.
36. Papas AS, et al: Caries prevalence in xerostomic individuals, *J Can Dent Assoc* 59(2):171–174, 177–179, 1993.
37. U.S. Centers for Disease Control and Prevention: Achievements in public health, 1900-1999: fluoridation of drinking water to prevent dental caries, *MMWR* 48(41):933–940, 1999.
38. Gluzman R, et al: Prevention of root caries: a literature review of primary and secondary preventive agents, *Spec Care Dentist* 33(3):133–140, 2013.
39. Tan HP, et al: A randomized trial on root caries prevention in elders, *J Dent Res* 89(10):1086–1090, 2010.
40. Watando A, et al: Daily oral care and cough reflex sensitivity in elderly nursing home patients, *Chest* 126(4):1066–1070, 2004.


## SUGGESTED READINGS AND RESOURCES


American Dental Association: Incurred Medical Expenses. http://www.ada.org/EPUBS/assets/ememo/incurred-medical-expenses-paying-for-dental-care-a-how-to-guide.pdf. Accessed June 21, 2015.

American Geriatric Society: American Geriatrics Society updated beers criteria for potentially inappropriate medication use in older adults. http://www.americangeriatrics.org/files/documents/beers/2012BeersCriteria_JAGS.pdf. Accessed June 21, 2015.

Little JW, Miller C, Rhodus NL, Falace D: *Dental management of the medically compromised patient*, ed 8, St Louis, 2013, Mosby.

Napeñas JJ, Kujan O, Arduino PG, et al: Controversies regarding dental management of medically complex patients: assessment of current recommendations. *Oral Surg Oral Med Oral Pathol Oral Radiol* 120:207–226, 2015.

Pretty IA, et al: The Seattle Care Pathway for securing oral health in older patients, *Gerodontology* (Suppl 1):77–87, 2014.

Sollecito TP, Abt E, Lockhart PB, et al: The use of prophylactic antibiotics prior to dental procedures in patients with prosthetic joints: Evidence-based clinical practice guidelines for dental practitioners – a report of the ADA Council on Scientific Affairs, *J Am Dent Assoc* 146(1):11–16.e8, 2015.

Waters W 3rd, Rethman MP, Hanson NB, et al: Clinical Practice Guideline Summary: Prevention of orthopaedic implant infection in patients undergoing dental procedures, *J Am Acad Orthop Surg* 21:180–189, 2013.

Xi C, Hon C, Douglas C, et al: Dental treatment intensity in frail older adults in the last year of life. *J of Am Dental Assoc* 144(11): 1234–1242, 2013.

# 18

# Patients Who Are Motivationally Compromised or Financially Limited

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http://evolve.elsevier.com/Stefanac/diagnosis/

## OUTLINE

**Oral Health Beliefs**
- Soft Teeth
- Pregnancy and Breast-Feeding
- Family Dentures
- Fear of the Dentist

**Identifying Underlying Problems**
- Genetic and Developmental Factors
- Metabolic, Endocrine, and Immune Deficiency Factors
- Oral Health Literacy
- Interrelationship of Oral Health and Self-Image
- Behavioral and Nutritional Factors
- Psychological Gain

**Evaluating Potential for Change**

**Making a Treatment Decision**
- Likelihood of Successful Treatment
- Consequences of Failure
- Patient Participation

**Motivating the Patient**
- Internal Motivators
- External Motivators
- Implementation

**Management Options**
- Ideal Treatment
- No Comprehensive Treatment (Provision of Acute Care Only)
- Limited (Disease Control Phase) Treatment
- Extraordinary Efforts to Maintain Dentition with Questionable Prognosis

**Caring for the Patient with Limited Financial Means**
- Staged Treatment
- Payment Plans
- Outside Resources
- Other Practice Settings
- Reducing or Waiving Fees
- Government-Sponsored Programs/Public Assistance Programs

**Disparities in Oral Health and Access to Care**
- Oral HealthDisparities and Social Determinants of Health
- Role of the Profession
- Role of Government
- Role of Third-Party Payers

**A Look to the Future**

In the third edition of *Treatment Planning in Dentistry,* the authors of this chapter have taken a more dichotomous approach to the management of those patients who are motivationally compromised and those patients with limited financial resources. Although there are frequent commonalities between the two groups as a result of social determinants that affect overall health, it is apparent that the motivationally compromised patient is not always financially limited, and the financially limited patient is not necessarily motivationally compromised. The body of the chapter focuses on the psychological, emotional, and social parameters that are common threads in both groups, and management strategies that are applicable to both. The chapter then offers additional information to the reader about options relating specifically to the financially limited patient.

Also woven into this edition of the chapter is a focus on social determinants of health. Such determinants as socioeconomic status, level of education attained, and cultural beliefs can be important for any patient but are more likely to have a significant effect on the motivationally compromised or financially limited patient. The entire dental team must be cognizant of the ways in which the patient may be affected by these issues, keeping them in mind as efforts are made to relate to, communicate with, educate, and deliver care to this vulnerable and important segment of the population.

Both motivationally compromised and financially limited patients may be fatalistic about their teeth. They may have serious doubts as to whether their teeth can or should be saved. They commonly see the challenge of attempting to rehabilitate their dentition as insurmountable, believing that they do not have the time, energy, ability, or financial resources to accomplish

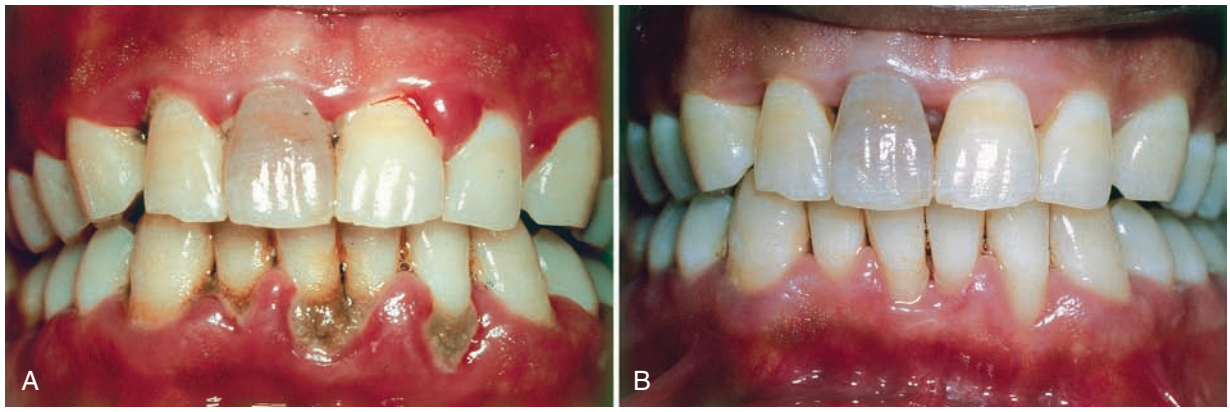


**FIG 18-1** Motivationally compromised and financially limited patient before **(A)** and after **(B)** treatment. (From Newman MG, Takei HH, Klokkevold PR, et al: *Carranza's Clinical Periodontology,* ed 12, St. Louis, Saunders, 2015.)

the task. These are all perceptions; sometimes they are realistic, and sometimes they are not. In many cases, significant improvements in oral health can be accomplished that are within the patient's financial means and capacity to handle (Figure 18-1). For the treatment to be successful, however, the patient must be willing to actively participate in the management of his or her own oral health. Unfortunately, some patients are unwilling or unable to do so—at least initially. Herein lies one of the greatest challenges to the practicing dentist—learning to discern how a new patient will respond to this challenge. Indeed, although some patients will become enthusiastically engaged, others will do so only after much education and encouragement, and some others never will.

The challenges in treating these patients are significant, but the rewards can be extraordinary. With a caring, committed, and sometimes adventuresome approach to treatment planning and treatment, the practitioner can achieve notable success in this arena. Furthermore, if the rewards and sense of accomplishment for the dental team are great, they can be even greater for the patient. The value to the patient who regains a functional, esthetic dentition is inestimable. The associated benefits to the person's self-esteem may last a lifetime.

## ORAL HEALTH BELIEFS

Several commonly encountered situations illustrate the kinds of health beliefs and opinions that a motivationally compromised or financially limited patient may hold. Many of these are related to cultural beliefs about oral health.[1] Listening carefully, the dentist will attempt to glean the health beliefs contributing to the patient's oral disease, being careful to avoid the temptation to immediately dispel myths and misunderstandings on the spot. The patient may resent the insensitivity of a healthcare professional who quickly dismisses his or her beliefs and values. The careful listener allows the patient sufficient latitude to characterize his or her perceptions concerning oral disease. As rapport and trust build in the relationship, the dentist will find opportunities to add to the patient's knowledge base. Providing the patient with information to modify his or her own beliefs is a more effective strategy than trying to substitute entirely new ones. The latter approach often does not work at all or if it does, apparent acceptance is more often incomplete or short-lived, failing for two critical reasons. First, the patient may perceive such a wholesale substitution as a dismissal of his or her total belief system. Second, this approach ignores the essential psychological and emotional investment that the beliefs represent for the patient. Several beliefs commonly held by such patients are discussed in the following section.

### Soft Teeth

Patients who believe their teeth are "soft" typically report numerous visits to the dentist beginning in their early teens, and a long succession of teeth restored and restored again because of new and recurrent caries. By the time this patient reaches middle adulthood, some teeth may be missing and others have large restorations (Figure 18-2). Recurrent caries continues to be a problem. Although a dentist may have even told the patient as a child, "You have soft teeth," the most frequent explanation is a cariogenic diet and poor oral hygiene. The patient may now believe that the teeth can no longer hold fillings and doubts that they are worth saving.

### Pregnancy and Breast-Feeding

Female patients who have carried and delivered babies and later breast-fed them may relate a history of rampant caries developing during that time. In some cases, the caries may have become less active, but the patient continues to suffer from the ill effects of the earlier decay (Figure 18-3). Large restorations often are present, some teeth may now be fractured, and multiple full-coverage restorations may be necessary. Some may continue to suffer from the rampant caries that they attribute to the earlier period of pregnancy and lactation. The patient may have been reluctant to replace missing teeth out of concern for the perceived poor prognosis or because of a maternal desire to take care of the needs of her children first.

**FIG 18-2** Patient with "soft teeth". (Courtesy Dr. Scott Eidson, Chapel Hill, N.C.)

## Family Dentures

Some patients, often those with extensive restorative needs or those suffering from severe periodontal disease, are certain that dentures are inevitable. Because numerous family members have experienced this fate, they see becoming edentulous as unavoidable. Those who are most fatalistic often observe that they have inherited the condition. The dentist may be hard pressed to convince such patients that they have other alternatives.

A variant of this explanation comes from the patient who refuses the option of replacing missing teeth with a removable partial denture, arguing that the retentive clasps will harm the abutment teeth. The patient often relates stories of friends or family members who wore partial dentures and eventually lost all remaining teeth. It is not surprising that partial dentures may sometimes fail when one considers the often questionable prognosis of some abutment teeth, the added burden of removing plaque around the clasps and other partial denture components, and the continuing risk for caries or periodontal disease. When the patient witnesses such a failure, it only confirms the belief that the family wisdom is correct and the patient also will end up in dentures (Figure 18-4).

## Fear of the Dentist

The management of the anxious or fearful patient is discussed in Chapter 14. Patients who have been unable to come to terms with this problem often avoid dental treatment altogether.

**FIG 18-3** This patient attributes her "bad dental condition" to the earlier time in her life when she was pregnant and a single parent with limited time and limited financial resources to use for dental treatment. She is now motivated and very interested in improving her oral condition. (Courtesy Dr. Christina Shaw, Chapel Hill, N.C.)

**FIG 18-4** Patient who wants full mouth extractions and complete dentures. (From Zarb G, Hobkirk JA, Eckert SE, et al: *Prosthodontic treatment for edentulous patients: completed dentures and implant-supported prostheses,* ed 13, St. Louis, 2013, Mosby.)

Those with untreated active caries suffer from gross tooth destruction, fractures, abscesses, and toothaches. They typically have a history of episodic visits for pain relief. Similarly, patients with untreated, rapidly progressive, or severe periodontal disease become afflicted with pain, abscesses, and tooth loss. Despite the physical discomfort and loss of self-esteem, overcoming fear is a greater obstacle than such a patient can surmount, resulting in grave consequences to teeth, health, and self-image.

## IDENTIFYING UNDERLYING PROBLEMS

The patient's history and the clinical examination will be indispensable, not only in determining the clinical condition, but also in helping to reveal how the condition evolved. At the initial visit, the motivationally compromised patient often is apologetic about the condition of his or her mouth. It is not unusual for such a patient to express embarrassment and self-consciousness about gross caries, fractured or missing teeth, periodontally involved teeth, and halitosis. It is imperative that the dentist project a nonjudgmental demeanor, assuring the patient that his or her oral condition is not unique, that improvement can be achieved, and that the dentist and staff will do their best to correct the problems and eliminate disease. In many cases, it will have taken great courage for the patient simply to come to the appointment. Any comments, stringent office policies regarding payment, or body language by the dentist or staff that the patient interprets as patronizing, unsympathetic, or demeaning can be devastating to the individual's self-esteem. Many motivationally impaired patients are extremely vulnerable at this point and may overreact to the smallest slight. On the positive side, if such patients are treated with respect and dignity, and if their concerns are dealt with professionally and sensitively, they can become appreciative, cooperative, and loyal to the practice. As the history is taken and the examination conducted, the patient usually begins to open up and share concerns and perspectives. Box 18-1 includes useful questions to ask that may help to facilitate discussion with the patient.

**BOX 18-1 Useful Questions to Ask the Motivationally Compromised or Financially Limited Patient**

- Were you anxious or nervous about coming in to see us today? If so, why?
- How would you describe your teeth?
- What are your most important dental problems? Do you know what has caused these problems?
- Have your family members had dental problems? If so, what kind?
- What do you do each day to take care of your teeth and gums? What have you been told in the past about how to take care of your teeth?
- How could your smile be improved?
- What are your long-term goals in relation to your teeth and gums and mouth? How difficult do you think it will be to reach those goals?
- What would you like to achieve as a result of your visits to the dental office?

As this process unfolds, specific causes for the compromised oral health will become apparent. The following includes many of the common underlying causes for the patient's condition. It is noteworthy that there is rarely a single cause for the patient's lack of motivation to address oral problems. Rather, it is not unusual for the motivationally compromised patient's history to include several of the following causes, and many of these patients may be affected by two or more of these factors at any moment in time.

## Genetic and Developmental Factors

Genetic and developmental factors affecting the dentition may include such conditions as hypocalcification, hypoplasia, amelogenesis imperfecta, and severe fluorosis (Figure 18-5). Recent research illustrates the complex interaction between an individual's genetic profile and the environment in the development of caries.[2] Periodontal disease affects approximately 90% of the population in its mildest form (gingivitis) and, like caries, stems from both genetic and environmental causes.[2] Identifying such factors can be useful in two important respects: helping the dentist develop treatment strategies that target the root causes of the patient's oral disease, and providing positive psychological benefit to the patient who now sees a logical reason for the condition of his or her teeth and may come to find hope that there is a solution.

## Metabolic, Endocrine, and Immune Deficiency Factors

Hormonal changes are known factors in the development of pubertal and pregnancy gingivitis (Figure 18-6). Both endocrine disorders and altered immune function can contribute to periodontal disease and other intraoral abnormalities and infections. Identifying these issues and sharing that insight with the patient will have the same potential benefits as noted previously, relating to genetic and developmental factors.

**FIG 18-5** Enamel hypoplasia. **A,** Maxillary central incisors with a mild form of pitted enamel. **B,** Multiple teeth with horizontal band of severe form of enamel hypoplasia. (From Sapp JP, Eversole LR, Wysocki GP: *Contemporary oral and maxillofacial pathology*, ed 2, St. Louis, 2004, Mosby.)

**FIG 18-6** Pregnancy-associated gingivitis. (From Newman MG, Takei HH, Klokkevold PR, et al: *Carranza's Clinical Periodontology,* ed 12, St. Louis, 2015, Saunders.)

## Oral Health Literacy

Some patients are fully capable of understanding the relationship between their behavior and the oral disease but

suffer from a lack of information or, perhaps worse, from misinformation. Sometimes they have correct information but are reluctant to act on it. There is an emerging body of literature regarding the effect of oral health literacy on an individual's ability to maintain good oral health. Oral health literacy has been defined as "the degree to which individuals have the capacity to obtain, process and understand basic oral and craniofacial health information and services needed to make appropriate health decisions."[3] Careful listening to what the patient has to say, use of plain language rather than dental or technical terms, asking the patient to confirm what she or he understands aligns with what the dentist has communicated, and using visual aids along with verbal explanations are strategies that have been shown to be effective techniques in addressing health literacy issues.

As the examination continues, the dentist will have an opportunity to gain a sense of the patient's level of knowledge about oral health and disease. This may not be the best time to try to educate or reeducate the individual, however. Only after a full understanding of all problems has been reached and a conscious decision made as to the most effective intervention should the dentist attempt to modify the patient's knowledge base.

In some instances, the intellectually challenged patient may be unable to grasp the connection between oral disease and deleterious habits, including poor oral self-care. Intellectually, psychologically, or physically challenged patients also may have care providers who are unaware that they are contributing to oral disease by supplying highly cariogenic snacks as rewards or pacifiers in the management of their clients. In such a situation, the caregiver must be counseled with appropriate information that will help improve the patient's oral health.

## Interrelationship of Oral Health and Self-Image

A poor self-image often diminishes an individual's interest in good oral health and reduces willingness to absorb the cost and discomfort of dental treatment. If the patient is not happy with himself or herself or with life in general, it is unlikely that enthusiasm for dental care will be generated. Unfortunately, such patients are more likely than most to need extensive and complex treatment, reinforcing this negative perception. Some may barely cope with the issues of daily life, and it may be too much for them to deal with the fear and expense of dental treatment, much of which they may consider elective. A rarely vocalized but often perceived sentiment is, "My bad teeth are just one more bad thing in my life." This negative perspective might have redeeming value if some tangible benefit to avoiding dental treatment could be described. Unfortunately, this is almost never the case. Left unattended and untreated, oral disease worsens, the likelihood of pain and infection increases, and, with the exception of full denture construction, the costs and complexity of treatment continue to grow. Furthermore, as the oral condition deteriorates, the patient's appearance becomes less attractive and the self-image suffers even more.

## Behavioral and Nutritional Factors

The motivationally compromised patient is also likely to have poor dietary habits, engage in self-destructive behaviors, and be less likely to engage in health-promoting practices, such as effective oral self-care or regular physical exercise. These behaviors are most often a consequence of the underlying social determinants that affect the individual's health.[4] In the case of the patient with limited financial resources, dire economic conditions may hinder the ability to adequately participate in healthy behaviors. Regardless of the cause, the end result will be a significant negative effect on the patient's sense of wellness and the actual state of oral, mental, and physical health. Poor nutrition contributes to dental caries and, to a lesser extent, to periodontal disease. Self-destructive habits, such as smoking and excessive alcohol consumption, also contribute to oral disease (see Chapter 13). Behavioral causes can be the most complex and difficult to solve, because the environmental and social factors underlying these behaviors are often beyond the control of the patient. Such patients can be a challenge for the dentist to manage (see *In Clinical Practice: Enhancing Relationships with Patients who have Oral Health Challenges* box). In extreme cases, such persons may be clinically depressed and have the expectation that they will not live a normal life span. In this situation, antidepressant therapy may be necessary and integral to any attempts to modify behavior relating to oral health. For more on managing patients with clinical depression, see Chapter 15.

### IN CLINICAL PRACTICE

**Enhancing Relationships with Patients who have Oral Health Challenges**

Although many patients with oral health challenges are prompt, polite, and engaged, others are not. When patients are inconsistent in their own oral healthcare, erratic in keeping appointments, and/or appear to be disinterested or resistive to oral hygiene instructions, they may be labeled as "difficult," "noncompliant," or "problematic." Although these behaviors by patients pose real problems in clinical settings, it is also important to recognize the importance of the response to these behaviors. As professionals, we must always remember that our own experiences, standards, and values influence what we perceive as acceptable or unacceptable behavior, and that we must not allow our own prejudices and stereotypes to affect the way we treat patients. It is also noteworthy that when members of the dental team first encounter a patient who is anticipated to be a "problem," the overt and subconscious body language, expressions, tone of voice, and manner in which information is delivered to the patient may actually promote and foster the predicted negative behaviors.

Healthy professional relationships require mutual effort on the part of both the clinician and the patient. Rather than blaming

the "difficult patient," it can be valuable to explore why the behaviors occur. Missing appointments or frequently arriving late may be due to dependence on another family member or friend for transportation or because of an unexpected event that took precedence over the dental visit. Some patients will cancel or fail to appear for an appointment because of a lack of financial resources. Patient rudeness may represent frustration with any number of issues encountered before arriving for the dental appointment or could simply be a part of the patient's acquired response to a lifetime of unfulfilled expectations, hopes, and dreams. Acknowledging that the professional's response to patient behavior may contribute to a dysfunctional clinical relationship balances the responsibility for finding reasonable solutions.

Exploring the reasons for the patient's behavior can help the clinician understand the patient's perspective. Setting clear boundaries or reaching agreements (e.g., contracts) with patients can also improve clinical relationships. When a dentist-patient relationship is perceived as difficult, the clinician and staff should attempt to identify the underlying reason or source of the difficulty. Once the clinician is able to pinpoint the problem, the issue can be addressed directly with the patient. For example, the clinician could say, "Forgive me if I am interpreting incorrectly, but you seem skeptical (or doubtful) about all of this; please help me to understand what you are thinking . . . " and "Can you think of ways you can help me help you?"[1]

Building strong clinical relationships requires time and commitment from both dentist and patient. Clear documentation of discussions with the patient regarding the expectations of the office that are designed to improve and maintain good oral health, such as keeping appointments and following postoperative instructions, may help the dentist support a decision to discontinue a clinical relationship in the event that efforts to build a workable relationship fail.

**Reference**

1. Niselle P: Difficult doctor-patient relationships, Aust Fam Phys 29(1):47-49, 2000.

### Psychological Gain

Some individuals find a psychological benefit in being impaired. They may garner sympathy for their poor oral health from family members, friends, and coworkers, using it to avoid work or other responsibilities. For such patients, a health-related disability may have become part of a defense mechanism, used as a shield to deflect blame or responsibility. Sometimes, it may actually be safer or more comfortable for the patient to believe that the situation is hopeless. In cases in which it seems possible that the patient has a significant investment in poor health, the dentist has the challenging but essential task of determining whether the patient genuinely seeks improved oral health. If so, does he or she want merely a temporary fix, or a genuine solution? How much emotional energy is the patient capable of investing in dental treatment?

## EVALUATING POTENTIAL FOR CHANGE

Maslow's hierarchy is a model frequently used to explain an individual's value system and priorities at a particular point in life (Figure 18-7). This hierarchy is also an excellent tool to help assess the patient's potential to be motivated to change his or her dental condition. If, in fact, satisfaction of the person's needs is restricted to Level 1, Physiologic (most basic human needs), then it is unlikely that efforts to convince the patient of the value of a healthy oral condition will be effective. By the same token, the patient who has all of his or her basic needs met and is now motivated by Level 5, Self-Actualization, is more likely to be amenable to a sophisticated intellectual rationale supporting the benefits of optimal oral health. This is not, however, a guarantee that those efforts will be successful, because that same patient has complete freedom to accept or reject the rationale and may choose to do so on strictly intellectual grounds. The patient also may choose to reject it because other self-actualizing concepts are more appealing or take precedence. Therefore, Maslow's hierarchy should not be viewed as an infallible tool, but may simply serve as a useful approach to determining whether a patient is likely to be amenable to change, and if so, what strategies are more likely to succeed.

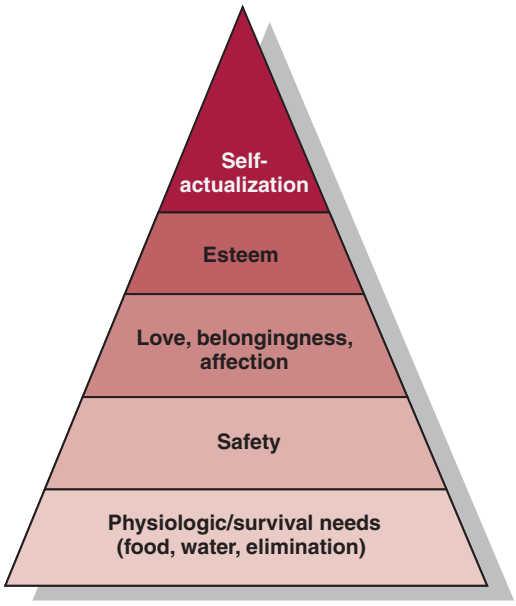


**FIG 18-7** Maslow's hierarchy of needs. (Maslow A: *Motivation and personality*. New York, 1954, Harper.)

Some factors contributing to the patient's motivational compromise cannot be altered, most notably those relating to heredity or physical and mental development. Some environmental factors, such as job stress, have the potential to be improved, whereas others realistically cannot, such as chronic unemployment and poor housing. Behavioral factors are strongly influenced by the patient's psychological perspective and sense of self-worth. When psychological barriers to change are not overwhelming, and when the patient has a positive sense of self-worth, the potential for eliminating mutable deleterious behaviors and promoting positive ones is good. The potential for eliminating or minimizing psychological barriers to change is highly variable and may not be

completely under the patient's control. When circumstances that contribute to deleterious behaviors cannot be eliminated, the best the dentist may hope to accomplish is to raise the patient's consciousness to the recognition that the barriers exist and help motivate the individual to work around or through them. With time, and a professional and supportive approach, such patients may be able to change and improve both their oral and general health.

Attempting to improve the patient's sense of self-worth is a similarly difficult undertaking with no guarantee of success. However, if early in the treatment the dentist can bring about a positive change in the patient's appearance, the person may be buoyed by an improved sense of self and begin to develop the belief that the effort is worthwhile. When these issues are dealt with effectively, educating the patient about the benefits of dental treatment is much easier.

It is also important to evaluate the patient's potential for improving oral self-care. The motivationally compromised patient often has poor oral home care, creating an unfavorable environment for the long-term success of any treatment. Most patients are receptive to some level of oral health instruction. How much they absorb and how effectively they implement that instruction varies, however. It is particularly important for the office staff to be attuned to the patient's dental history, cultural beliefs, knowledge base, and other factors that affect the individual's oral health status, including any specific barriers to care. When crafting an instructional plan, the dental staff and the hygienist, in particular, must have an understanding of the patient's individual needs and take those needs into account. The routine impersonal approach to oral physiotherapy instruction is unlikely to succeed with the motivationally compromised patient. A compassionate, thoughtful, and individualized approach to educating the patient regarding effective oral self-care is much more likely to produce the desired result and may also give the patient a greater appreciation for the benefits of comprehensive dental care.

## MAKING A TREATMENT DECISION

Once the dentist has determined that the motivationally compromised patient genuinely wishes to improve his or her oral health status, a plan of care must be developed and informed consent obtained. If the patient remains unmotivated or is unwilling or unable to modify the circumstances and attitudes that led to the oral problems, then there may be no alternative but to recommend the extraction of questionable teeth and transition the patient to complete dentures. If the individual is receptive and motivated to change, however, then more comprehensive treatment can be proposed. Some of these treatment options are discussed later in this chapter.

The presentation of treatment options is critical with the motivationally compromised patient. At the outset, such a patient is more likely to have an unusually pessimistic view of the treatment and its chances of success. The same patient may also have unrealistic expectations about how long or how demanding the dental treatment will be. Although candid, the discussion must not be coercive, threatening, or intimidating. The patient must feel comfortable enough with the dentist to be able to share what are often deep-seated concerns and reservations.

For this patient, informed consent also carries greater-than-normal significance. In addition to the usual presentation of treatment options, their risks and benefits and advantages and disadvantages, and the costs in time and money required for each, additional subjective components must be carefully and clearly presented. These include a patient-specific estimation of (1) the likelihood of successful treatment and (2) the consequences of failure. For these patients, the rewards of success are generally greater and the risks of failure often far more devastating than for other patients. After such a discussion the patient is more likely to be engaged in the treatment plan decision making in a meaningful way.

### Likelihood of Successful Treatment

Having presented to the practice in what is often a self-described "deep dark hole," the motivationally compromised patient is in position to have an extraordinary appreciation for the value of specific restorations and the importance of improved overall oral health. Successful treatment may significantly raise the individual's comfort level, enjoyment of life, and self-esteem. For the dentist, an accurate estimation of prognosis guides the selection of treatment options for presentation to the patient and may also shape the manner in which the options are presented. For the patient, such information helps determine which option to pursue and whether to accept a plan. Unfortunately, with these patients, it often can be difficult to determine the likelihood of success with any or all dental treatments, making it more difficult for patient and dentist to evaluate and compare the various options.

Often, dentist and patient must make a treatment decision without a clear idea of the disease or treatment prognosis. In these situations, the dentist must be sure the patient receives all the available information and that the information and discussion of prognosis, although limited, are documented thoroughly.

In the process, some patients will become able to recognize and correct preconceived notions about dental disease and dental treatment. On completion of the plan of care, and having achieved a good state of oral health – as well as a value of and a wish to preserve it – this patient is likely to be an appreciative and committed participant in the practice for the long term.

Having an honest, realistic discussion is also helpful in another important way. Even if the treatment outcome is not what the patient and dentist hoped it would be, at least the patient will have been fully informed of that possibility and can, in most cases, appreciate that although one approach has

not worked, there are other treatment options to be tried and success may still be achieved.

### Consequences of Failure

For the motivationally compromised patient, the consequences of treatment failure may go far beyond such concerns as infection or loss of a tooth. The dentist may need to assess what effect treatment failure could have on the patient's self-worth and sense of well-being. If the patient is already fragile psychologically or emotionally, a dental treatment failure could result in an emotional breakdown or a severe depressive episode.

While developing the plan of care, it is useful to be mindful of the patient's future or anticipated concerns about treatment failure. The motivationally compromised patient is more apt to attach greater-than-normal (sometimes inappropriately or excessively) significance to each step or to any unexpected event in the treatment process. This patient is likely to regard even minor setbacks as abject failures and be tempted to give up entirely on the process. Appropriately detailed explanations and gentle positive persuasion by the dental team can be effective tools in reassuring the patient, encouraging continued participation, enhancing self-esteem, and moving the process forward. If the dentist anticipates that the patient's anxiety about treatment failure cannot be overcome, then it is preferable to suggest a more aggressive or robust treatment plan involving extraction of any questionable teeth. This stratagem has dual benefits: increasing the probability of treatment success and simultaneously reducing both the number and intensity of the patient's concerns about treatment failure.

### Patient Participation

It is not unusual at this juncture for some patients to attempt to distance themselves from the discussion and seek to pass the decision making to the dentist, with expressions such as, "You're the doc. Whatever you recommend is fine with me." Because the dental problems seem overwhelming, the options complex, and the prognosis guarded, it is not surprising that the patient has difficulty making decisions. The older practitioner with a paternalistic approach to treatment plan presentation may take the opportunity to make the decision for the patient, whereas a less-experienced practitioner may find it flattering that the patient has that level of confidence in his or her skills. The astute provider will try to avoid this situation, however. By abdicating the decision-making role, the patient, consciously or unconsciously, also abdicates responsibility for his or her own oral health. If the treatment fails, no matter how many disclaimers have been made and no matter how complete the informed consent, the patient is likely to attribute the failure to the dentist. Even when the treatment is ultimately successful, if the patient has cast the burden of success fully on the dentist, unanticipated costs in time, money, stress, and energy may be resented and blamed on the dentist. For these reasons, and particularly with this type of patient, the dentist must *not* make final treatment decisions *for* the patient. The dentist may guide, assist, or provide recommendations, but at the same time must encourage the patient to take responsibility for making the ultimate decision. In some circumstances, a family member, trusted friend, or caregiver may be willing to participate in the discussion and provide support for the patient's decision.

## MOTIVATING THE PATIENT

After the dental problems have been identified, the root causes and contributing factors brought to light, and the patient and practitioner have agreed together to embark on a serious attempt to deal with the oral disease, a strategy for motivating the patient must still be developed. The patient and practitioner may design and carry out this strategy jointly, or more often the dentist undertakes it alone. Often, this aspect of planning, although a part of the dentist's thought process, is not formalized in conversation or on paper. The fact that it is not externalized, however, does not mean that it is not important. When this part of the process is carried out with forethought and purpose, the chances of successful treatment are greatly enhanced. Without it, the likelihood of success is poor. The development of an effective strategy is generally a two-part process: (1) identifying an approach to motivating the patient and (2) discerning how to apply those motivators to greatest effect.

Several issues may motivate a patient to improve his or her oral condition and overcome deep-seated barriers to care. Although these can be categorized separately as external or internal factors, to a great degree, they overlap.

### Internal Motivators

#### Immediate Pain Relief

Pain relief is a powerful motivator in the short run, but unfortunately when the pain is gone, the patient may resume old habits and patterns that will delay treatment until the next painful episode arises. Occasionally, suggestions by the dentist, or other members of the dental team, at the episodic visit will induce the patient to commit to comprehensive care.

#### Long-Term Pain Relief

The prospect of long-term pain relief is a less-powerful but still potentially effective motivator, especially if the patient has had a notably traumatic episode that he or she wishes never to repeat.

#### Prospect of a More-Positive Self-Image

The desire for or expectation of a more-positive self-image can be an effective long-term motivator and works best with the patient who functions at or near the top of Maslow's hierarchy.

#### Improved Appearance and Elimination of Halitosis

The prospect of improved appearance and elimination of halitosis are powerful motivators; however, in the absence of

other longer-term motivators, the patient may lose interest and discontinue treatment once the esthetic goal is achieved or the halitosis eliminated.

### Improved Function

For persons at any level of Maslow's hierarchy who "want to chew better", the prospect of improved function can be an exremely effective short term and long term motivator.

### Eliminating Disease

For a few patients, the prospect of eliminating disease can be a strong and all-sufficient motivator. Care must be taken to temper enthusiasm and avoid self-destructive or obsessive cleaning behaviors. For patients who function at the upper levels of Maslow's hierarchy, eliminating oral disease can sometimes be an effective short- and long-term motivator.

### Improved Wellness

Although an abstract concept to most patients, improved wellness is a powerful priority for some persons, especially those functioning at the upper level of Maslow's hierarchy.

## External Motivators

### Family Pressure

Expressed through the wishes of parents, children, or significant others, family pressure can be a powerful short- and long-term motivator. In the absence of concurrent internal motivation, however, this influence may wane over time.

### Career Advancement/Positive Employment Outcomes

Associating improved oral health and appearance with career advancement may generate enthusiasm for treatment and willingness to undergo considerable sacrifice and cost. Additional benefits may include fewer lost days at work due to dental pain.[5] Studies have shown a favorable employment outcome in welfare recipients after completion of dental treatment.[6]

### Impending Changes in Life Companion

Dating, marriage or remarriage, and the social pressures associated with impending changes in personal relationships can be among the most powerful of motivators, but the manner in which patients react to those forces and the duration of their effects are highly variable. Affairs of the heart can be fickle, and so can this patient's compliance with and enthusiasm for dental treatment.

## Implementation

To be effective, the issues mentioned must be matched specifically to the patient's needs and circumstances. The dentist must articulate clearly how the dental treatment will benefit the patient's particular circumstances. The dental team also needs to share these views with the patient in a manner that will both engage and motivate the individual. The patient may require frequent reminders of the critical issues and relationships. Key issues in motivating and managing the motivationally compromised patient are summarized in Box 18-2.

**BOX 18-2 Some "Dos and Don'ts" in Motivating the Compromised Patient**

**Do**

- Present information in clear segments that the patient can understand and retain.
- Set realistic and incremental goals.
- Reward the patient for positive behavior and achievement of goals.
- Add new goals sequentially. Giving the patient too many goals too quickly can be counterproductive.
- Strive to build the patient's confidence.
- Work to dispel the perception that the problems are insurmountable.

**Don't**

- Overwhelm the patient with information.
- Rush the process to completion if the patient is not responding.
- Let yourself get discouraged or give up. The patient is looking to you to keep the process going. A resetting of goals or a change of course may be necessary, but as long as the patient is trying, the dentist must stay engaged.
- Make a half-hearted effort. A half-hearted effort is an invitation to failure and simply confirms the patient's earlier suspicions.

Some patients will fail to maintain a new oral health program despite the dentist's best efforts. Some will lose interest; others will suffer personal or financial difficulties that preclude continuation of treatment. Still others will delay or discontinue care with the expectation of resuming later. The dentist must be prepared for the possibility that a comprehensive plan of care must be terminated. This unfortunate outcome is more common with the motivationally compromised or financially limited patient than with others. Should the situation arise, the dentist must handle it with tact and professionalism and should not take the failure personally.

# MANAGEMENT OPTIONS

The motivationally compromised or financially limited patient may still have multiple treatment options. Any limitations or barriers to treatment should not necessarily limit the breadth or scope of treatment. In some cases, the barriers to care may actually stimulate creative new solutions to the patient's unique difficulties. Occasionally, in the course of discussion, the patient may be inspired to suggest his or her own treatment solution, which can be exciting and productive for both the patient and dentist.

Selecting the right plan for such a patient is often more difficult and has a greater chance of failure than with the average person. Given that reality, in dealing with these patients it is important for the dentist to modify his or her own

standards and expectations as discussed in the accompanying *In Clinical Practice: The Need to Redefine "Success"* box. As with most patients, the possibilities range from ideal treatment to no treatment. Additional approaches to be considered for the motivationally or financially compromised patient include the limited treatment plan and the extraordinary efforts plan to maintain a dentition with a questionable prognosis.

## Ideal Treatment

The dentist may assume that the motivationally compromised patient is not really interested or committed to ideal treatment, but it may be the case that the patient has never been *offered* ideal care and is unaware of its potential advantages. All patients deserve to at least hear about an optimal treatment option. In some clear instances, information about available alternatives may provide the motivation and incentive necessary to encourage the patient to participate in such treatment.

On the other hand, it is unwise to tantalize the patient with the prospects of ideal comprehensive care when the disease control phase has not been successfully completed. For example, a patient with rampant caries and severe periodontal disease may inquire about replacing a missing tooth with an implant. Although it is desirable to offer replacement options, an implant would not be a viable immediate option in the presence of an overall deteriorating oral condition.

## IN CLINICAL PRACTICE

### The Need to Redefine "Success"

When dealing with the motivationally or financially challenged patient, the dentist's barometer of success must be reset. With this type of patient, it is almost guaranteed that achieving goals will come less often and goals will be harder to reach. The reason for this is self-evident. By definition, these patients have significant barriers to care. Most have sporadic dental histories and are anxious or phobic about receiving dental treatment. It can be extremely difficult to reverse this cycle of behavior and its effects. When dealing with such patients, the specific goals must be clear, realistic, and attainable. The goals should be neither too high, increasing the failure rate and discouraging the patient, nor too low, appearing simplistic and therefore meaningless.

The process of redefining treatment success for the motivationally compromised patient must often include a shift in the perspective of both the patient and the dentist

#### *Patient's Perspective*

The dentist and patient must engage in honest discussion. If the patient has an overly pessimistic view of his or her condition and the possibility of overcoming problems, the dentist must help to raise those expectations. Conversely, if the patient has an overly optimistic or fanciful view of the situation, the dentist must encourage lower expectations and lead the patient to view the situation more realistically.

#### *Practitioner's Perspective*

The dentist should recognize that the more complicated or heroic the proposed plan, the less likely the chance of success. The obvious response to this predicament is to simplify the plan, but this approach can become counterproductive if the patient is asked to give up personally important elements. If too much is sacrificed for the sake of simplicity, the patient may forego the attempt altogether or enter into it with so little enthusiasm that there is little chance of success. The dentist must avoid the temptation to simplify all such treatment plans to improve his or her own personal success rate.

The dentist must accept the fact that not all cases will yield *immediate* success. For some patients, it may take months or years, and active treatment may be in on-again, off-again cycles before the patient and dental team are satisfied with the achieved level of oral health.

The following suggestions can improve the odds of attaining success with this patient:

- At the outset, offer ideal treatment to those patients who are motivated to change destructive behaviors and determined to undergo the treatment. Patients who initially are not motivated or committed to receive ideal treatment should be offered acute care or limited care. After acute needs are addressed, active disease stabilized or resolved, and trust and rapport established, ideal treatment options should then be thoroughly investigated.
- Give your best effort and encourage the patient to do the same. If treatment fails, it should be for reasons other than lack of trying. The patient will usually appreciate your effort and may then choose to work with you on a revised plan.
- Do not take shortcuts or compromise the standard of care. Not only can this jeopardize the success of the plan, but it also may be hard to justify to other care providers or licensing boards.
- Document thoroughly, because with good documentation the provider can substantiate whatever was done, even if the treatment does not succeed.
- Do not take the failure of treatment personally. Other opportunities will present themselves and other patients will need you to go to the same lengths for them.
- Be realistic about your chances of helping the patient to achieve an optimal state of oral health. You can expect that approximately one-third of the motivationally and financially compromised patients will discontinue care. Despite your best efforts, multiple issues and confounding circumstances will prohibit their continuance with dental treatment. You can expect another one-third of this group to have an uneven, largely episodic experience. With perseverance, patience, compassion, and understanding on your part, you can expect that approximately one-third of these patients who come to your practice will become motivated and conscientious comprehensive care patients. Recognizing that turning one-third of these patients around is a significant success should serve as a realistic goal for the dentist and keep the dental team motivated to continue this important endeavor.

## No Comprehensive Treatment (Provision of Acute Care Only)

Dentists are conditioned to intervene when a problem is encountered. When a patient displays the ravages of oral disease, the dentist is not inclined to wait and see what happens. As uncomfortable as that alternative may be, however, sometimes it is best for all concerned not to intervene, except for acute care to eliminate current active infection. At least three situations can be described in which comprehensive care would not be the best alternative.

*The patient has been brought in for treatment for the sole purpose of making someone else happy.* If the patient has no personal interest whatsoever in undergoing treatment, the treatment is almost certain to fail. A good case in point is the patient confined in a nursing home who has no desire for dental treatment, but whose family members seek to improve his or her appearance. In such a situation, a simple cosmetic compromise that the patient can tolerate may satisfy the family. To attempt comprehensive care for this patient would be ill advised.

*The patient suffers from extensive oral disease and believes he or she wants comprehensive care but is unrealistic about the demands of the task.* This patient may have unrealistic expectations about the amount of time and effort necessary to complete the treatment, as well as about the outcome. The patient's financial resources may not be adequate to pay for such a complex treatment plan. If the dentist initiates comprehensive treatment under these circumstances, the likelihood of patient discontent, treatment failure, and a host of negative outcomes for the dentist is great. Again, the most prudent course of action is to provide acute care for pain or swelling, and then educate the patient about the demands and commitment required to complete the comprehensive treatment plan. If the patient is still unrealistic about what is entailed in the treatment, or the expected outcomes of the treatment, then the dentist may have no alternative but to decline treating the patient.

*The patient desires extensive restorative work but has several missing teeth, severe attrition, and decreased vertical dimension of occlusion.* The patient does not want dentures and does not have the financial resources to pay for a full mouth reconstruction. This is often an onerous situation for both patient and practitioner. Difficult though it may be, if the patient is asymptomatic and has no active disease, the best approach may be to defer treatment until more teeth have been lost, and the patient accepts the idea of a complete denture or dentures. An occlusal guard or cast partial overdenture may represent a compromise approach, but such treatment has significant risk for the dentist. It may raise the patient's expectations unrealistically and obligate the dentist professionally and legally to maintain the patient in a "holding phase" for an indefinite period. If the patient's finances truly preclude comprehensive treatment and the patient continues to decline complete or partial denture options, the only recourse may be to dismiss the patient from the practice.

Unfortunately, the *no treatment* option is sometimes used improperly by the dentist. Following are descriptions of two situations to be avoided.

First, when confronted by a patient with limited finances or who is motivationally compromised, and who suffers from overwhelming oral disease, the dentist may be drawn to the *no treatment* option simply because it is the easiest solution for *the dentist.* The shortsighted perspective is "Why waste time explaining options and considering treatment for a patient who doesn't really want or can't afford comprehensive care anyway?" But all patients deserve to be given an honest and complete perspective on all the reasonable options available, and to be offered the opportunity to make an informed choice. The patient should not be discouraged from reasonable treatment options simply because of the *dentist's* reluctance to get involved. Refusal to treat a patient because it is inconvenient for the dentist would be a violation of several ethical principles (see Chapter 6).

However, there are legitimate reasons for a dentist to refer a patient to another provider for comprehensive treatment. If the patient desires comprehensive care, but the dentist does not believe that he or she has the knowledge, skill, or expertise to successfully complete the treatment, then the patient can, in good conscience, be referred to another practitioner for treatment. If the encounter and referral are handled well by the dental team, the patient will leave better informed and appreciative of the time and respectful manner with which they were dealt.

The second difficulty to avoid is the temptation to use the *no treatment* option as a method of scaring the patient into treatment. It is appropriate and wise to caution the patient about the ill effects and hazards of declining treatment, but that presentation must be honest and realistic, and should never be used to coerce.

If the patient, dentist, or both choose the *no treatment* option, the dentist still has several obligations to the patient. Any acute needs must be addressed and all reasonable efforts should be made to eliminate current active infection. The patient must be informed about the risks and hazards associated with deferring treatment. The dentist must thoroughly document this discussion in the patient's record, including options presented, risks and benefits, the choice of no treatment, and the rationale for the decision.

## Limited (Disease Control Phase) Treatment

A reasonable option for many motivationally and financially compromised patients is limited treatment, which may eventually lead to complete care when the limitations or barriers to treatment have been reduced or eliminated. A limited treatment plan provides the practitioner and patient with maximum flexibility. A disease control phase plan represents one form of limited treatment, the details of which are described in Chapter 9. The goals of limited care are similar to those of a disease control phase but may include more than disease and infection control. A limited treatment plan

typically includes temporary or definitive management of the chief concern, resolution of any acute problems, and disease control phase treatment for teeth that are certain to be retained (including behavioral, chemotherapeutic, and restorative treatment). Any specific barriers to treatment must be addressed. As with a standard disease control phase plan, it is imperative to have clear goals and an established endpoint to the treatment. In most cases, it is necessary to follow with a posttreatment assessment or equivalent mechanism to reassess the extent to which established goals have been achieved. At the assessment appointment, patient and dentist can come to a decision about whether to discontinue treatment altogether, go into a holding phase, or proceed with some form of definitive phase care. In any case, it is essential that full and informed consent is achieved and that the patient does not have any illusions about the prospect or promise of treatment beyond the limited plan that has been agreed to.

## Extraordinary Efforts to Maintain Dentition with Questionable Prognosis

Virtually all patients who are motivationally compromised come to the dentist seeking some form of treatment, and sometimes very specific treatment requests. They may not have the interest or the financial resources to embark on an ideal treatment plan. They may be overwhelmed with oral problems and oral disease to such an extent that they are unwilling to engage in a classic disease control phase plan of care. In such situations, are there other alternatives that can be offered? Here the dentist is challenged to come up with a creative, sometimes adventuresome, sometimes unconventional approach to treatment planning. For some patients, limited financial resources will be the driver in this exploration, but that is not always necessarily the case. Rarely will this involve untried experimental techniques. Most frequently, established techniques will be selected for treatment, but in this setting there is uncertainty with the prognosis and lack of predictability in the outcome.

This approach has sometimes been described as **compromise treatment**. Unfortunately, this term is often misinterpreted, and the concept often abused. In this context, *compromise* does not mean that the work fails to meet professional standards. Indeed, there should be no diminution in the quality of the individual restorations, or in the way in which care is delivered or documented. Examples of this type of treatment include the following:

The dentist and patient agree to

- Save a key tooth (see Chapter 4), even though there is significant bone loss and mobility.
- Attempt to salvage the existing dentition despite advanced generalized periodontitis.
- Provide a large protective cusp amalgam restoration (rather than a crown) in an effort to save a badly broken down tooth.
- Enlist heroic measures to maintain an existing fixed partial denture.

Before engaging in such treatment, several essential elements must be in place:

- Informed consent: The patient must have complete understanding of the limitations of treatment and the significant possibility of failure resulting in loss of the tooth or teeth.
- Agreement of both parties: The dentist and patient must both agree to the plan and be firmly committed to it.
- Documentation of the nature of the compromise, the rationale behind it, and contingency plans in case of a negative or adverse outcome.

It is important to recognize that compromise treatment plans involve an element of risk—and in some cases, a high degree of risk—for both parties. A compromise plan is not for the faint of heart—dentist or patient. From the dentist's perspective, the plan will often push the limits of the "comfort zone" and may encourage trying techniques and/or materials that are innovative or new to the practitioner. Similarly, the patient must be, at least to some degree, a risk taker, preferably an adventuresome spirit, who is willing to face the possibility of a fractured tooth, lost restoration, broken appliance, or even toothache at an inopportune time.

Proper patient selection is critical. Compromise treatment should only be attempted when there is complete trust and entirely open communication between the parties. An anxious patient who has had previous unsatisfactory dental experiences, who has mistrusted dentists in the past, or who is rattled by the prospect of unscheduled emergency dental visits is not a candidate for a compromise plan.

It is important to keep in mind that a compromise plan does not supplant the need for disease control therapy. In reality, most compromise plans will be an amalgam of specific heroic treatments within the framework of a disease control plan of care. As with all dental patients, a definitive phase treatment plan should never be undertaken without confirming that the patient's active oral disease is being controlled.

With careful patient selection, open communication, complete informed consent, and ideal documentation, a compromise plan can be successfully accomplished with minimal legal risk. Consideration of a compromise plan can drastically expand the range of possible therapies. The process can be exciting, dynamic, and creative for both patient and provider. But in the absence of the required elements (patient flexibility and understanding, informed consent, and thorough documentation), a compromise plan can be a recipe for disaster, inviting patient anxiety and disappointment, peer criticism for the dentist, and the potential for malpractice litigation.

As with the limited care plan, the compromise plan may be followed by a complete array of definitive therapies as the clinical situation evolves, the patient's finances improve, and the patient's attitude, interests, and expectations mature and come into clearer focus.

## CARING FOR THE PATIENT WITH LIMITED FINANCIAL MEANS

Having spent so many hours and so much energy learning to improve the oral health of their patients, most dentists find the discussion of costs and finances intrusive and potentially damaging to the doctor-patient relationship. At no time is this more necessary, however, than with the patient who has limited financial means. Such patients may have very real financial limitations, or they may simply perceive financial limitations because dental treatment falls below other priorities for use of their discretionary income. To further complicate matters, the patient may use the perceived financial limitation to mask other barriers to care. In any case, the issue of finances must be dealt with forthrightly before treatment can begin.

Financially limited patients have many of the characteristics described for motivationally compromised patients. They often suffer from the ill effects of poor oral hygiene and inadequate professional care. They may be afflicted with extensive oral disease. In addition, their financial limitations color their perceptions of the treatment they can obtain. Such patients may feel intimidated by the cost of dental care. The extent to which those limitations will preclude treatment must be determined. Options for obtaining reasonable oral health must be explored when formulating the patient's overall treatment plan.

Many patients report that they do not have the financial resources to pay for dental treatment. It is important to recognize that although some purported financial limitations are valid, in other cases they are a reflection of other deeper issues or concerns, such as the fear of dental treatment. In general, patients who describe themselves as having financial limitations fall into one of four groups:

1. Patients on a fixed or bare subsistence income with no discretionary resources available to spend on dental care.
2. Patients who can afford a minimal level of care.
3. Patients who can afford comprehensive dental care but prefer to use their discretionary income for other things.
4. Patients who previously had financial means (whether through employer-sponsored insurance or out-of-pocket payments) but are now unemployed or underemployed.

In many cases, the patient may have used financial or other concerns as both an explanation and an excuse for neglecting dental care. Over time, the concerns of such patients become barriers that they cannot get past, with the mere presence of the barrier justifying inaction and setting up the expectation of failure. Expecting failure, and afraid to act, the patient's disease continues with adverse outcomes: A self-fulfilling prophesy has occurred. Breaking this cycle represents a significant challenge for both patient and dentist.

For most patients, the easiest and most effective approach is to separate the discussion of finances into two parts and deal with each part individually and at different times. During the first part of the discussion, focus simply on the question of how much the patient can reasonably afford to spend on dental care in the coming 6 to 12 months. The question must be raised with discretion and only after ample opportunity has been provided to develop rapport and trust between the dentist and patient. Usually this stage is reached toward the end of the initial examination visit. In some cases, it may need to be deferred to a later time. The limiting factor, of course, is that it must occur before treatment plan options can be discussed definitively. The dentist needs to determine, as tactfully as possible, whether the patient has financial limitations and to evaluate whether those limitations are genuine or perceived. At a minimum, will disease control treatment be financially feasible? Should outside financial assistance for the patient be sought? Is the reported financial limitation actually an expression of some other underlying barrier to treatment? If financial issues are raised too early, or insensitively, the patient may perceive the queries as an intrusion into his or her private life and conclude that the dentist is "after my money." Such a breach in the dentist-patient relationship may be irreparable.

Without such information, the dentist cannot determine which type of treatment plan (acute, disease control, limited care, extraordinary efforts to maintain a dentition with a questionable prognosis, or comprehensive care) is most appropriate, much less its details and sequence. With financial information, the dentist can, in a professional and sympathetic manner, begin to establish a range of feasible options for the patient to consider.

The second part of the discussion addresses the issue of how payment for the services will be sequenced. This part of the discussion occurs most appropriately after the treatment plan has been developed and agreed to by patient and dentist. The office manager often handles the specific arrangements. Like all other aspects of the patient's records, the financial information must remain confidential between dentist, administrative staff, and patient. Conversation about financial affairs must reaffirm the patient's dignity regardless of his or her financial means. It is always important that the treatment be provided in a compassionate manner, with an appreciation for the patient's individual needs and circumstances.

Many patients are unable to afford the optimum treatment plan. Some will be unwilling to accept even the limited treatment alternatives proposed by the dentist. What then? Other options that should be considered are discussed in the following sections.

### Staged Treatment

Staged treatment may be a workable alternative and is particularly appropriate for the patient whose treatment needs are not acute or urgent. A patient with a stable oral condition who needs multiple crowns can be offered a plan in which crowns are placed sequentially over a period of years.

### Payment Plans

Payment plans are certainly an option if the patient has good credit and the needs are urgent, or if the patient, for whatever

reason, does not want staged treatment. Through various different sources, including local or national financial institutions or credit cards, the patient or the practice can establish payment plans or loans, or in-office individualized arrangements.

## Outside Resources

Family members may be a source of financial aid, particularly if the family has a vested interest in the patient's improved oral health. Outside funding sources, including religious organizations, philanthropic organizations, and social services, can sometimes augment the patient's limited resources.

## Other Practice Settings

All of the aforementioned options represent possible alternatives if the patient wants to stay in the practice and the practitioner wishes to keep the patient in the practice. Many financially limited patients take a long time to build a trusting relationship with a particular care provider and, once that relationship is established, are extremely loyal and do not wish to leave the practice under any circumstances. If it becomes desirable or necessary for the patient to seek care elsewhere, however, the following options remain:

- Colleges of dentistry in academic health centers and their associated satellite clinics
- Local, regional, state, or private, not-for-profit public health clinics
- Federally Qualified Health Centers (FQHCs)
- Clinics for low-income patients that have been established in some localities by local or state dental societies and are staffed by volunteer practitioners

The principal limitations to these programs may be lack of universal availability, relative inaccessibility, and limitations to the scope of services they may provide. A dental college, for example, represents a source for good-quality care but requires some remuneration and substantially more time to complete the treatment and may not be accessible to some patients. Local, regional, state, or private, not-for-profit public health clinics or volunteer clinics may have restricted hours and long waiting lists, and may provide only a limited range of services. (For more information regarding FQHCs, see *Suggested Readings* at the end of this chapter.)

## Reducing or Waiving Fees

Reducing or waiving fees should be an option of last resort and considered only for the most worthy and reliable of patients. For more details, see the accompanying *In Clinical Practice: Should I Do Pro Bono Work in My Office?* box.

### IN CLINICAL PRACTICE

**Should I Do Pro Bono Work in My Office?**

The American Dental Association estimates that dentists in private practice provided $2.16 billion in free or discounted care in 2007 alone. More than 70% of dentists provide charity care, with the typical dentist donating more than $13,000 in free or discounted care annually.[7]

Many reasons can be cited for choosing to provide free or reduced-fee dental treatment for selected patients. Many dentists are motivated by the altruistic desire to give something back to the community because their lives have been enriched by their experience in the profession. Some, who would like to do charitable or mission work but are unable to go outside their community, see this as an alternative. Others report doing it simply because they feel an obligation to society. The personal rewards from philanthropic work come in many forms. They include positive responses from appreciative patients and the self-satisfaction that comes from knowing that a disadvantaged patient is healthier and better because of one's own efforts. In addition, there may be spiritual rewards and the satisfaction of building a positive image in the community and among one's peers.

There are also many reasons why a practitioner might choose *not* to provide dental care at waived or reduced fees. It can be argued that providing this care to a few patients has no real effect on the overall societal need. Furthermore, it may give false hope to other patients or perhaps cause bitterness among those not able to benefit from such philanthropy. Some would suggest that such a policy might attract "undesirable persons" to the office and promote a bad image for the practice. An argument can be made against such work on financial grounds. Fee reductions may not be possible for patients who have dental insurance. Waiving the patient's copayment or accepting the insurance contribution as full payment is usually forbidden by insurance companies and is illegal in many jurisdictions. Other arguments against doing pro bono work include the potential for the patient to abuse the service or that patients may not fully value or appreciate it.

Ideally, the decision about whether to offer treatment at a reduced rate or *gratis* is made with thoughtful consideration after the establishment of a formal office policy. Written guidelines in the office manual, clearly delineating the circumstances in which waivers of fees will be granted, can help the practitioner avoid ambiguity, making clear to staff that a consistent policy exists that is fair and equitable for all concerned.

The following list of suggestions summarizes a rational approach to charity dental work:

- Establish a clear office policy and be consistent with it.
- Select patients based on merit and an estimation of that person's reliability and motivation to improve his or her oral health.
- Select patients who have compelling oral health needs and legitimate financial constraints.
- Confirm with the office manager or other staff that the patient meets the established criteria for this kind of assistance.
- Carefully plan the case with a clear timetable for both the dental treatment and the payment schedule. Include appropriate stipulations concerning expected attendance at appointments and compliance with home care. Put this information in writing and have both the patient and dentist sign it.
- Carefully document the treatment and the patient's performance and compliance with recommendations.
- In all cases, provide treatment that meets the professional standard of care.

## Government-Sponsored Programs/Public Assistance Programs

Internationally, there are many models of government-funded programs, but they generally fall under the heading of "socialized medicine." Although this term often incites fervent argument in the United States by both proponents and adversaries, globally, the term simply means "medical and hospital services for the members of a class or population administered by an organized group (such as a state agency), and paid for from funds obtained usually by assessments, philanthropy, or taxation."[8]

In the United States, Medicaid is the primary government-sponsored public assistance program that supports the dental treatment of children who fall below the poverty line, the disabled, and the impaired. Medicaid also supports a limited range of dental services for adults who qualify on the basis of limited financial means. The intent of the Medicaid dental program is to provide low-income individuals with dental insurance, because individuals with such insurance, including children, are more likely to receive dental care than those without dental insurance.[9-18]

Medicaid, a joint federal and state healthcare program, began in 1965 and, with its inception, became the largest public dental insurance program in the United States.[19,20]

To qualify for Medicaid, a family must demonstrate that their income is a certain percentage of the Federal Poverty Level (FPL). For example, in 2014, 100% of the FPL for a family of four is $23,850.[21,22] Many states have expanded coverage, particularly for children, above the federal minimums. The Affordable Care Act of 2010, signed by President Barack Obama on March 23, 2010, created a national Medicaid minimum eligibility level of 133% of the federal poverty level ($29,711 for a family of four in 2011) for nearly all Americans younger than age 65. States have the option to expand Medicaid coverage with federal support for a limited time period.[21]

Although the program covers both medical and dental care, considerably fewer federal and state dollars are allocated to Medicaid dental care compared with medical care.[23] Although the federal government requires that state Medicaid programs include dental services for children, the type and extent of dental services for adults are left to the discretion of each state.[20] States vary in the services they cover, eligibility criteria, and reimbursement levels.[24] Most states have the goal of providing a full range of dental services to all individuals who are eligible for Medicaid.[25] The cost of such provisions is expensive and often not recognized when funding allocations are made. Instead of reducing the number of services provided by Medicaid or the number of individuals who are eligible, states often decide to reduce the level of reimbursement for services.[23,25] As a result, in many states, dental services for adults under the program are limited or nonexistent. The dental practitioner in the United States makes the decision as to whether to participate or abstain from providing care to patients with Dental Medicaid insurance (see *In Clinical Practice: Should I Accept Medicaid in My Practice?* box).

### IN CLINICAL PRACTICE

**Should I Accept Medicaid in My Practice?**

Many dentists report that they do not accept Medicaid patients because of low reimbursement levels, the limited number of reimbursed procedures, cumbersome claims administration, delays in reimbursement, and problematic patient behavior, such as missed appointments and lack of compliance with professional recommendations.[23,25-34]

Those who accept Medicaid reimbursement for services rendered do so for multiple reasons. Some feel a desire to "give back," others feel a responsibility as a practitioner to provide care for a certain number of low-income individuals, some have been in less-than-ideal economic situations themselves, and others accept it when the practice is young and regular patients are few.

Although the administrative burden of filing Medicaid claims has decreased dramatically in most states, some dentists opt out of Medicaid and instead provide pro bono care in their offices (see the *In Clinical Practice: Should I Do Pro Bono Work in My Office?* box). Nevertheless, when children living below the poverty level do receive dental care, it is most likely to be through 0 the Medicaid program.[35]

Given the option of participating in the Medicaid program, dentists usually choose one of the three following courses of action:

1. *Declining the option,* perhaps waiting for a time when the reimbursement will be more reasonable.
2. *Accepting a limited number of Medicaid patients* and making such patients an adjunctive part but not the focus of the practice. This approach serves some patients that otherwise would not receive treatment, and the practice minimizes some of the expenses incurred.
3. *Establishing a practice that focuses on Medicaid.* With this option, the goals and mode of operation are modified somewhat from the typical private practice. Patients are typically overbooked owing to anticipation of higher no-show rates, and every effort is made to complete as many procedures as possible at one visit. Other models of care receive a per-visit Medicaid rate reimbursement; giving the dentist more choice in determining the number of procedures to be completed at each visit. By increasing production volume and decreasing expenses and overhead costs, some dentists can make a living from an almost exclusively Medicaid practice.

# DISPARITIES IN ORAL HEALTH AND ACCESS TO CARE

## Oral Health Disparities and Social Determinants of Health

The landmark report "Oral Health in America: A Report of the Surgeon General" makes it clear that there are "profound and consequential disparities in the oral health of our citizens."[36] The report describes a "silent epidemic" of oral disease affecting our most vulnerable populations, many of whom are motivationally and financially disadvantaged. The disparities are found within specific population groups, including those with lower levels of income and education, racial and ethnic

minorities, the frail elderly, and those living with disabilities and other health conditions.

Good health, including oral health, begins at home and is directly related to the physical and social environment in which one lives, works, and plays.[37] Living in a community in which the water is fluoridated, nutritious foods are readily available, and dental offices are conveniently located facilitates good oral health for the general population. Access to reliable transportation, good schools, and safe environments in which to actively participate in physical activities affects one's ability to maintain his or her own health.

Multiple barriers exist to accessing oral health services. These include but are not limited to socioeconomic status, oral health literacy, geography, availability of dental insurance, and location of dental offices.[38] The issues surrounding the lack of access to dental care are complex and require collaborative and coordinated action by the private and public sector.

### Role of the Profession

As a profession, dentistry has done a remarkably effective job of treating the ravages of oral disease in those patients who seek treatment and have the financial resources to pay for it. The record in the United States for managing care for those who are both motivationally and financially challenged has been far less impressive. The reasons for this failure are myriad and are found on multiple levels. In the United States dental treatment is generally perceived as a privilege rather than a right. Oral health, or lack thereof, has traditionally been viewed as something within the purview and responsibility of the individual. Most dental treatment in the United States is still delivered through a private practice, fee-for-service system and overtures to move to a single payer (government based) delivery system continue to be met with vigorous political opposition.

On the positive side, the American Dental Association's and other dental professional codes of ethics (see Chapter 6) clearly espouse the need for dental professionals to help alleviate this problem. To their credit, many dental organizations and societies, and individual practitioners, have tried to make a contribution to this cause. But much need remains.

### Role of Government

Historically, the dental section of state departments of public health have focused their efforts on prevention of oral disease and provision of preventive dental services. Many county and municipal governments have established community based dental clinics to provide services for the underserved in their area. When direct therapeutic care has been made available, the focus almost always has been on the needs of children and those with acute dental problems. Few of these programs provide definitive care for adults beyond direct-fill restorations, extractions, and uncomplicated removable prostheses. The admissions criteria, availability and level of services, and fees charged may vary greatly from locality to locality, even within the same jurisdiction.

The federal government has partnered with local communities to establish permanent medical and dental public health clinics in some designated areas of need, and has recently expanded funds to provide dental services in some established federally qualified healthcare centers.

Medicaid funds administered through state government are available to the practitioner who chooses to provide dental services to the low-income patient. The range of covered services is limited, and the provider must agree to accept Medicaid fees as payment in full. Typically, the adult patient is required to make a minimal copayment to cover the administrative costs for each visit; oftentimes, there is no copayment for the child patient. Although much of the administrative process (such as submitting claims and prior authorizations) has been streamlined in some jurisdictions in recent years, the enrollment process for the practitioner can be slow and cumbersome. For these and other reasons, many private practitioners have chosen to opt out from participating in Medicaid.

Some state governments, sometimes in cooperation with the federal government, have made available scholarships and low interest loans and used partial forgiveness of health profession loans to encourage dental providers to settle in underserved areas.

### Role of Third-Party Payers

Private dental insurance carriers are profit driven. This group of patients, with a need for extensive services, does not offer an attractive revenue stream. Since cost containment is achieved via high premiums, high co-pays, limiting services and reducing reimbursement rates – dental insurance is often not very beneficial to these patients.

With dental managed care plans, patients are enrolled in a private health plan that receives a fixed monthly premium from the state or employer. The health plan is then responsible for providing all or most of the recipient's healthcare needs. Although the potential for benefit from such plans to the motivationally or financially limited patient is great, uncertainties remain concerning the extent of benefits, level of care to be provided, and accessibility of care. Many states are embracing managed care plans. At this time, it is difficult to predict the effect these plans will have on this group of patients.

## A LOOK TO THE FUTURE

Just what does the future hold for financially compromised or motivationally limited patients? As the general population continues to increase, the number of these patients can be expected to also increase. Our society places a high value on a healthy mouth and an esthetically pleasing dentition. Government intervention may be required if the dental profession, individual dentists, insurance carriers, and managed care plans fail to serve this population's oral health needs. It is difficult to predict how the autonomy of the treatment planning experience or the dentist-patient relationship will be affected. However, a change seems certain.

What is not expected to change is the existence of a group of patients with both complex treatment needs and significant barriers to care. These patients will continue to make significant demands on the dental team in terms of time, expertise, and financial considerations.

The challenges that the motivationally compromised or financially limited patient present to the individual dentist, and to the dental profession as a whole, are significant. These challenges deserve to be met in a responsible and meaningful way. Altered societal values will be necessary to create a climate in which the needs of these patients are recognized and public resources applied to the task. The dental profession, allied health workers, third-party payers, and public health agencies at all levels of government will need to engage in a cooperative effort if this complex problem is to be addressed. In the meantime, it is the individual dentist who, with an open, caring, and compassionate approach, can often make the difference in the lives of these patients. Although the patient's care does require a significant investment of energy on the part of the dentist, the professional satisfaction that comes with a successful outcome is immeasurable. Likewise, the effect on the patient's well-being and self-esteem can be life-changing.

## REVIEW QUESTIONS

- What common perceptions (or misperceptions) about their own oral health and oral healthcare limit or preclude patients from seeking dental treatment?
- Describe some of the frequently encountered causes for an individual to develop a severely compromised oral condition.
- How can the dentist assess the patient's potential for developing a realistic and positive attitude toward oral healthcare?
- What techniques and strategies can the dentist use to motivate a patient to improve his or her oral condition?
- What dental treatment options are available in your community for the patient with limited financial resources?
- Does the profession of dentistry have an ethical obligation to address the needs of the underserved? If so, how far does that obligation extend (what populations need to be served? What treatment should be provided? Under what circumstances should that treatment be provided?).
- Do you have an ethical responsibility as an individual practitioner to serve patients who have limited financial resources? If so, how will you fulfill that responsibility?

## SUGGESTED PROJECT

Do a self-assessment of your current practice setting. When patients present who have extensive oral health needs and limited financial resources, how are those patients managed in your practice? Are those patients welcomed into the practice? What are the provider and staff attitudes and behaviors toward these patients? Does the dental team effectively discern, appreciate, and address the individual patients' social determinants of health? What efforts are being made to help patients overcome their past and present barriers to care? After such an assessment, analyze how office policies, culture, and behaviors might become more responsive to the needs of your patients.

## SUGGESTED READINGS/WEBSITES

Association of Clinicians for the Underserved
501 Darby Creek Road, Suite 20
Lexington, KY 40509
www.clinicians.org

Health Resources and Services Administration
http://www.nidcr.nih.gov/DataStatistics/SurgeonGeneral/

National Association of Community Health Centers
7501 Wisconsin Ave, Suite 1100W
Bethesda, MD 20814
www.nachc.com

National Network for Oral Health Access
181 E 56th Avenue, Suite 501
Denver, CO 80216
www.nnoha.org

U.S. Department of Health and Human Services: Oral health in America: a report of the Surgeon General, Rockville, MD, 2000, National Institute of Dental and Craniofacial Research, National Institutes of Health.
www.surgeongeneral.gov/library/oralhealth/

## REFERENCES

1. Butani Y, Weintraub JA, Barker JC: Oral health-related cultural beliefs for four racial/ethnic groups: assessment of the literature, *BMC Oral Health* 8:26, 2008.
2. D'Souza RN, Dunnvald M, Frazier-Bowers S, et al: Translational genetics advancing fronts for craniofacial health, *J Dent Res* 92(12):1058–1064, 2013.
3. Institute of Medicine: *Oral health literacy*, Washington, DC, 2013, The National Academies Press.
4. Watt RG: From victim blaming to upstream action: tackling the social determinants of oral health inequalities, *Community Dent Oral Epidemiol* 35(1):1–11, 2007.
5. Hall JP, Chapan SL, Kurth NK: Poor oral health as an obstacle to employment for Medicaid beneficiaries with disabilities, *J Public Health Dent* 73:79–82, 2013.
6. Hyde S, Satariano WA, Weintraub JA: Welfare dental intervention improves employment and quality of life, *J Dent Res* 85(1):79–84, 2006.
7. American Dental Association: Breaking down barriers to oral health for all Americans: *The role of finance, a statement from the American Dental Association*, April 2012.

8. Merriam-Webster Online: http://www.merriam-webster.com/. Accessed February 15, 2015.
9. Ahlberg J, Tuominen R, Murtomaa H: Dental knowledge, attitudes towards oral health care and utilization of dental services among male industrial workers with or without an employer-provided dental benefit scheme, *Community Dent Oral Epidemiol* 24(6):380–384, 1996.
10. Bloom B, Jones LI, Freeman G: Summary health statistics for US children: National Health Interview Survey, 2012, *Vital Health Stat* 10(258):1–81, Dec 2013.
11. Eklund SA, Pittman JL, Smith RC: Trends in dental care among insured Americans: 1980 to 1995, *J Am Dent Assoc* 128(2):171–178, 1997.
12. Grembowski D, Conrad D, Milgrom P: Utilization of a prepaid plan of commercial dental insurance, *J Public Health* 75(1): 87–89, 1985.
13. Macek MD, Wagner ML, Goodman HS, et al: Dental visits and access to dental care among Maryland schoolchildren, *J Am Dent Assoc* 136(4):524–533, 2005.
14. Manski RJ, Edelstein BL, Moeller JF: The impact of insurance coverage on children's dental visits and expenditures, 1996, *J Am Dent Assoc* 132(8):1137–1145, 2001.
15. Manski RJ, Magder LS: Demographic and socioeconomic predictors of dental care utilization, *J Am Dent Assoc* 129(2): 195–200, 1998.
16. Manski RJ, Macek MD, Moeller JF: Private dental coverage: who has it and how does it influence dental visits and expenditures? *J Am Dent Assoc* 133(11):1551–1559, 2002.
17. Manski RJ, Moeller JF, Mass WR: Dental services, use, expenditures and sources of payment, 1987, *J Am Dent Assoc* 130(4): 500–508, 1999.
18. Manning WG, Bailit HL, Benjamin B, et al: The demand for dental care: evidence from a randomized trial in health insurance, *J Am Dent Assoc* 110(6):895–902, 1985.
19. Eklund SA: The impact of insurance on oral health, *J Am Coll Dent* 68(2):8–11, 2001.
20. Sweet M, Damiano P, Rivera E, et al: A comparison of dental services received by Medicaid and privately insured adult populations, *J Am Dent Assoc* 136(1):93–100, 2005.
21. Medicaid: http://www.Medicaid.gov/. Accessed February 25, 2015.
22. Office of the Assistant Secretary for Planning and Evaluation: http://aspe.hhs.gov/. Accessed February 25, 2015.
23. Manski RJ, Moeller JF, Maas WR: Dental services. An analysis of utilization over 20 years, *J Am Dent Assoc* 133:655–664, 2001.
24. White BA, editor: Toward improving the oral health of Americans: an overview of oral health status, resources, and care delivery, Oral Health Coordinating Committee, Public Health Service, *Public Health Rep* 108(6):657–672, 1993.
25. Manski RJ: Access to dental care: a call for innovation, *J Am Coll Dent* 68(2):12–15, 2001.
26. Lang WP, Weintraub JA: Comparison of Medicaid and non-Medicaid dental providers, *J Public Health Dent* 46(4):207–211, 1986.
27. Nainar SM: Dentists' ranking of Medicaid reimbursement rates as a measure of their pediatric Medicaid participation, *ASDC J Dent Child, Nov-Dec* 67(6):422–424, 375, 407, 2000.
28. Venezie RD, Vann WF Jr, Cashion SW, et al: Pediatric and general dentists' participation in the North Carolina Medicaid program: trends from 1986 to 1992, *Pediatr Dent* 19(2): 114–117, 1997.
29. Iben P, Kanellis MJ, Warren J: Appointment-keeping behavior of Medicaid-enrolled pediatric dental patients in eastern Iowa, *Pediat Dent* 22(4):325–329, 2000.
30. Damiano PC, Brown ER, Johnson JD, et al: Factors affecting dentist participation in a state Medicaid program, *J Dent Educ* 54(11):638–643, 1990.
31. Blackwelder A, Shulman JD: Texas dentists' attitudes toward the dental Medicaid program, *Pediatr Dent Jan-Feb* 29(1): 40–46, 2007.
32. Im JL, Phillips C, Lee J, Beane R: The North Carolina Medicaid program: participation and perceptions among practicing orthodontists, *Am J Orthod Dentofacial Orthop Aug* 132(2):144e15–144e21, 2007.
33. Morris PJ, Freed JR, Nguyen A, et al: Pediatric dentists; participation in the California Medicaid program, *Pediatr Dent Jan-Feb* 26(1):79–86, 2004.
34. Shulman JD, Ezemobi EO, Sutherland JN, Barsley R: Louisiana dentists' attitudes toward the dental Medicaid program, *Pediatr Dent* 23(5):395–400, Sep-Oct 2001.
35. U.S. Congress, Office of Technology Assessment: *Children's dental services under the Medicaid program: background paper*, Washington, DC, 1990, Congress Report OTA-BP-H-78.
36. U.S. Department of Health and Human Services: *Oral health in America: a report of the Surgeon General*, Rockville, MD, 2000, U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health.
37. U.S. Department of Health and Human Services: *Secretary's Advisory Committee on health promotion and disease prevention objectives for 2020. Healthy people 2020: an opportunity to address the societal determinants of health in the United States*. http://www.healthypeople.gov/2010/hp2020/advisory/SocietalDeterminantsHealth.htm/. Accessed February 25, 2015.
38. Institute of Medicine and National Research Council: *Improving access to oral health care for vulnerable and underserved populations*. Washington, DC, 2011, The National Academies Press.

# GLOSSARY

## A

**Abfraction** A wedge-shaped lesion occurring in the cervical third of the tooth attributed to occlusal loading and tooth flexure in this area.

**Abrasion** The wearing away or notching of teeth by mechanical means; for example, as a result of excessive toothbrushing.

**Abscess** A consolidated collection of polymorphonuclear leukocytes (pus) characterized by pain and swelling.

**Actinic keratosis** A precancerous lesion on the skin caused by excessive exposure to the sun. The lesion may be red or skin colored, flat or elevated, and verrucous or keratotic.

**Active treatment plan** Document that typically lists the disease control and definitive procedures sequenced in the order in which they will be provided. The active treatment plan has an endpoint, in contrast to the perpetual treatment plan.

**Activities of daily living (ADL)** Activities that require basic skills and focus on self-care tasks such as bathing/showering, bowel and bladder management, dressing/undressing, eating/swallowing, feeding, functional mobility, sexual activity, toilet hygiene, and the care of personal devices.

**Acute apical abscess** Pulpal infection and necrosis that lead to tooth sensitivity, abscess formation, and eventual swelling of associated tissues.

**Acute apical periodontitis/apical periodontitis** Pulpal inflammation that extends to the periradicular tissues. Typically the patient reports pain on occlusal contact or mastication.

**Acute phase of care** Diagnostic and treatment procedures aimed at solving urgent problems.

**Acute pulmonary edema** Fluid accumulation in the lungs causing difficulty in breathing; often seen in patients with congestive heart failure.

**Acute sinusitis** A severe infection in one or both maxillary sinuses characterized by a constant, "heavy," debilitating pain that changes intensity with changes in head position and may be accompanied by heavy discharge of mucus or pus from the affected sinus.

**Addiction** Physical or emotional dependence, or both, on a substance such as alcohol or drugs.

**Adenocarcinoma** A carcinoma derived from glandular tissue.

**Administrative law** Type of law governing state and federal regulatory areas that define the qualifications required for a specified profession.

**Adrenocortical crisis** An emergency situation caused by inability of the adrenal cortex to produce sufficient corticosteroids in the presence of stress, such as during a dental appointment. Symptoms include weakness, headache, nausea, and confusion.

**Affective disorders** Mood disorders.

**Ageusia** A generalized loss of taste sensation.

**Aggressive periodontitis** Aggressive periodontal disease that leads to rapid attachment loss and periodontal bone destruction. Most commonly seen in younger individuals.

**Agoraphobia** Fear of open and crowded spaces that often renders patients homebound.

**Akathisia** The inability to sit still.

**Alcohol abuse** The continued excessive use of alcohol despite the development of social, legal, health, or other problems related to alcohol use.

**Alcohol dependence** A chronic disease characterized by a strong craving for alcohol and a constant or periodic reliance on use of alcohol despite adverse consequences. The individual is unable to limit drinking and physical illness occurs when drinking is stopped. The individual needs to consume an increasing amount of alcohol to experience its effects.

**Alogia** Diminished speech.

**Alzheimer's disease (AD)** A presenile dementia characterized by confusion, memory failure, disorientation, restlessness, agnosia, hallucinosis, speech disturbances, and the inability to carry out purposeful movement. The disease usually begins in later middle life with slight defects in memory and behavior that become progressively more severe.

**Amalgam bluing** A flat, bluish-gray lesion of the oral mucosa that results from introducing amalgam into the oral tissues. Also referred to as *amalgam tattoo*.

**Amelogenesis imperfecta** A hereditary abnormality characterized by defects in the formation of enamel.

**Amotivational syndrome** A loss of interest and desire to study or work, decreased energy or productivity, and generalized apathy, sullenness, moodiness, and inability to concentrate. Frequently seen in chronic marijuana users.

**Anesthesia** Temporary but complete loss of sensation.

**Angina** A spasmodic, often severe pain in the chest caused by reduced blood flow to the heart. Symptoms of *stable angina* are predictable and usually occur after stress or physical exertion. *Unstable angina* is chest pain that is unpredictable and often occurs without exertion and at night.

**Anhedonia** The inability to experience pleasure in life.

**Ankylosed teeth** Teeth that are fused to the alveolar bone.

**Anorexia nervosa** A pathologic, psychosocial disorder manifested by extreme aversion to food and an intense fear of gaining weight.

**Anterograde amnesia** A form of amnesia in which new events are not transferred to long-term memory.

**Antibiotics** Medications used to treat or prevent infection.

**Anxiety** A response to an anticipated experience that the person perceives as threatening in some way.

**Anxiolytics** Anxiety-relieving medications used in the management of fearful patients.

**Aphasia** A deficiency in the ability to understand or communicate the spoken or written word.

**Aphthous ulcers** Also referred to as *canker sores,* these ulcerative lesions are usually found on movable tissues in the oral cavity, especially the buccal and labial mucosa. They are typically diagnosed by their characteristic appearance.

**Apical sclerosing osteitis** A periapical inflammatory lesion with a radiopaque appearance.

**Appointment plan** A document that lists the activities and procedures that will occur at each appointment and is useful for providing an estimate of the number of appointments that will be necessary to complete the treatment plan.

**Arrested caries** Carious lesion that is no longer active or progressive. It often appears as a dark, stained pit or fissure on the teeth or as a cavitation with hard, dark dentin at its base.

**Asociality** Lack of desire for social interaction.

**At risk/at increased risk** A phrase used to describe individuals who have an innate predisposition for a particular disease or condition or who engage in behaviors that are known to promote that disease or condition.

**Attrition** The wearing of occlusal or incisal surfaces of the teeth as a result of functional or parafunctional occlusal contact.

**Atypical odontalgia** Chronic pain in a tooth or teeth, or in a site where teeth have been extracted or following endodontic treatment, without an identifiable cause. Also referred to as *idiopathic continuous neuropathic pain.*

## B

**Baby boomers** The cohort of persons born in the United States between 1946 and 1964.

**Beneficence** One of the five core principles of the Principles of Ethics and Code of Professional Responsibility published by the American Dental Association; requires dentists to maximize the patient's welfare at all times.

**Biopsy** The removal and examination of bodily tissue, performed to establish a diagnosis.

**Bipolar disorder** Also known as manic-depressive illness, this disorder is characterized by cyclical episodes of mania, or elevated mood, often alternating with depression. During episodes of mania, patients experience recurrent fluctuations of increased energy, expansive mood, and often inappropriate behavior.

**Bite guard/bite splint** A custom-fabricated hard or soft acrylic device that fits over the occlusal and incisal surfaces of the maxillary or mandibular teeth.

**Black triangles** Gingival esthetic issue caused by gingival recession and the exposure of interproximal spaces at the cervical portion of the teeth.

**Bleeding index** The percentage of examined sites that bleed upon periodontal probing.

**Bounded edentulous spaces** An edentulous space with at least one tooth on either side of it.

**Brachytherapy** A form of radiation therapy in which radioactive material is inserted directly into the tumor.

**Bradycardia** A slow heart rate as evidenced by a pulse rate of less than 60 beats per minute.

**Breach of duty** Failing to do something that the ordinary, prudent, or "reasonable" dentist would do in the same or similar circumstances; also, failure to not do something that the ordinary, prudent, or "reasonable" dentist would not do in the same or similar circumstances.

**Bruxism/bruxing** A condition in which a patient grinds his or her teeth.

**Bulimia** Episodic binge eating followed by purging in an attempt to prevent weight gain. The process of purging most often takes the form of self-induced vomiting, but can also involve the use of laxatives.

**Burning mouth syndrome** Disorder characterized by persistent burning pain perceived in the oral mucosa, tongue, and/or lips.

## C

**Calcified canals** The presence of calcified material in the root canal space, often making such teeth more difficult to treat endodontically.

**Camouflage/camouflaging** Orthodontically displacing teeth relative to the supporting bone to compensate for an underlying jaw discrepancy. This technique is used primarily to improve facial esthetics and as an alternative to orthognathic surgery.

**Candidiasis** An infection of the mucosa caused by *Candida albicans.*

**Carcinoma** A malignant growth of epithelial tissue.

**Caries control** Any and all efforts to prevent, arrest, remineralize, or restore carious lesions.

**Caries control protocol** A comprehensive plan designed to arrest or remineralize early carious lesions, to eradicate overt carious lesions, and to prevent the formation of new lesions in a person who has a moderate or high rate of caries formation or who is at significant risk for developing future caries.

**Cellulitis** A diffuse soft tissue infection with swelling and poorly defined borders. Often accompanied by pain, fever, and malaise.

**Cerebrovascular accident (CVA)** A neurologic deficit caused by a sudden interruption of oxygenated blood to the brain; also known as a stroke.

**Cervical notching** Common noncarious abnormality of the teeth often seen in middle-aged and older individuals that may be caused by abfraction, erosion, or abrasion.

**Cheilitis** An inflammatory condition of the lips and angles of the mouth characterized by chapping and fissuring.

**Chemotherapeutic agent** Chemical agents used to treat pathologic conditions.

**Chemotherapy** Treatment of cancer with chemical agents.

**Chief complaint/chief concern (CC)** A symptom or request that becomes the motivating factor for seeking dental treatment.

**Chronic apical periodontitis** An inflammatory process at the apex of a tooth, characterized by radiographic change in the form of a widened periodontal ligament space, usually in the absence of pain.

**Chronologic record of treatment (CRT)** The section of the dental record containing information about what occurs at each appointment. Also referred to as *treatment entries* or *progress notes*. The CRT is also a location for noting telephone conversations and missed appointments.

**Civil law** Type of law that governs the private legal relationships between two or more parties.

**Clear and timely communication and collaboration** An understanding between a dentist and a patient's medical doctor in which the dentist must have clear knowledge of the patient's health status, prognosis, and medical treatment plan prior to initiating any dental treatment.

**Clenching** A parafunctional habit that can be a cause of attrition.

**Closed questions** Questions that usually can be answered with one or two words. In the dental interview they permit specific facts to be obtained or clarified, but do not give insight into patient beliefs, attitudes, or feelings.

**Combination factors** Factors about which the dentist and patient have legitimate, though sometimes differing, interests and perspectives that are critical to making the correct treatment decision.

**Complete (displaced) fracture** A fracture that involves the entire cross section of the bone so that the bone snaps into two or more parts.

**Composite resin** A tooth-colored restorative material usually composed of glass or porcelain filler particles in a resin matrix.

**Compromise plan** A treatment plan that intentionally does not meet all of the patient's or practitioner's goals, but that provides some level of care at a lower overall cost to the patient.

**Computed tomography (CT)** An x-ray technique used to create cross-sectional images of the body or area of the body. This technique provides more detailed images than can be obtained with conventional x-rays. May be used to help pinpoint the exact location of a tumor or to help guide procedures such as biopsies, surgery, and/or radiation therapy. Also called CT, CT scan, or CAT scan.

**Cone-beam CT** Cone-beam computed tomography (CBCT, also sometimes called digital volume tomography, DVT) is an imaging technique in which a cone-shaped beam of x-rays makes a single revolution around the head during exposure. The resultant transmission data collected by the x-ray detector are manipulated with a computer to produce images of the head in multiple planes to provide three-dimensional information.

**Confidentiality** The expectation that disclosures made to health care professionals will not be made public.

**Congestive heart failure** Failure of the heart to pump blood adequately; has various causes and degrees of severity.

**Consultation** The referral of a patient to another clinician for an opinion or treatment. A dentist may also seek specified information from another clinician regarding a patient's case.

**Contingency management** A treatment program that provides immediate rewards for desired changes in behavior. Often used in the treatment of drug and alcohol abuse.

**Conversion hysteria** A mental disorder characterized by symptoms of a physical illness for which there is no demonstrable physiologic cause.

**Core/foundation** An initial restoration of a severely involved tooth in such a manner that the restorative material will serve in lieu of tooth structure and provides a retention and resistance form for the final restoration.

**Corrosion** Surface destruction of a metal restoration, most commonly amalgam, in the oral environment by a chemical or electrochemical reaction.

**Cracked tooth syndrome** A mixture of signs and symptoms associated with a fracture in a tooth, often associated with a large intracoronal restoration. Characterized by transient acute pain experienced while chewing.

**Credentialing** The process of assessing and confirming the qualifications of a health care practitioner.

**Criminal law** Type of law that governs wrongful acts against society or the public.

**Cross-bite** An occlusal relationship in which the maxillary facial surface of one or several teeth is positioned lingual to the facial surface of the opposing mandibular tooth.

**Cross-tolerance** A phenomenon in which tolerance to one drug induces tolerance to another drug.

**Cytology** The microscopic study of cells obtained by aspiration, smearing, or scraping.

## D

**Damage/damages** In a lawsuit, an undesired result that must be shown to be directly related to a breach of duty and must be quantifiable.

**Decision-making capacity** An ability to make informed decisions about proposed treatment, risks and benefits, alternatives, and consequences of nontreatment. The patient must exhibit rationality in weighing the options and be able to communicate a choice.

**Decision pathways** Protocols that provide direction in identifying the range of treatment options, indicating some of the key decision points leading to an appropriate treatment decision.

**Decision trees** Protocols that specify key decision points and treatment options. May also include research-based success rates for each of these options.

**Definitive diagnosis** A pattern of findings that point clearly to a specific disease entity or problem.

**Definitive phase of care** Treatment aimed at comprehensive, long-term rehabilitation of a patient's oral condition. Depending on the patient, procedures in the various disciplines of dentistry, such as prosthodontics, periodontics, and endodontics may be required.

**Degenerative joint disease (DJD)** A disorder resulting from destruction of the articular surfaces of the condyle and fossa caused by inflammation of the joint, also known as osteoarthritis. It may result from traumatic injury or a prior surgical procedure involving the joint.

**Dental evaluation and clearance** Routine practice in some areas of medicine to ensure provision of any necessary dental treatment that could minimize the risk of infection and oral complications prior to such procedures.

**Dental practice guidelines** Specific suggestions (parameters of care) for how patients should be managed or their treatment planned. These suggestions may be the work of governing bodies, agencies, councils, or any professional organizations or societies within or outside of dentistry.

**Dentist-patient relationship** Relationship between dentist and patient that is initiated when the dentist moves beyond the examination stage and implements treatment.

**Diagnoses** Precise, scientific terms used to describe variations from normal.

**Diastema** A noticeable space between two teeth.

**Differential diagnosis** The process of distinguishing or differentiating among a list of possible disease entities by systematically comparing and contrasting their clinical findings.

**Dilaceration** Sharply bent or angular shaped roots.

**Direct-fill restoration** Usually a composite, amalgam, or glass ionomer filling that is placed, shaped, set, and finished directly in the cavity preparation.

**Disease control phase of care** That portion of a treatment plan that focuses on the elimination of active disease and its causes.

**Disease risk** The probability that an individual or population will develop a certain disease or condition. It is usually expressed as a general category, such as high/low or high/moderate/negligible.

**Distraction osteogenesis** A surgical process for the reconstruction of skeletal deformities and the lengthening of bones. A bone fracture is surgically created and the two ends of the bone are moved apart, slowly enough so that new bone can grow in the gap. Distraction osteogenesis is useful in simultaneously expanding both bone volume and the surrounding soft tissues.

**Do not intubate (DNI)** Physician's orders written in conjunction with the wishes of a patient (and his or her care provider and family if the patient is incapacitated) instructing that if the patient goes into respiratory arrest, he or she will not be intubated and placed on a respirator. DNI orders are usually written only for terminally ill patients or those with severely diminished quality of life and no expectation of recovery.

**Do not resuscitate (DNR)** Physician's orders written in conjunction with the wishes of a patient (and his or her care provider and family if the patient is incapacitated) instructing that if the patient goes into cardiac arrest, he or she will not be given cardiopulmonary resuscitation (CPR) or placed on artificial life support. DNR orders are usually written only for terminally ill patients or those with severely diminished quality of life and no expectation of recovery.

**Drug tolerance** A condition in which an individual's reaction to a drug, such as alcohol or narcotics, decreases over time so that larger doses are required to achieve an equivalent effect.

**Duty to treat** An understanding that arises from the doctor-patient relationship for all dentists to properly diagnose and appropriately treat disease.

**Dysgeusia** Abnormalities of the sense of taste.

**Dysphagia** Difficulty in swallowing that may be indicative of ninth, tenth, and/or twelfth cranial nerve damage.

**Dysplasia** Abnormal tissue development. Pathologic alteration in size, shape, and organization of cells.

**Dysthymic disorder** A depressed mood that persists for at least 2 years, but that is not severe enough to meet the criteria for major depression.

**Dystonia** An irregular contraction of the muscles.

## E

**Early onset periodontitis** Term used prior to 1999 for what is now called aggressive periodontitis. The condition is characterized by rapid attachment loss and bone destruction in otherwise clinically healthy patients that may occur even in the presence of good oral hygiene.

**Ectopic eruption** The abnormal direction of tooth eruption, most common to mandibular first and third molars, which sometimes leads to abnormal resorption of the adjacent tooth.

**Edentulous/edentate** Without teeth.

**Electronic health record (EHR)** Health information relating to the patient's past, present, or future physical and mental health condition maintained in electronic format, usually involving computer systems, for the primary purpose of providing and documenting health care and health-related services. Also referred to as *electronic patient record (EPR)*.

**Emancipated minors** Persons who are under the legal age of consent, but who function as independent adults, living apart from their parents and supporting themselves.

**Emergency problem** A situation that incapacitates the patient and has the potential to become life threatening.

**Empathy** The capacity and willingness to understand a situation from another person's point of view.

**Erosion** Chemical dissolution of the tooth enamel often seen in patients with a high-acid diet, gastric acid reflux disease, or bulimia.

**Esthetic** Beautiful. In dentistry, the term refers to the extent to which a specific treatment restores or enhances physical appearance.

**Esthetic zone** The portion of the dentition that is readily visible to the patient and to other persons.

**Evidence-based dentistry** Assessing clinical findings, making diagnoses, and recommending treatment based on a combination of the clinician's expertise, the patient's particular needs, and the best and most relevant published research.

**Excessive gingival display** Showing too much of the gingiva to be esthetically pleasing when the lip raises above the gingival margins of the maxillary anterior teeth as the patient is speaking or smiling.

**Exostoses** Developmental, nonmalignant bony overgrowths.

**External resorption** Resorption of a tooth initiated in the periodontium and affecting the external root surfaces.

**Extracoronal restorations** Restorations, such as a gold onlay or a porcelain veneer crown, that surround the tooth, replacing most if not all of the functioning or occluding surfaces.

**Extrapyramidal effects** Movement disorders that may include tardive dyskinesia, pseudoparkinsonism, dystonia, and akathisia. Can result from long-term use of certain antipsychotic medications.

**Extravasation phenomenon** A fluid-filled lesion most commonly found on the mucosal surface of the lower lip caused by blockage of the duct from one or more minor salivary glands. Also known as mucocele or mucous extravasation phenomenon.

**Extrinsic staining** Stains on the surface of tooth enamel caused by exposure to such substances as coffee, tea, or tobacco products.

## F

**Factitial injuries** Self-inflicted lesions not attributable to accidental trauma or other oral disease.

**Failing restoration** A dental restoration that is not serviceable because of cracks and fractures; open margins with known, suspected, or anticipated recurrent caries; voids in material; loose restorations; or restorations with poor contours.

**Fear** An emotional response to a perceived threat or danger.

**Fever lines** A developmental anomaly that can occur to the developing teeth of a fetus if the mother suffers a serious virus or infection during pregnancy. The lines appear when the teeth later erupt into the mouth.

**Fiduciary relationship** Any relationship grounded in assumed trust.

**Findings** Pieces of information about the patient that have been gathered by asking questions and reviewing forms, observing and examining structures, performing diagnostic tests, and, if appropriate, consulting with physicians and other dentists.

**Florid osseous dysplasia** Multiple radiopaque and radiolucent lesions in the periapical regions throughout one jaw or in several quadrants; a more extensive form of periapical cemental dysplasia.

**Fluorosis** Chronic overexposure to fluoride.

**Focal sclerosing osteitis** The radiographic diagnosis of a zone of increased radiopacity in the maxilla or mandible. The condition is also known as condensing osteitis.

**Full code** Physician's order that stipulates that in the case of a cardiac arrest, the patient is to be resuscitated and placed on artificial life support if necessary to sustain life.

## G

**Generalized anxiety disorder (GAD)** One category of anxiety disorder recognized by *The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V)* characterized by excessive anxiety and worry about multiple events or activities that is out of proportion to the actual likelihood or effect of the anticipated event. This condition is often comorbid with other mental disorders such as depression, panic attacks, and substance abuse. Treatment is patient-specific.

**GERD** Gastroesophageal reflux disease.

**Gingival zenith** The most apical aspect of free gingival margin.

**Gingivitis** Inflammation of the gingival tissue.

**Goals** In the context of treatment planning, patient or practitioner expectations that can be either short- or long-term in nature, or both.

**Guided bone regeneration (GBR)** Surgical procedure associated with implant placement performed in edentulous sites with insufficient bone volume or in cases where the ridge volume is deficient. GBR increases the ridge dimension using a variety of materials including bone grafts, barrier membranes, biologic agents, and/or space maintaining devices.

## H

**Halitosis** Breath that has an unpleasant odor; "bad breath."

**Health belief model** A theory that argues that patients must possess certain health beliefs before they will accept treatment for a particular disease.

**Health Insurance Portability and Accountability Act of 1996 (HIPAA)** A U.S. law that requires practitioners and health care organizations to prevent unnecessary use and release of protected health information.

**Herpes zoster** An acute viral disease involving the dorsal spinal root or cranial nerve and producing vesicular eruptions in areas of the skin corresponding to the involved sensory nerve. Pain is a prominent feature and may persist, although skin lesions subside in 1 to 2 weeks.

**Herpetic ulcer** A recurring vesicular lesion caused by herpes simplex virus (HSV) that progresses to an ulceration; usually on keratinized tissue, such as the lips or gingiva.

**History of present illness** The history of the chief concern or complaint.

**Hybrid prosthesis** Nonremovable fixed complete denture prosthesis composed of cast alloy framework with denture teeth and resin for completely edentulous patients that compensates for moderate bone loss and missing soft tissue contours.

**Hyperactive lip** Excess lip mobility evident when the lip raises above the gingival margins of the maxillary anterior teeth as the patient is speaking or smiling.

**Hypercementosis** An excessive formation of cementum on the roots of one or more teeth.

**Hypererupted** A tooth that protrudes out of the occlusal plane, usually because there is no antagonist or because the tooth has significant attachment loss.

**Hyperesthesia** Increased sensation.

**Hypertension** An abnormal elevation of systolic and/or diastolic arterial pressure.

**Hyperventilation** Rapid or excessive breathing.

**Hypocalcification** A developmental anomaly that results in the incomplete calcification or hardening of the enamel of a tooth.

**Hypoglycemic** Being in a state of low blood glucose level. Early signs and symptoms include hunger, weakness, trembling, pallor, and a rapid heartbeat. Condition is sometimes seen in diabetic patients when glycemic control is altered.

**Hypoplasia** A developmental anomaly that results in the incomplete development of the teeth.

**Hyposalivation** A diminished secretion of saliva.

**Hypotension** Abnormally low blood pressure.

**Hypothermia** Body temperature significantly below 98.6° F (37° C).

## I

**Iatrogenic complication** An adverse condition in a patient that occurs as a result of treatment by a dentist or physician.

**Iatrosedation** A mode of anxiety control that can be simply and routinely applied by the dentist in the course of treating the patient; it is independent of pharmacologic forms of anxiety control or traditional forms of psychosedation (as administered by a psychologist or psychotherapist). Common elements include a calm, soothing, and compassionate demeanor on the part of the dentist; voice control; and suggestions that evoke a positive and relaxing environment and that minimize aversive stimuli. Giving the patient control over breaks and the power to interrupt or terminate the procedure can also be an effective form of iatrosedation.

**Ideal treatment plan** The treatment plan that provides the best, or most preferred, treatment for each of the patient's problems regardless of time or financial concerns.

**Immediate loading** Description of the process for placing an abutment and the provisional prosthesis attached to the abutment at the time of the implant fixture placement.

**Immediate placement** Description of the process for placing an implant fixture in the tooth socket at the time of the tooth extraction.

**Immunosuppression** The diminution or prevention of the immune response.

**Immutable risk factor** Those risk factors that are not within the patient's ability to alter. Examples include heritable or genetic conditions.

**Impacted teeth** Teeth that have not erupted.

**Incidence** The number of new cases of a specific disease occurring during a specified period.

**Incipient** Beginning, initial, commencing.

**Incomplete (nondisplaced) fracture** Fracture that does not go across the entire width of the bone; the bone cracks, but does not break all the way through.

**Indirect restoration** A dental restoration such as a crown, inlay, or porcelain veneer that is fabricated outside of the patient's mouth for later placement.

**Infective endocarditis** An infection by microorganisms of the valves and/or lining of the heart.

**Informed consent** A verbal or written agreement by a patient to have a procedure performed after being informed in sufficient detail of possible risks, benefits, and options.

**Initial therapy** In dentistry usually refers to the management of active periodontal disease in the disease control phase of treatment.

**Inlay** An indirect, intracoronal restoration made of gold, composite resin, or porcelain.

**Inspection** The visual examination of the body or portions thereof. Is an integral part of the physical or dental examination.

**Intensity modulated radiation therapy (IMRT)** A treatment method using a computer-directed radiation source to deliver precisely targeted high doses of radiation directly to cancer cells.

**Internal resorption** A pathologic process of tooth structure loss from within the pulp space that may perforate the external root surface.

**International normalized ratio (INR)** A standardized laboratory value used to assess a patient's coagulation time.

**Interprofessional care** The collaborative care provided by dentists, other healthcare professionals, the patient, family members and patient caregivers all working together for the patient.

**Interproximal or bitewing radiographs** Intraoral radiographs that show the coronal portion of the teeth and the alveolar crestal bone in both arches.

**Intracoronal restorations** Restorations placed directly into teeth that are dependent on surrounding tooth structure for retention.

**Intraprofessional care** The collaborative care provided by multidisciplinary healthcare providers within the same profession.

**Intravenous (IV) sedation** Analgesic or anesthetic medication delivered through the blood stream to allow a patient to better tolerate a procedure.

**Intrinsic staining** Staining within the enamel, dentin, or pulp space of a tooth.

**Irreversible pulpitis** A clinical diagnosis, based on subjective and objective findings, that the pulp is incapable of healing. The condition is characterized by prolonged dental pain that appears to arise spontaneously. The tooth may have marked sensitivity to cold, air, or heat.

## J

**Justice** One of the five core principles of the Principles of Ethics and Code of Professional Responsibility published by the American Dental Association; prohibits dentists from discrimination against individual patients or groups of people, and obligates dentists to assure access to oral health services for all members of society.

## K

**Key teeth** Important teeth that often serve as abutments for fixed or removable partial dentures or to add stability to a dental prosthesis. Such teeth are favorably positioned in the dental arch, are restorable, and often improve the prognosis for other teeth or the case as a whole. Loss of a key tooth or teeth may adversely affect the treatment options and prognosis.

## L

**Lateral window sinus elevation (lift)** A commonly used technique for sinus floor elevation. The bone is removed from the lateral aspect of the alveolus overlying the planned implant site, permitting access to the underlying Schneiderian membrane lining the sinus cavity.

**Legal competence** A legally defined age of majority at which the right to make certain binding commitments is granted.

**Lesions** Tissue abnormalities.

**Lichen planus** An autoimmune disorder of skin and/or mucous membranes.

**Linear gingival erythema (LGE)** A distinctive red band of free gingiva that is the result of a fungal infection; often seen in immunocompromised patients.

**Lip incompetence** A short upper lip.

**Longitudinal study** The process of evaluating a group of subjects over time. This process may be used to determine whether persons with a particular risk factor develop a disease or other problem. Contrasts with cross-sectional studies that evaluate patients or other subjects at one point in time.

**Lymphadenitis** Inflammation of a lymph node or nodes.

**Lymphoma** Any neoplastic disorder of the lymphoid tissue.

## M

**Magnetic resonance imaging (MRI)** An imaging technique that uses a magnetic field and radio waves to create cross-sectional images. These images can be combined to create a three-dimensional image. The detailed, clear images assist in the diagnosis and treatment of many conditions including oral cancer.

**Maintenance phase of care** That portion of a comprehensive dental treatment plan that is intended to promote the long-term oral health of the patient and manage any persistent or chronic oral problems.

**Maintenance therapy** Preventive and therapeutic measures instituted to sustain and ensure long-term oral health.

**Major depressive disorder** A disabling, often recurrent disorder defined as a depressed mood, loss of interest, and other symptoms occurring almost daily for at least 2 weeks.

**Malignancy** A cancerous growth.

**Maximum intercuspation** Excursive jaw movements.

**Medicaid** A U.S. social healthcare program, defined by the federal government, but administered by the states, to provide health insurance for low-income individuals and families. Among the groups of people served by Medicaid are eligible low-income parents, children, seniors, and people with disabilities.

**Medicare** A U.S. health insurance program that helps pay medical costs for individuals aged 65 and older, some disabled individuals under age 65, and individuals with end-stage renal disease (permanent kidney failure treated with dialysis or a transplant).

**Melanoma** A malignant tumor composed of melanin-pigmented cells.

**Metastasis** The transfer of disease cells from one organ or area to another not directly connected to it. Characteristic of malignant tumors.

**Metal ceramic restoration** A restoration composed of a ceramic layer fused to a metal substructure (coping). Also referred to as *porcelain fused to metal (PFM) crown*.

**Microdonts** Abnormally small teeth.

**Microleakage** Microscopic space located at the interface of the tooth structure and the sealant or restoration.

**Microstomia** A congenital or acquired reduction in the size of the oral opening that is severe enough to compromise physical appearance, nutrition, and quality of life.

**Migraine headache** Type of headache characterized by recurrent, severe, and disabling attacks of head pain, often unilateral and pulsating, along with symptoms of sensory disturbance, such as photophobia, phonophobia, and hyperosmia.

**Modified treatment plan** A variation from an ideal treatment plan that balances the patient's treatment objectives with those of the dentist's.

**Mucocele** A nonneoplastic lesion most commonly found on the mucosal surface of the lower lip.

**Mutable risk factor** Those risk factors that are within the patient's purview to change. Examples include tobacco smoking, lack of exercise, and an unhealthy diet.

**Myalgia** Muscular pain.

**Myelosuppression** A reduction in the ability of the bone marrow to produce blood cells.

**Myocardial infarction (MI)** Blockage of one or more coronary arteries leading to necrosis of a localized area of the myocardium, commonly referred to as a *heart attack*.

## N

**Natural history** The typical course of events; the sequence and progression over time of a disease process in the absence of treatment or medical intervention.

**Necrotizing ulcerative gingivitis (NUG)** Also known as "trench mouth." Distinctive clinical features include marked gingival inflammation, foul breath, and "punched-out" papillae with a pseudomembrane. Typically occurs in a patient who is experiencing stress; has a poor diet; suffers from sleep deprivation; uses tobacco; and, for the time at least, has not maintained good oral hygiene.

**Necrotizing ulcerative periodontitis (NUP)** An acute periodontal disease in severely immunocompromised patients that consists of extensive soft tissue necrosis and rapid severe loss of periodontal attachment without pocket formation.

**Neoplasm** Any new and abnormal growth. May be benign or malignant.

**Neuritis** A deep, constant, burning pain that runs the course of a nerve trunk.

**Nicotine** A poisonous colorless soluble fluid alkaloid. It is the psychoactive and addictive chemical agent found in all forms of tobacco.

**Nicotine replacement product** A product used to reduce or eliminate withdrawal symptoms in individuals with nicotine addiction. These products may be over-the-counter or prescription agents.

**Nitrous oxide and oxygen analgesia** The administration of nitrous oxide and oxygen to reduce patient pain and anxiety.

**Nonmaleficence** One of the five core principles of the Principles of Ethics and Code of Professional Responsibility published by the American Dental Association; requires dentists to act to avoid harm or risk to patients and recognize his or her own limitations.

**Nondiscoverable** Records kept by a dentist that are not admissible in court because they are not a part of the patient record and therefore subject to the confidentiality between attorney and client (dentist).

**Nonreducing anterior disk displacement (NADD)** Condition in which the articular disk is displaced and remains fully displaced in open and closed jaw positions.

**NSAIDs** The acronym for nonsteroidal anti-inflammatory agents used in the control of pain and inflammation.

## O

**Obsessive-compulsive disorder** Abnormal behavior involving performance of repetitive acts or rituals, usually as a means of releasing tension or relieving anxiety.

**Obturator** A prosthetic appliance used to close a congenital or acquired opening in the palate.

**Occlusal equilibration** Occlusal adjustment through selective grinding of tooth surfaces with the goal of improving tooth contact patterns.

**Occlusal guard/bite guard/night guard** A custom fitted device commonly used to prevent additional occlusal wear in patients who have marked bruxism or attrition.

**Occlusal radiograph** A radiographic exposure during which the film is placed over the teeth in the occlusal plane.

**Occlusal splint/bite splint** A custom fitted device that fits over the occlusal and incisal surfaces of the maxillary or mandibular teeth typically used for patients with temporomandibular disorders.

**Odontoma** Odontogenic tumor composed of mature enamel, dentin, cementum, and pulp tissue.

**One-stage technique** Surgical technique in which the implant fixture is placed in the bone and a healing cap is screwed into place leaving the coronal portion exposed to the oral environment. After an appropriate healing time, the healing cap is removed and an impression of the fixture and surrounding tissue is taken.

**Onlay** An indirect restoration that covers most, but not all, of the coronal surface of the tooth.

**Open questions** Questions that cannot be answered with a simple response, such as "yes" or "no," but instead generate reflection by asking for opinions, past experiences, feelings, or desires.

**Operculum** Soft tissue flap covering the crown of an erupting tooth.

**Oral cancer** Cancer that occurs in any part of the oral cavity, including lips and oropharynx.

**Oral physiotherapy** The use of aids such as toothbrush, floss, or other adjunctive armamentaria to maintain the oral health.

**Oral sedation** Use of a medication taken orally (i.e., a tablet or liquid) to reduce anxiety and relax the patient.

**Oropharynx** The part of the pharynx that lies between the soft palate and the upper edge of the epiglottis.

**Orthognathic surgery** Surgical realignment of the jaws or repositioning of dentoalveolar segments.

**Orthostatic hypotension** Low blood pressure and a feeling of light-headedness that occurs when an individual arises quickly from a supine position.

**Osseointegration** The process of introducing certain metals, such as titanium, into living bone and forming a biocompatible bond with living bone.

**Osteomyelitis** An infection of the bone.

**Osteoradionecrosis** Bone destruction and sloughing as a result of therapeutic radiation to the area.

**Otorhinolaryngologist** A surgeon specializing in treatment of ears, noses, and throats. Commonly called an ENT doctor.

**Outcomes** Specific, tangible results of treatment.

**Outcomes expectations** The results that a patient and practitioner anticipate will occur as a consequence of a course of treatment.

**Overhang** An overcontoured portion of a restoration on a proximal surface.

## P

**Pack year** The number of years someone has smoked multiplied by the number of packs smoked per day. This may have different significance in various countries. For example, a pack of cigarettes in the United States contains 20 cigarettes, whereas in Canada a pack contains 25 cigarettes.

**Palliative care** Treatment to relieve, rather than cure, a patient's symptoms.

**Palpation** An examination procedure in which the sense of touch is used to gather data for diagnosis.

**Palpitation** The sensation by a patient of a rapid or irregular heartbeat.

**Panoramic radiograph** An extraoral radiographic film image that displays a wide area of the jaws and enables evaluation of some structures not visualized by intraoral projections. Also referred to as a *pantomograph*.

**Papillary-bleeding index** Measure of sites with gingival bleeding during periodontal probing.

**Parafunctional habits** Jaw movements and their accompanying tooth contacts, such as bruxism, that are considered outside or beyond masticatory function and that can result in damage to the oral soft or hard tissues.

**Paresthesia** Altered sensation.

**Parkinson's disease (PD)** A degenerative neurologic disease characterized by tremor, rigidity, slow movement, and postural instability.

**PARQ note** An acronym representing the components of informed consent: *p*rocedure, *a*lternatives, *r*isks, *q*uestions; can be documented in a patient's health record before treatment.

**Partial caries excavation (PCE)** Conservative procedure to manage caries encroaching on the pulp of a tooth that is done during the disease control phase and ideally results in the formation of secondary dentin and also maintaining the vitality of the tooth.

**Partial luxation** Slight loosening of a single tooth.

**Partially erupted teeth** Teeth that have not fully erupted.

**Parulis** A localized abscess of the gingiva. Also referred to as a *gum boil*.

**Patient autonomy** One of the five core principles of the Principles of Ethics and Code of Professional Responsibility published by the American Dental Association; asserts that dentists "have a duty to treat the patient according to the patient's desires, within the bounds of accepted treatment, and to protect the patient's confidentiality."

**Patient considerations** Modifiers to treatment planning that are derived exclusively from information about the patient.

**Patient database** Information gathered about the patient from which treatment planning decisions are made.

**Patient factors (or modifiers)** Patient concerns, issues, or attributes that have a bearing on treatment plan formulation.

**Percussion** A diagnostic procedure that involves tapping a tooth or other body part.

**Peri-implantitis** Infection of the peri-implant tissues.

**Periapical cemental dysplasia** A localized, usually benign change in the periapical bone that results in a characteristic radiolucent and/or radiopaque appearance.

**Periapical radiograph** An intraoral radiographic film or image that includes the tooth and surrounding bone.

**Pericoronitis** Infection of the soft tissue covering a partially erupted tooth.

**Perimolysis** A characteristic type of enamel erosion caused by a decreased oral pH resulting from the reflux of acidic stomach contents.

**Periodic visit/recare visit** Visits prescribed after completion of all active treatment during which the patient returns to the dental office for maintenance therapy. The visit commonly includes an examination and periodontal maintenance procedures.

**Periodontal abscess** A localized collection of pus that originates in the periodontal pocket.

**Periodontal/endodontic lesion** An inflammatory process that simultaneously involves a necrotic pulp, the periapical area, and the marginal periodontium.

**Periodontal probing** A diagnostic technique that measures the depth of the periodontal sulcus.

**Periodontitis** Inflammatory disease of the supporting tissues of the teeth.

**Perpetual treatment plan** Document that addresses patient concerns, issues, and needs beyond the completion of the active treatment plan, and may continue for the life of the doctor-patient relationship. Perpetual treatment plans commonly include specific systemic and maintenance procedures and actions, and have no endpoint.

**Persistent depressive disorder (dysthymia)** Being in a depressed mood most of the day, for more days than not, for at least 2 years in adults and 1 year in children and adolescents.

**Phases** Segments of a treatment plan.

**Phobia** Fear of a specific stimulus. Response to such a fear may dominate a person's life.

**Physical addiction** A physiologic adaption to the use of a substance in which the absence of the substance produces symptoms and signs of withdrawal.

**Pleomorphic adenoma** The most common type of salivary gland neoplasia, which presents as a dome-shaped mass without ulceration or symptoms.

**Pontic** The suspended member of a fixed partial denture.

**Porcelain-fused-to-metal crown (PFM)** *See metal ceramic restoration.*

**Porcelain veneer** A thin porcelain restoration designed to cover the facial and incisal surfaces of anterior teeth and premolars for esthetic purposes.

**Positron emission tomography (PET)** A type of diagnostic imaging that detects a small amount of radioactive material injected into the bloodstream that has concentrated in areas of cancer.

**Post and core** A directly or indirectly fabricated foundation restoration that is anchored in the root canal space of an endodontically treated tooth and provides a resistance and retention form for a final restoration, usually a crown.

**Postherpetic neuralgia** Pain that develops during the acute phase of herpes zoster and recurs or persists for more than 3 months after the onset of herpetic eruption.

**Postinitial therapy evaluation** An evaluation of the disease control phase of periodontal therapy. It serves to assess the effectiveness of periodontal therapy to date and to provide guidance for future treatment.

**Posttreatment assessment examination** A comprehensive evaluation of the patient's oral condition and the treatment performed to date. The assessment is typically made at the conclusion of the disease control and definitive phases of treatment.

**Posttreatment assessment protocol** A formalized process for accomplishing the posttreatment assessment.

**Prevalence** The total number of cases of a disease in existence in a population at a certain time.

**Primary occlusal trauma** Injury to a previously healthy periodontium, in the absence of inflammation, caused by excessive occlusal forces. This may be caused by a "high" restoration or prosthetic device.

**Privileging** The process that health care organizations employ in authorizing practitioners to provide specific services to patients.

**Problem** A significant finding that may have an important effect on the treatment plan, but that does not fit the classic definition of a diagnosis.

**Professional factors** Medical, physiological, and technical parameters identified by the dentist that have a bearing on the formulation of the treatment plan.

**Prognosis** An estimation of the probable outcome for a disease, condition, or treatment.

**Progress notes** Documentation of each appointment recorded in the patient record. This documentation can include appointment-specific diagnoses, evidence of a health history review, details of treatment provided, patient behavior, and plans for the next appointment. Also referred to as *treatment notes.*

**Protected health information (PHI)** Health-related findings, diagnoses, treatment notes, or demographic data that could identify the patient, and needs to be protected.

**Provisional/provisional restoration** A prosthesis or individual tooth restoration intended to serve only for a limited period of time.

**Proximate cause** A legal term for the initial act or event that produces an injury.

**Pseudoparkinsonism** A side effect of some antipsychotic drugs that resembles symptoms of Parkinson's disease.

**Psychological addiction** A person's need to use a drug out of desire for the effects it produces, rather than to relieve withdrawal symptoms.

**Ptyalism** Excessive salivation.

**Puberty associated gingivitis/puberty gingivitis** An increase in gingival inflammation that sometimes occurs during puberty. It is a generalized form of gingivitis characterized by inflamed, enlarged gingival papillae that are susceptible to bleeding.

**Pulp vitality testing** Techniques for evaluating the condition of pulp tissue in a tooth.

**Pulpal necrosis** A clinical diagnosis that indicates the death of dental pulp tissue.

## R

**Radiation caries** Decalcification, decay, and disintegration of tooth structure after radiation therapy, typically affecting the cervical and coronal root surfaces of a tooth. The condition is attributed to decreased salivary function and an alteration of the saliva's buffering capacity.

**Radiation ports** The areas of radiation exposure during radiation therapy.

**Radiation therapy** The use of ionizing radiation to treat cancer.

**Ranula** A mucous filled lesion associated with the submandibular or sublingual glands and located on the floor of the mouth.

**Reasons for treatment** The foundation of a treatment plan, justified by one or more diagnoses.

**Reciprocal click** A pronounced snap or pop in the temporomandibular joint both on opening and closing.

**Recurrent caries** Caries occurring at the restoration-tooth interface or under an existing restoration. Also referred to as *secondary caries.*

**Reduced periodontium** Clinical appearance of the breakdown of the structures that surround, support, and are attached to the teeth, resulting in loss of tissue attachment and destruction of alveolar bone.

**Reducing anterior disc displacement (RADD)** Anterior displacement of the intraarticular disc when the posterior teeth are fully occluded.

**Remineralization** The reintroduction of complex mineral salts into bone, enamel, dentin, or cementum.

**Removable partial denture** A removable appliance that contains replacement teeth. Usually attaches with clasps to several remaining teeth.

**Repose** A neutral facial expression.

**Res ipsa loquitur** Latin for "the thing speaks for itself." This legal term refers to situations in which it is assumed that a person's injury was caused by the negligent action of another party because the accident was otherwise unlikely to have occurred.

**Respondeat superior** Latin for "let the master answer," a legal term that provides that an employer is responsible for those actions of his or her employees that are performed within the scope of their employment.

**Retainer** An orthodontic appliance placed at the completion of active orthodontic therapy to maintain the position of the teeth. Also a synonym for a *fixed partial denture abutment.*

**Reverse smoking** The habit of holding the lighted end of a cigarette inside the mouth.

**Reversible pulpitis** A clinical diagnosis that describes an inflamed dental pulp judged capable of recovery.

**Review of systems** That portion of the patient history in which the clinician evaluates the major organ systems.

**Ridge augmentation** The placement of bone graft materials to enhance the height and/or width of the alveolar ridge in preparation to receive dental implants, or to better retain a dental prosthesis.

**Risk assessment** Evaluation of the likelihood or probability that a patient will develop a particular condition or disease.

**Risk factors** Identifiable conditions known to predispose individuals to an undesirable condition; for example, oral disease. Ideally, this causal biologic link is confirmed from longitudinal studies.

**Risk indicators** Identifiable conditions that are known to be associated with a higher probability of the occurrence of a disease. They are typically identified from cross-sectional studies.

**Robust treatment planning** An aggressive approach to treatment planning that involves removal of all teeth with a questionable prognosis and simplification of the treatment plan.

**Root dilacerations** Irregularities of the roots of the teeth.

## S

**Sarcoma** Cancerous tumors that develop from mesenchymal tissues, such as fat, bone, muscle, nerve, joint, blood vessel, or deep skin tissue.

**Secondary caries** Caries that occurs adjacent to an existing restoration.

**Secondary occlusal trauma** Injury to the periodontium in the presence of inflammation and attachment loss; caused by excessive occlusal forces.

**Second-hand smoke** The environmental smoke produced by tobacco smokers. Second-hand smoke exposes nonsmokers to the adverse effects of tobacco smoking.

**Sedative-hypnotics** Medications that reduce the excitability of patients and induce an altered state of consciousness.

**Sedative restoration** An interim, direct-fill restoration placed with the dual purpose of

decreasing pulpal sensitivity and arresting the progression of caries in the tooth.

**Shared decision making** The process of making informed treatment choices between dentist and patient based on the dentist providing the proper information to the patient.

**Sialagogue** A medication used to promote the flow of saliva.

**Signs** Findings discovered by the clinician during an examination.

**Sinus tract** A chronic or persistent abscess that drains purulent exudate. Also referred to as a *fistulous tract*.

**Site preservation** Placement of bone fill materials in a new extraction site for the purpose of preserving ridge height and contour, and preventing bone loss. Also referred to as *socket preservation*.

**Sjögren syndrome** An autoimmune condition related to deficient secretion of salivary, sweat, lacrimal, and mucous glands; increased size of salivary glands; and polyarthritis.

**Sliding board** A smooth wooden board used to help a disabled patient transfer from a wheelchair to the dental chair.

**Smokeless tobacco** A form of tobacco designed to be used without smoking. Also known as spit, topical, snuff, or chewing tobacco.

**SOAP note** A method of organizing information to document a patient visit. The component parts are *s*ubjective findings, *o*bjective findings, *a*ssessment, and the *p*lan for treatment. The SOAP note is frequently used to document treatment for acute conditions.

**Social phobias** A persistent distinct fear of social or performance situations in which embarrassment may occur.

**Solar cheilitis** A premalignant lesion of the lip caused by excessive sun damage.

**Somatoform disorders** A set of conditions in which, although the patient does not fabricate the symptomatology, the symptoms described by the patient appear to greatly exceed the physical signs of a particular disease process.

**Specific phobias** Excessive fear of a specific object or situation, such as heights, flying, snakes, or insects. Patients are asymptomatic unless in contact with the specific "trigger" to their anxiety.

**Split tooth** The end result of a cracked tooth. The root surface is involved and the two segments are completely separate.

**Squamous cell carcinoma** A malignant tumor developed from squamous epithelium.

**Staging** The classification of cancers according to the extent of the tumor. Staging is based on three basic components: primary tumor (T), regional nodes (N), and metastasis (M).

**Standard of care** An established measure or model for treatment to which a health practitioner should conform. In legal proceedings, would be defined as treatment that the reasonable or average dentist might have provided under the circumstances.

**Stomatitis** Generalized oral lesions, such as vesicles, bullae, erosions, or ulcers commonly found in patients in debilitated health or suffering from an autoimmune disorder.

**Stress** A disturbance in a person's normal homeostasis resulting from events that may be physical, mental, or emotional in nature.

**Sun protection factor (SPF)** A measure of the effectiveness of a sunscreen product. The higher the SPF the more protection an individual will receive.

**Supernumerary teeth** Any teeth in excess of the 32 normal permanent teeth. May be normal in size, but frequently small and poorly developed.

**Surgical stent** A device usually made of acrylic or thermo-formed material that may be used to hold a graft in place. May also be used during imaging or surgery to assist in the planning and placement of implants or other prosthodontic devices.

**Surrogate decision maker/proxy** A patient's representative who speaks for the patient in situations when a patient if unable to make an informed choice.

**Symptoms** Findings that are apparent to a patient, usually because the findings are causing a problem.

**Systemic phase of care** The aspects of a treatment plan aimed at establishing and maintaining the best possible state of physical health for a patient before, during, and after dental treatment. This aspect of the plan takes into account the effect that any systemic illness or condition will have on dental treatment.

## T

**Tachycardia** A rapid heart rate.

**Tachyphylaxis** The decrease in the effectiveness of a given dose of a drug in response to long-term use.

**Tardive dyskinesia** An adverse reaction to certain antipsychotic drugs, characterized by persistent involuntary movement of the lips, jaws, or face, and the extremities.

**Temporization** The process of creating a temporary restoration.

**Temporomandibular disorder (TMD)** An abnormality of the temporomandibular joint complex characterized by pain and altered function.

**Tetracycline stain** Staining of the developing teeth of a fetus that occurs as a result of a mother taking prescription tetracycline during pregnancy.

**Therapeutic index** A measure of the safety of a medication.

**Third parties** Other persons or organizations that may modify the dentist-patient relationship. Examples include dental insurance companies and a patient's parent or guardian.

**Toluidine blue O** A rinse used to help pinpoint areas of increased, possibly abnormal, cellular activity.

**Tooth mobility** Visible movement of a tooth or teeth when external pressure is applied.

**Tooth fracture** A crack or break in a tooth that may occur when heavy occlusal forces are applied to a vulnerable tooth.

**Tort law/Torts** The body of the law that allows an injured person to obtain compensation from the person who caused the injury.

**Transalveolar sinus elevation (lift)** A commonly used technique for sinus floor elevation in which the Schneiderian membrane is gently elevated through the socket immediately following tooth extraction. Also referred to as *osteotome sinus lift*.

**Transient ischemic attack (TIA)** A temporary disturbance in blood supply to a localized area of the brain.

**Transillumination** The passage of light between the teeth to help identify dark areas of proximal caries, especially in the anterior region.

**Traumatic ulcer** A localized area on the skin or mucosa in which the surface epithelium has been destroyed as a result of trauma.

**Treatment objectives** Certain goals that represent the intent or rationale for a treatment plan.

**Treatment outcomes** The actual results of treatment.

**Trigeminal autonomic cephalalgias (TAC)** A variety of idiopathic headaches involving activation of trigeminovascular nociceptive pathways along with reflex cranial autonomic activation.

**Trigeminal nerve injury/deafferentation** Pain that follows the loss of normal afferent input to the central nervous system.

**Trigeminal neuralgia** An exquisitely severe, electric-like, lancinating pain whose location is related to the distribution of the trigeminal nerve.

**Trismus** Spasms of the muscles of mastication that result in the inability to open the mouth.

**Tumor board** A multidisciplinary group of health care providers who convene to discuss and coordinate cancer therapy for individual patients.

**Two-stage technique** Surgical technique in which the implant fixture is placed and covered with oral tissue at the first surgical appointment. The patient returns for another visit, usually 3 to 6 weeks later, to uncover the fixture. At that time a fixture or abutment level impression is taken using an impression post.

## U

**Unbounded edentulous spaces** An edentulous space that does not have a tooth on at least one side of it.

**Urgent problem** A situation that does not require immediate attention for health reasons, but is a problem that the dentist, or more commonly the patient, thinks should be attended to "now" or "soon."

## V

**Vasodepressor syncope** A loss of consciousness that may be caused by the stress and fear associated with receiving dental treatment, or by rapid positional changes such as sitting or standing up quickly.

**Veneer** A layer of tooth-colored material, usually porcelain or acrylic resin, placed on the facial surface of a tooth for esthetic reasons.

**Veracity** One of the five core principles of the Principles of Ethics and Code of Professional Responsibility published by the American Dental Association; stipulates that dentists

maintain truthfulness in all professional relationships.

**Vertical dimension of occlusion** The superior-inferior relationship of the maxilla and the mandible when the teeth are situated in maximum intercuspation.

**Vertical root fracture** A complete or incomplete fracture line, initiated from the root, running parallel or slightly oblique to the long axis of the tooth.

**Vision** An image or idea of what the patient's mouth will look like when treatment is complete.

## W

**Withdrawal syndromes** A predictable group of signs and symptoms resulting from abrupt removal of, or a rapid decrease in, the regular dosage of a psychoactive substance.

**Working or tentative diagnosis** A preliminary diagnosis made before beginning treatment, when the actual diagnosis is questionable.

## X

**Xerostomia** Dry mouth.

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