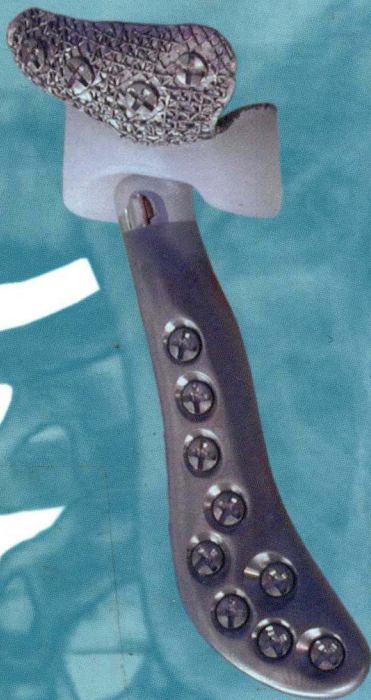


SIXTH EDITION

CONTEMPORARY ORAL AND MAXILLOFACIAL SURGERY

JAMES R. HUPP EDWARD ELLIS III MYRON R. TUCKER



ELSEVIER

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CONTEMPORARY ORAL AND MAXILLOFACIAL SURGERY

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CONTEMPORARY
**ORAL AND
MAXILLOFACIAL
SURGERY**

My contributions to this book are dedicated to my wonderful family: Carmen, my wife, best friend, and the love of my life; our children, Jamie, Justin, Joelle, and Jordan; our daughter-in-law, Natacha; and our precious grandchild, Peyton Marie.

James R. Hupp

To all the partners in my surgical practice, and the residents and fellows that have made my surgical career so fulfilling.

Myron R. Tucker

To the many students and residents who have allowed me to take part in their education.

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Preface

As in the previous editions of this highly-regarded text, the sixth edition of *Contemporary Oral and Maxillofacial Surgery* aims to present the fundamental principles of surgical and medical management of oral surgery problems. The book provides suitable detail on the foundational techniques of evaluation, diagnosis, and medical management, which makes immediate clinical application possible. The extensive number of illustrations is designed to make the surgical techniques easily understandable, while also enhancing readers' understanding of the biologic and technical aspects so they can capably respond to surgical situations that go beyond "textbook cases."

The purpose of the book continues to be twofold:

- To present a comprehensive description of the basic oral surgery procedures that are performed in the office of the general practitioner
- To provide information on advanced and complex surgical management of patients who are typically referred to the specialist in oral and maxillofacial surgery

Whether you are a dental student, resident, or already in practice, the latest edition of *Contemporary Oral and Maxillofacial Surgery* is an excellent resource to make a part of your library!

NEW TO THIS EDITION

- Chapter 12, *Medicolegal Considerations*, has been completely rewritten. It now addresses the concepts of liability, risk management, methods of risk reduction, and actions that should be taken if a malpractice suit is filed against the dentist or a dentist's employee. In addition, it discusses electronic records, telemedicine and the Internet, and The Health Information Technology for Economic and Clinical Health Act of 2009 (HITECH).
- The chapter on implants has been divided into two new chapters, one on basic concepts and one on more complex concepts:
 - Chapter 14, *Implant Treatment: Basic Concepts and Techniques*, focuses on the clinical evaluation and surgical/prosthetic considerations for basic implant treatment. The techniques described primarily address clinical situations where adequate bone and soft tissue exists and implants can be placed into a well-healed area of bone without jeopardizing anatomical structures such as the maxillary sinus or the inferior alveolar nerve.
 - Chapter 15, *Implant Treatment: Advanced Concepts and Complex Cases*, focuses on cases that require immediate implant placement and cases where bone and soft tissue augmentation may be required before implant placement.
- Chapter 26, *Correction of Dentofacial Deformities*, includes new information on conventional treatment planning and image prediction and 3D virtual computerized surgical planning.
- Chapter 27, *Facial Esthetic Surgery*, has been completely rewritten and is now organized by nonsurgical and surgical procedures. Popular procedures covered include dermal fillers, Botox, facial resurfacing, browlift and forehead procedures, blepharoplasty, rhinoplasty, rhytidectomy, and more.
- Chapter 29, *Surgical Reconstruction of Defects of the Jaws*, includes new information on bone morphogenetic proteins (BMPs).

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James R. Hupp

I would like to thank Ashley Tucker for the design of this book's cover and for all the art and graphic design work she has done for me.

Myron R. Tucker

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Part



Principles of Surgery

Surgery is a discipline based on principles that have evolved from basic research and centuries of trial and error. These principles pervade every area of surgery, whether oral and maxillofacial, periodontal, or gastrointestinal. Part I provides information about patient health evaluation, managing medical emergencies, and surgical concepts, which together form the necessary foundation for presentations of the specialized surgical techniques in succeeding chapters in this book.

Many patients have medical conditions that affect their ability to tolerate oral and maxillofacial surgery and anesthesia. Chapter 1 discusses the process of evaluating the health status of patients. This chapter also describes methods of modifying surgical treatment plans to safely accommodate patients with the most common medical problems.

Preventing medical emergencies in the patient undergoing oral and maxillofacial surgery or other forms of dentistry is always easier than managing emergencies should they occur. Chapter 2 discusses the means of recognizing and managing common medical emergencies in the dental office. Just as important, Chapter 2 also provides information about measures to lower the probability of emergencies.

Contemporary surgery is guided by a set of guiding principles, most of which apply no matter where in the body they are put into practice. Chapter 3 covers the most important principles for those practitioners who perform surgery of the oral cavity and maxillofacial regions.

Surgery always leaves a wound, whether one was initially present or not. Although obvious, this fact is often forgotten

by the inexperienced surgeon, who may act as if the surgical procedure is complete once the final suture has been tied and the patient leaves. The surgeon's primary responsibility to the patient continues until the wound has healed; therefore, an understanding of wound healing is mandatory for anyone who intends to create wounds surgically or manage accidental wounds. Chapter 4 presents basic wound healing concepts, particularly as they relate to oral surgery.

The work of Semmelweis and Lister in the 1800s made clinicians aware of the microbial origin of postoperative infections, thereby changing surgery from a last resort to a more predictably successful endeavor. The advent of antibiotics designed to be used systemically further advanced surgical science, allowing elective surgery to be performed at low risk. However, pathogenic communicable organisms still exist, and when the epithelial barrier is breached during surgery, these can cause wound infections or systemic infectious diseases. The most serious examples are the hepatitis B virus (HBV) and human immunodeficiency virus (HIV). In addition, microbes resistant to even the most powerful antimicrobials today are emerging, making surgical sepsis more important than ever. Chapter 5 describes the means of minimizing the risk of significant wound contamination and the spread of infectious organisms among individuals. This includes thorough decontamination of surgical instruments, disinfection of the room in which surgery is performed, lowering of bacterial counts in the operative site, and adherence to infection control principles by the members of the surgical team—in other words, strict adherence to aseptic technique.

Chapter

1

Preoperative Health Status Evaluation

James R. Hupp

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The extent of the medical history, physical examination, and laboratory evaluation of patients requiring outpatient dentoalveolar surgery, under local anesthesia, nitrous oxide sedation, or both, differs substantially from that necessary for a patient requiring hospital admission and general anesthesia for surgical procedures. A patient's primary care physician typically performs periodic comprehensive history taking and physical examination of patients; so, it is impractical and of little value for the dentist to duplicate this process. However, the dental professional must discover the presence or history of medical problems that may affect the safe delivery of the care she or he plans to provide, as well as any conditions specifically affecting the health of the oral and maxillofacial regions.

Dentists are educated in the basic biomedical sciences and the pathophysiology of common medical problems, particularly as they relate to the maxillofacial region. This special expertise in medical topics as they relate to the oral region makes dentists valuable resources in the community health care delivery team. The responsibility this carries is that dentists must be capable of recognizing and appropriately managing pathologic oral conditions. To maintain this expertise, a dentist must keep informed of new developments in medicine, be vigilant while treating patients, and be prepared to communicate a thorough but succinct evaluation of the oral health of patients to other health care providers.

MEDICAL HISTORY

An accurate medical history is the most useful information a clinician can have when deciding whether a patient can safely undergo planned dental therapy. The dentist must also be prepared to anticipate how a medical problem might alter a patient's response to planned

Box 1-1 Standard Format for Recording Results of History and Physical Examinations

1. Biographic data
2. Chief complaint and its history
3. Medical history
4. Social and family medical histories
5. Review of systems
6. Physical examination
7. Laboratory and imaging results

anesthetic agents and surgery. If obtaining the history is done well, the physical examination and laboratory evaluation of a patient usually play minor roles in the presurgical evaluation. The standard format used for recording the results of medical histories and physical examinations is illustrated in Box 1-1. This general format tends to be followed even in electronic medical records.

The medical history interview and the physical examination should be tailored to each patient, taking into consideration the patient's medical problems, age, intelligence, and social circumstances; the complexity of the planned procedure; and the anticipated anesthetic methods.

Biographic Data

The first information to obtain from a patient is biographic data. These data include the patient's full name, home address, age, gender, and occupation, as well as the name of the patient's primary care physician. The clinician uses this information, along with an impression of the patient's intelligence and personality, to assess the patient's reliability. This is important because the validity of the medical history provided by the patient depends primarily on the reliability of the patient as a historian. If the identification data and patient interview give the clinician reason to suspect that the medical history may be unreliable, alternative methods of obtaining the necessary information should be tried. A reliability assessment should continue throughout the entire history interview and physical examination, with the interviewer looking for illogical, improbable, or inconsistent patient responses that might suggest the need for corroboration of information.

Chief Complaint

Every patient should be asked to state the chief complaint. This can be accomplished on a form the patient completes, or the patient's answers should be transcribed (preferably verbatim) into the dental record during the initial interview by a staff member or the dentist. This statement helps the clinician establish priorities during history taking and treatment planning. In addition, having patients formulate a chief complaint encourages them to clarify for themselves and the clinician why they desire treatment. Occasionally, a hidden agenda may exist for the patient, consciously or subconsciously. In such circumstances, subsequent information elicited from the patient interview may reveal the true reason the patient is seeking care.

History of Chief Complaint

The patient should be asked to describe the history of the present complaint or illness, particularly its first appearance, any changes since its first appearance, and its influence on or by other factors. For example, descriptions of pain should include date of onset, intensity, duration, location, and radiation, as well as factors that worsen and mitigate the pain. In addition, an inquiry should be made about

Box 1-2 Baseline Health History Database

1. Past hospitalizations, operations, traumatic injuries, and serious illnesses
2. Recent minor illnesses or symptoms
3. Medications currently or recently in use and allergies (particularly drug allergies)
4. Description of health-related habits or addictions such as the use of ethanol, tobacco, and illicit drugs; and the amount and type of daily exercise
5. Date and result of last medical checkup or physician visit

constitutional symptoms such as fever, chills, lethargy, anorexia, malaise, and any weakness associated with the chief complaint.

This portion of the health history may be straightforward, such as a 2-day history of pain and swelling around an erupting third molar. However, the chief complaint may be relatively involved, such as a lengthy history of a painful, nonhealing extraction site in a patient who received therapeutic irradiation. In this more complex case, a more detailed history of the chief complaint is necessary.

Medical History

Most dental practitioners find health history forms (questionnaires) to be an efficient means of initially collecting the medical history, whether obtained in writing or in an electronic format. When a credible patient completes a health history form, the dentist can use pertinent answers to direct the interview. Properly trained dental assistants can "red flag" important patient responses on the form (e.g., circling allergies to medications in red or electronically flagging them) to bring positive answers to the dentist's attention.

Health questionnaires should be written clearly, in nontechnical language, and in a concise manner. To lessen the chance of patients giving incomplete or inaccurate responses, and to comply with Health Insurance Portability and Accountability Act regulations, the form should include a statement that assures the patient of the confidentiality of the information and a consent line identifying those individuals the patient approves of having access to the dental record, such as the primary care physician and other clinicians in the practice. The form should also include a way, for example, a signature line or pad, for the patient to verify that he or she has understood the questions and the accuracy of the answers. Numerous health questionnaires designed for dental patients are available from sources such as the American Dental Association (ADA) and dental textbooks (Fig. 1-1). The dentist should choose a prepared form or formulate an individualized one.

The items listed in Box 1-2 (collected on a form, via touch screen, or verbally) help establish a suitable health history database for patients; if the data are collected verbally, subsequent written documentation of the results is important.

In addition to this basic information, it is helpful to inquire specifically about common medical problems that are likely to alter the dental management of the patient. These problems include angina, myocardial infarction (MI), heart murmurs, rheumatic heart disease, bleeding disorders (including anticoagulant use), asthma, chronic lung disease, hepatitis, sexually transmitted infections (STIs), diabetes, corticosteroid use, seizure disorder, stroke, and any implanted prosthetic device such as artificial joint or heart valve. Patients should be asked specifically about allergies to local anesthetics, aspirin, and penicillin. Female patients, in the appropriate age group, must also be asked at each visit whether they could be pregnant.

A brief family history can be useful and should focus on relevant inherited diseases such as hemophilia (Box 1-3). The medical history

| MEDICAL HISTORY | | |
|--|-----------------|---------------------------|
| Name _____ | M _____ F _____ | Date of Birth _____ |
| Address _____ | | |
| Telephone: (Home) _____ | (Work) _____ | Height _____ Weight _____ |
| Today's Date _____ Occupation _____ | | |
| Answer all questions by circling either YES or NO and fill in all blank spaces where indicated. Answers to the following questions are for our records only and are confidential. | | |
| 1. My last medical physical examination was on (approximate) _____ | | |
| 2. The name & address of my personal physician is _____ _____ | | |
| 3. Are you now under the care of a physician YES NO If so, what is the condition being treated? _____ | | |
| 4. Have you had any serious illness or operation YES NO If so, what was the illness or operation? _____ | | |
| 5. Have you been hospitalized within the past 5 years YES NO If so, what was the problem? _____ | | |
| 6. Do you have or have you had any of the following diseases or problems: | | |
| a. Rheumatic fever or rheumatic heart disease. | YES | NO |
| b. Heart abnormalities present since birth | YES | NO |
| c. Cardiovascular disease (heart trouble, heart attack, angina, stroke, high blood pressure, heart murmur). | YES | NO |
| (1) Do you have pain or pressure in chest upon exertion | YES | NO |
| (2) Are you ever short of breath after mild exercise | YES | NO |
| (3) Do your ankles swell | YES | NO |
| (4) Do you get short of breath when you lie down, or do you require extra pillows when you sleep | YES | NO |
| (5) Have you been told you have a heart murmur. | YES | NO |
| d. Asthma or hay fever | YES | NO |
| e. Hives or a skin rash | YES | NO |
| f. Fainting spells or seizures. | YES | NO |
| g. Diabetes. | YES | NO |
| (1) Do you have to urinate (pass water) more than six times a day | YES | NO |
| (2) Are you thirsty much of the time | YES | NO |
| (3) Does your mouth usually feel dry. | YES | NO |
| h. Hepatitis, jaundice or liver disease. | YES | NO |
| i. Arthritis or other joint problems. | YES | NO |
| j. Stomach ulcers. | YES | NO |
| k. Kidney trouble. | YES | NO |
| l. Tuberculosis. | YES | NO |
| m. Do you have a persistent cough or cough up blood. | YES | NO |
| n. Venereal disease. | YES | NO |
| o. Other (list) _____ _____ _____ | | |
| 7. Have you had abnormal bleeding associated with previous extractions, surgery, or trauma YES NO | | |
| a. Do you bruise easily. | YES | NO |
| b. Have you ever required a blood transfusion | YES | NO |
| c. If so, explain the circumstances _____ _____ | | |
| 8. Do you have any blood disorder such as anemia, including sickle cell anemia. YES NO | | |
| 9. Have you had surgery or radiation treatment for a tumor, cancer, or other condition of your head or neck. YES NO | | |

Figure 1-1 Example of health history questionnaire useful for screening dental patients. (Modified from a form provided by the American Dental Association.)

MEDICAL HISTORY—cont'd

10. Are you taking any drug or medicine or herb YES NO
If so, what _____
11. Are you taking any of the following:
- | | | |
|--|-----|----|
| a. Antibiotics or sulfa drugs | YES | NO |
| b. Anticoagulants (blood thinners). | YES | NO |
| c. Medicine for high blood pressure | YES | NO |
| d. Cortisone (steroids) (including prednisone). | YES | NO |
| e. Tranquilizers. | YES | NO |
| f. Aspirin. | YES | NO |
| g. Insulin, tolbutamide (Orinase) or similar drug for diabetes | YES | NO |
| h. Digitalis or drugs for heart trouble | YES | NO |
| i. Nitroglycerin | YES | NO |
| j. Antihistamine | YES | NO |
| k. Oral birth control drug or other hormonal therapy. | YES | NO |
| l. Medicines for osteoporosis | YES | NO |
| m. Other _____ | | |
12. Are you allergic or have you reacted adversely to:
- | | | |
|---|-----|----|
| a. Local anesthetics (procaine [Novocain]). | YES | NO |
| b. Penicillin or other antibiotics. | YES | NO |
| c. Sulfa drugs. | YES | NO |
| d. Aspirin. | YES | NO |
| e. Iodine or x-ray dyes. | YES | NO |
| f. Codeine or other narcotics. | YES | NO |
| g. Other _____ | | |
13. Have you had any serious trouble associated with any previous dental treatment YES NO
If so, explain _____
14. Do you have any disease, condition, or problem not listed above that you think I should know about. YES NO
If so, explain _____
15. Are you employed in any situation which exposes you regularly to x-rays or other ionizing radiation YES NO
16. Are you wearing contact lenses YES NO
- WOMEN:**
17. Are you pregnant or have you recently missed a menstrual period. YES NO
18. Are you presently breast-feeding YES NO

Chief dental complaint (Why did you come to the office today?): _____

 Signature of Patient (verifying accuracy
 of historical information)

 Signature of Dentist

Figure 1-1, cont'd

Box 1-3 Common Health Conditions to Inquire about Verbally or on a Health Questionnaire

- Allergies to antibiotics or local anesthetics
- Angina
- Anticoagulant use
- Asthma
- Bleeding disorders
- Breastfeeding
- Corticosteroid use
- Diabetes
- Heart murmurs
- Hepatitis
- Hypertension
- Implanted prosthetic devices
- Lung disease
- Myocardial infarction (i.e., heart attack)
- Osteoporosis
- Pregnancy
- Renal disease
- Rheumatic heart disease
- Seizure disorder
- Sexually transmitted diseases
- Tuberculosis

should be regularly updated. Many dentists have their assistants specifically ask each patient at checkup appointments whether there has been any change in health since the last dental visit. The dentist is alerted if a change has occurred and the changes documented in the record.

Review of Systems

The medical review of systems is a sequential, comprehensive method of eliciting patient symptoms on an organ-by-organ basis. The review of systems may reveal undiagnosed medical conditions. This review can be extensive when performed by a physician for a patient with complicated medical problems. However, the review of systems conducted by the dentist before oral surgery should be guided by pertinent answers obtained from the history. For example, the review of the cardiovascular system in a patient with a history of ischemic heart disease includes questions concerning chest discomfort (during exertion, eating, or at rest), palpitations, fainting, and ankle swelling. Such questions help the dentist decide whether to perform surgery at all or to alter the surgical or anesthetic methods. If anxiety-controlling adjuncts such as intravenous (IV) and inhalation sedation are planned, the cardiovascular, respiratory, and nervous systems should always be reviewed; this can disclose previously undiagnosed problems that may jeopardize successful sedation. In the role of the oral health specialist, the dentist is expected to perform a quick review of the head, ears, eyes, nose, mouth, and throat on every patient, regardless of whether other systems are reviewed. Items to be reviewed are outlined in Box 1-4.

The need to review organ systems in addition to those in the maxillofacial region depends on clinical circumstances. The cardiovascular and respiratory systems commonly require evaluation before oral surgery or sedation (Box 1-5).

Box 1-4 Routine Review of Head, Neck, and Maxillofacial Regions

- *Constitutional:* Fever, chills, sweats, weight loss, fatigue, malaise, loss of appetite
- *Head:* Headache, dizziness, fainting, insomnia
- *Ears:* Decreased hearing, tinnitus (ringing), pain
- *Eyes:* Blurring, double vision, excessive tearing, dryness, pain
- *Nose and sinuses:* Rhinorrhea, epistaxis, problems breathing through nose, pain, change in sense of smell
- *Temporomandibular joint area:* Pain, noise, limited jaw motion, locking
- *Oral:* Dental pain or sensitivity, lip or mucosal sores, problems chewing, problems speaking, bad breath, loose restorations, sore throat, loud snoring
- *Neck:* Difficulty swallowing, change in voice, pain, stiffness

Box 1-5 Review of Cardiovascular and Respiratory Systems

Cardiovascular Review

Chest discomfort on exertion, when eating, or at rest; palpitations; fainting; ankle edema; shortness of breath (dyspnea) on exertion; dyspnea on assuming supine position (orthopnea or paroxysmal nocturnal dyspnea); postural hypotension; fatigue; leg muscle cramping

Respiratory Review

Dyspnea with exertion, wheezing, coughing, excessive sputum production, coughing up blood (hemoptysis)

Recording the results of the physical examination should be an exercise in accurate description rather than a listing of suspected medical diagnoses. For example, the clinician may find a mucosal lesion inside the lower lip that is 5 mm in diameter, raised and firm, and not painful to palpation. These physical findings should be recorded in a similarly descriptive manner; the dentist should not jump to a diagnosis and record only "fibroma on lower lip."

Any physical examination should begin with the measurement of vital signs. This serves as a screening device for unsuspected medical problems and as a baseline for future measurements. The techniques of measuring blood pressure and pulse rates are illustrated in Figures 1-2 and 1-3.

The physical evaluation of various parts of the body usually involves one or more of the following four primary means of evaluation: (1) inspection, (2) palpation, (3) percussion, and (4) auscultation. In the oral and maxillofacial regions, inspection should always be performed. The clinician should note hair distribution and texture, facial symmetry and proportion, eye movements and conjunctival color, nasal patency on each side, the presence or absence of skin lesions or discoloration, and neck or facial masses. A thorough inspection of the oral cavity is necessary, including the oropharynx, tongue, floor of the mouth, and oral mucosa (Fig. 1-4).

Palpation is important when examining temporomandibular joint (TMJ) function, salivary gland size and function, thyroid gland size, presence or absence of enlarged or tender lymph nodes, and induration of oral soft tissues, as well as for determining pain or the presence of fluctuance in areas of swelling.

Physicians commonly use percussion during thoracic and abdominal examinations, and the dentist can use it to test teeth and paranasal sinuses. The dentist uses auscultation primarily for TMJ evaluation, but it is also used for cardiac, pulmonary, and

PHYSICAL EXAMINATION

The physical examination of the dental patient focuses on the oral cavity and, to a lesser degree, on the entire maxillofacial region.



Figure 1-2 A, Measurement of systemic blood pressure. A cuff of proper size placed securely around the upper arm so that the lower edge of cuff lies 2 to 4 cm above the antecubital fossa. The brachial artery is palpated in the fossa, and the stethoscope diaphragm is placed over the artery and held in place with the fingers of the left hand. The squeeze-bulb is held in the palm of the right hand, and the valve is screwed closed with the thumb and the index finger of that hand. The bulb is then repeatedly squeezed until the pressure gauge reads approximately 220 mm Hg. Air is allowed to escape slowly from the cuff by partially opening the valve while the dentist listens through the stethoscope. Gauge reading at the point when a faint blowing sound is first heard is systolic blood pressure. Gauge reading when the sound from the artery disappears is diastolic pressure. Once the diastolic pressure reading is obtained, the valve is opened to deflate the cuff completely. **B**, Pulse rate and rhythm most commonly are evaluated by using the tips of the middle and index fingers of the right hand to palpate the radial artery at the wrist. Once the rhythm has been determined to be regular, the number of pulsations to occur during 30 seconds is multiplied by 2 to get the number of pulses per minute. If a weak pulse or irregular rhythm is discovered while palpating the radial pulse, the heart should be auscultated directly to determine heart rate and rhythm.

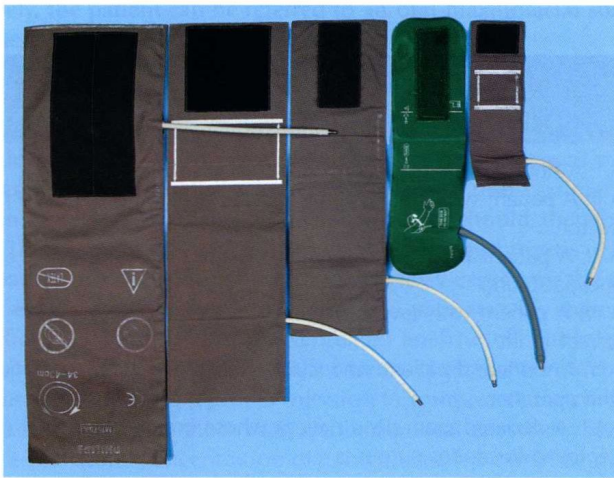


Figure 1-3 Blood pressure cuffs of varying sizes for patients with arms of different diameters (ranging from infants through obese adult patients). Use of an improper cuff size can jeopardize the accuracy of blood pressure results. Too small a cuff causes readings to be falsely high, and too large a cuff causes artificially low readings. Blood pressure cuffs typically are labeled as to the type and size of patient for whom they are designed.

gastrointestinal systems evaluations (Box 1-6). A brief maxillofacial examination that all dentists should be able to perform is described in Box 1-7.

The results of the medical evaluation are used to assign a physical status classification. A few classification systems exist, but the one most commonly used is the American Society of Anesthesiologists' (ASA) physical status classification system (Box 1-8).

Once an ASA physical status class has been determined, the dentist can decide whether required treatment can be safely and routinely performed in the dental office. If a patient is not ASA class I or a relatively healthy class II patient, the practitioner generally has the following four options: (1) modifying routine treatment plans by anxiety-reduction measures, pharmacologic anxiety-control

Box 1-6 Physical Examination before Oral and Maxillofacial Surgery

Inspection

- *Head and face*: General shape, symmetry, hair distribution
- *Ear*: Normal reaction to sounds (otoscopic examination if indicated)
- *Eye*: Symmetry, size, reactivity of pupil, color of sclera and conjunctiva, movement, test of vision
- *Nose*: Septum, mucosa, patency
- *Mouth*: Teeth, mucosa, pharynx, lips, tonsils
- *Neck*: Size of thyroid gland, jugular venous distention

Palpation

- *Temporomandibular joint*: Crepitus, tenderness
- *Paranasal*: Pain over sinuses
- *Mouth*: Salivary glands, floor of mouth, lips, muscles of mastication
- *Neck*: Thyroid gland size, lymph nodes

Percussion

- *Paranasal*: Resonance over sinuses (difficult to assess)
- *Mouth*: Teeth

Auscultation

- *Temporomandibular joint*: Clicks, crepitus
- *Neck*: Carotid bruits

techniques, more careful monitoring of the patient during treatment, or a combination of these methods (this is usually all that is necessary for ASA class II); (2) obtaining medical consultation for guidance in preparing patients to undergo ambulatory oral surgery (e.g., not fully reclining a patient with congestive heart failure); (3) refusing to treat the patient in the ambulatory setting; or (4) referring the patient to an oral-maxillofacial surgeon. Modifications to the ASA system designed to be more specific to dentistry are available but are not yet widely used among health care professionals.