1 Medical History, Physical Evaluation, and Risk Assessment

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Abbreviations used in this chapter

ADA	American Dental Association
ASA	American Society of Anesthesiologists
GERD	gastroesophageal reflux disease
PS	physical status

I. Background

The US and global population demographics are constantly changing, chronic diseases are becoming more prevalent, new medications are being developed and brought to the market, and new and reemerging infectious diseases are being identified. The average life expectancy in the USA increased from 70.0 years to 76.2 years for males and from 77.4 years to 81.0 years for females in the 30 years between 1980 and 2010.[1] With this increased life expectancy comes an increase in chronic medical conditions. Americans' use of prescription drugs has grown over the past half-century due to many factors, with almost one-half of the US population taking at least one prescription drug in the preceding month and 1 in 10 taking five or more drugs.[1]

More patients seeking oral health care have underlying medical conditions that may alter oral health status, treatment approaches, and outcomes. The challenges of medical history information gathering and risk assessment required for safe dental treatment planning and care delivery will be discussed and presented in a practical manner applicable to day-to-day needs of the general practice dentist. There are four key considerations that serve as a framework for assessing and managing the risks of dental care used in this book, although additional considerations may be relevant for certain medical conditions. The key considerations are impaired hemostasis, susceptibility to infections, drug actions/interactions, and ability to tolerate the stress of dental care. The potential for the dental practice to encounter different types of medical emergencies is related to the patient's medical health, adequacy of management, and stress tolerance.

The ADA Practical Guide to Patients with Medical Conditions, Second Edition. Edited by Lauren L. Patton and Michael Glick.

Four key risks of dental care

- Impaired hemostasis
- Susceptibility to infections
- Drug actions/interactions
- Patient's ability to tolerate dental care

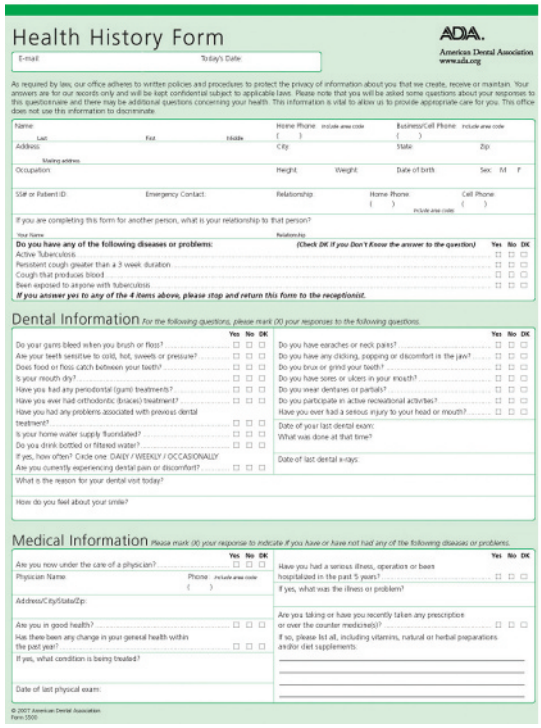
II. Medical History

A medical history can be recorded by the patient in advance of the dental appointment and reviewed by providers seeking clarification of patient responses. In the national shift to electronic health records, medical history, medications, and allergies may be recorded in a number of data collection formats and in a variety of settings, including use of web-based applications. Personal information should be kept private and shared only in compliance with privacy rules.

An example is the American Dental Association (ADA) Health History Form (see Fig. 1.1; available at http://www.ada.org), which is comprised of the following:

- demographic information;
- screening questions for active tuberculosis;
- dental information;
- medical information, including physician contact information;
- hospitalizations, illnesses, and surgeries;
- modified review of systems and diseases survey;
- medications (prescribed, over-the-counter, and natural remedies, including oral and intravenous bisphosphonates);
- substance use history, including tobacco, alcohol, and controlled substances;
- allergies;

(a)


Health History Form

ADA
American Dental Association
www.ada.org

E-mail: 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 OK if you Don't Know the answer to the question) Yes No OK

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?
Does food or floss catch between your teeth?
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?
What is the reason for your dental visit today?
How do you feel about your smile?

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:

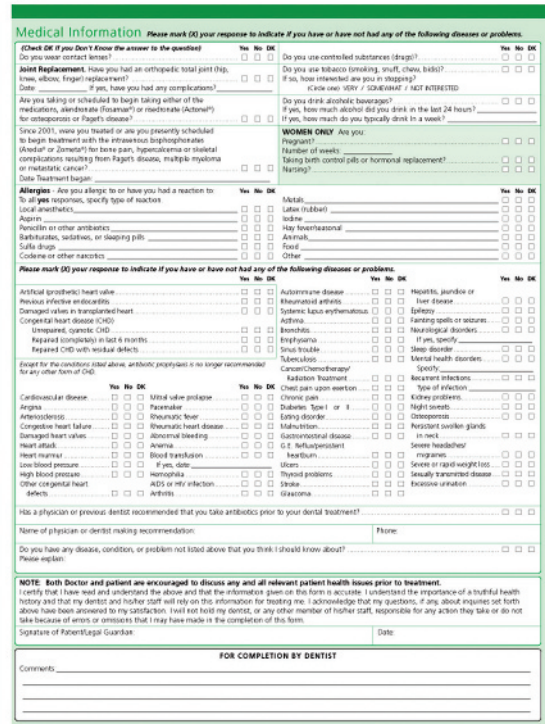
Medical Information *Please mark (X) your response to indicate if you have or have not had any of the following diseases or problems.*

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:

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 diet supplements:

(b)


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

(Check OK 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 either of the medications, alendronate (Fosamax®) or risedronate (Actonel®) for osteoporosis or Paget's disease?
Since 2001, were you treated or are you presently scheduled to begin treatment with the intravenous bisphosphonates (Aredia® or Zometa®) for bone pain, hypercalcemia or skeletal complications resulting from Paget's disease, multiple myeloma or metastatic cancer?
Date Treatment began:

Allergies - Are you allergic to or have you had a reaction to: Yes No DK
To all **yes** responses, specify type of reaction
Local anesthetics
Aspirin
Penicillin or other antibiotics
Barbiturates, sedatives, or sleeping pills
Sulfa drugs
Codeine or other narcotics

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 in a week?

WOMEN ONLY Are you:
Pregnant?
Number of weeks
Taking birth control pills or hormonal replacement?
Nursing?

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.

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
Hemophilia
AIDS or HIV infection
Arthritis

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
Glaucoma

Hepatitis, jaundice or liver disease
Epilepsy
Fainting spells or seizures
Neurological disorders
If yes, specify
Sleep disorder
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

Has a physician or previous dentist recommended that you take antibiotics prior to your dental treatment?
Name of physician or dentist making recommendation: Phone:
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:

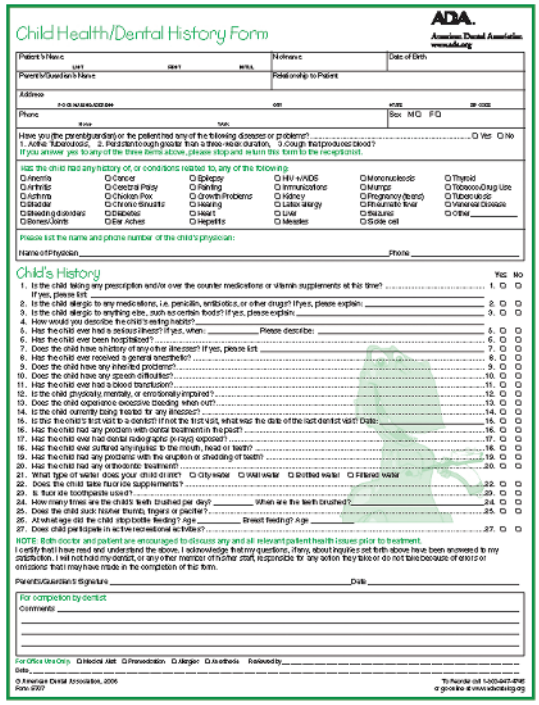
FOR COMPLETION BY DENTIST
Comments:

Figure 1.1 ADA Health History Form: (a) adult form S500 page 1, copyright 2007; (b) adult form S500 page 2, copyright 2007. American Dental Association. Reproduced with permission of the American Dental Association.

- a query about prosthetic joint replacements and any prior antibiotic recommendations by a physician or dentist and name and contact phone number of recommending provider;
- a query about the four cardiac disease conditions recommended for antibiotic coverage for prevention of infective endocarditis;
- a query of women about current pregnancy, nursing status, or birth control pills or hormonal therapy.

There is a Child Health/Dental History Form (see Fig. 1.2) also available from the ADA that focuses on inherited, developmental, infectious, and acquired diseases of importance to dental health-care delivery for children.

Family history can facilitate awareness of need to screen for and engage in prevention efforts for common diseases (such as heart disease, cancer, diabetes) and rarer diseases (including hemophilia, sickle cell anemia, and cystic fibrosis). The Surgeon General has created a family health history initiative to facilitate family discussion of inherited diseases. This free tool, found at https://familyhistory.hhs.gov, will allow patients and providers to download the form to gather relevant health information for patients to share with providers. Whether disease etiology derives from genetics, environment, learned behaviors, or a combination of factors, many health conditions, such as propensity to hypertension, may run in families.



Child Health/Dental History Form

ADA. American Dental Association www.ada.org

Patient's Name | Nickname | Date of Birth

Parent's/Guardian's Name | Relationship to Patient

Address

Phone | Sex M O F O

Have you (the parent/guardian) or the patient had any of the following diseases or problems? O Yes O No
1. Active Tuberculosis 2. Persistent cough greater than a three-week duration 3. Cough that produces blood?
If you answer yes to any of the three items above, please stop and return this form to the receptionist.

Has the child had any history of, or conditions related to, any of the following:

O Anemia	O Cancer	O Epilepsy	O HIV +/AIDS	O Mononucleosis	O Thyroid
O Arthritis	O Cerebral Palsy	O Fainting	O Immunizations	O Mumps	O Tobacco/Drug Use
O Asthma	O Chicken Pox	O Growth Problems	O Kidney	O Pregnancy (term)	O Tuberculosis
O Bladder	O Chronic Sinusitis	O Hearing	O Latex Allergy	O Rheumatic Fever	O Venereal Disease
O Bleeding disorders	O Diabetes	O Heart	O Liver	O Seizures	O Other
O Bones/Joints	O Ear Aches	O Hepatitis	O Measles	O Sickle cell	

Please list the name and phone number of the child's physician:

Name of Physician | Phone

Child's History — Yes No

1. Is the child taking any prescription and/or over the counter medications or vitamin supplements at this time? 1. O O
If yes, please list
2. Is the child allergic to any medications, i.e. penicillin, antibiotics, or other drugs? If yes, please explain 2. O O
3. Is the child allergic to anything else...such as certain foods? If yes, please explain 3. O O
4. How would you describe the child's eating habits? 4. O O
5. Has the child ever had a serious illness? If yes, when: Please describe: 5. O O
6. Has the child ever been hospitalized? 6. O O
7. Does the child have a history of any other illnesses? If yes, please list 7. O O
8. Has the child ever received a general anesthetic? 8. O O
9. Does the child have any inherited problems? 9. O O
10. Does the child have any speech difficulties? 10. O O
11. Has the child ever had a blood transfusion? 11. O O
12. Is the child physically, mentally, or emotionally impaired? 12. O O
13. Does the child experience excessive bleeding when cut? 13. O O
14. Is the child currently being treated for any illnesses? 14. O O
15. Is this the child's first visit to a dentist? If not the first visit, what was the date of the last dentist visit? Date: 15. O O
16. Has the child had any problems with dental treatment in the past? 16. O O
17. Has the child ever had dental radiographs (x-rays) exposed? 17. O O
18. Has the child ever suffered any injuries to the mouth, head or teeth? 18. O O
19. Has the child had any problems with the eruption or shedding of teeth? 19. O O
20. Has the child had any orthodontic treatment? 20. O O
21. What type of water does your child drink? O City water O Well water O Bottled water O Filtered water
22. Does the child take fluoride supplements? 22. O O
23. Is fluoride toothpaste used? 23. O O
24. How many times are the child's teeth brushed per day? When are the teeth brushed? 24. O O
25. Does the child suck his/her thumb, fingers or pacifier? 25. O O
26. At what age did the child stop bottle feeding? Age Breast feeding? Age
27. Does child participate in active recreational activities? 27. O O

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. 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 may have made in the completion of this form.

Parent's/Guardian's Signature Date

For completion by dentist
Comments

For Office Use Only O Medical Alert O Premedication O Allergies O Anesthesia Reviewed by
Date

Form S707

To reorder call 1-800-947-4746 or go online at www.adacatalog.org

Figure 1.2 ADA Child Health/Dental History Form S707, copyright 2006. American Dental Association. Reproduced with permission of the American Dental Association.

III. Physical Evaluation and Medical Risk Assessment

The initial and ongoing assessment of patient medical risk in dental practice has several purposes:

- To minimize risk of adverse events in the dental office resulting from dental treatment.
- To identify patients who need further medical assessment and management.
- To identify patients for whom specific perioperative therapies or treatment modifications will minimize risk, including postponing elective treatment.
- To identify appropriate anesthetic technique, intraprocedure monitoring, and postprocedure management.
- To discuss treatment procedures with patients, outlining risks and benefits, in order to obtain informed consent and determine need for additional anxiolysis.

One of the most common medical risk assessment frameworks is the American Society of Anesthesiologists (ASA) Physical Status Score[2] used to classify patients for anesthesia risk (Table 1.1 A medical risk-related health history is important to detect medical problems in patients. While across all ages most (78%) dental patients are healthy ASA 1 patients, the

Table 1.1 ASA Physical Status (PS) Classification,[2] Activity Characteristics/Treatment Risk, and Medical Examples

ASA Physical Status	Activity Characteristics/Treatment Risk	Medical Examples
ASA PS 1 A normal healthy patient.	• Patient is able to walk up one flight of stairs or two level city blocks without distress. • Little of no anxiety. • **Little or no risk during treatment.**	• Healthy 20-year-old.
ASA PS 2 A patient with mild systemic disease.	• Patient has mild to moderate systemic disease or is a healthy ADA PS1 patient who demonstrated a more extreme anxiety and fear towards dentistry. • Patient is able to walk up one flight of stairs or two level city blocks, but will have to stop after completion of the exercise because of distress. • **Minimal risk during treatment.**	• ASA 1 with respiratory condition, active allergies, dental phobia, or pregnancy. • Well diet or oral hypoglycemic agent—controlled diabetic. • Well-controlled asthmatic. • Well-controlled epileptic. • Well-controlled hypertensive not on medication.
ASA PS 3 A patient with severe systemic disease.	• Patient has severe systemic disease that limits activity, but is not incapacitating. • Patient is able to walk up one flight of stairs or two level city blocks, but will have to stop on the way because of distress. • **If dental care is indicated, stress reduction protocol and other treatment modifications are indicated.**	• Well-controlled hypertensive on medication. • Well-controlled diabetic on insulin. • Slight chronic obstructive pulmonary disease. • Thirty days or more ago history of myocardial infarction or cerebrovascular accident or congestive heart failure.
ASA PS 4 A patient with severe systemic disease that is a constant threat to life.	• Patient has severe systemic disease that limits activity and is a constant threat to life. • Patient is unable to walk up one flight of stairs or two level city blocks. Distress is present even at rest. • **Patient poses significant risk during treatment.** • **Elective dental care should be postponed until such time as the patient's medical condition has improved to at least an ASA P3 classification.** • **Emergent dental care may be best provided in a hospital setting in consultation with the patient's physician team.**	• History of unstable angina, myocardial infarction, or cerebrovascular accident in last 30 days. • Severe congestive heart failure. • Moderate to severe chronic obstructive pulmonary disease. • Uncontrolled hypertension. • Uncontrolled diabetes. • Uncontrolled epilepsy or seizure disorder.

(Continued)

Table 1.1 *(Continued)*

ASA Physical Status	Activity Characteristics/Treatment Risk	Medical Examples
ASA PS 5 A moribund patient who is not expected to survive without the operation.	• Hospitalized patient in critical condition. • **Emergency dental care to eliminate acute oral disease is provided only when deemed a component of lifesaving surgery.**	• Terminal illness often of acute onset.
ASA PS 6 A declared brain-dead patient whose organs are being removed for donor purposes.	• **Dental care not warranted.**	• Brain dead.

Source: Adapted from American Society of Anesthesiologists. Accessed 2014.[2]

percentage that is of higher ASA physical status (ASA 2–ASA 6) increases with increasing age.[3] By age 65, only 55% of adults remain healthy ASA 1. Medical conditions such as cardiovascular disease and hypertension account for a high proportion of ASA 3 and ASA 4 patients.

Up to a third of dental patients who answer yes to "Are you in good health?" on verification are found to be medically compromised.[4] In a survey of dental patients completing health history forms based on the ADA Health History Form available at the time, the diseases most inaccurately reported or omitted were blood disorders, cardiovascular disease, and diabetes.[4] The authors concluded that using both a self-administered questionnaire and dialog on the health history might improve communication.

There are several physical signs or clues that indicate a patient who reports having received no medical care might not truly be healthy, but rather simply not accessing medical care:

- age over 40 years;
- obese or cachectic body habitus;
- low energy level;
- abnormal skin coloration;
- poor oral hygiene;
- tobacco smoking.

Often, the patient's response to the question "Can you walk up two flights of stairs without stopping to catch your breath?" can indicate general cardiovascular and pulmonary health status.

Vital signs, including blood pressure and heart rate (pulse), should be assessed at each visit. The other vital signs of temperature, respiration rate, and pain score may be useful additional signs of current health. A focused review of systems should allow a cursory review of the patient's recent state of health, focusing on recent changes and be tailored to the patient and planned dental procedure(s).

Brief review of systems

- **General:** fever, chills, night sweats, weakness, fatigue
- **Cardiovascular:** reduced exercise tolerance, chest pain, orthopnea, ankle swelling, claudication
- **Pulmonary:** upper respiratory infection symptoms—productive cough, bronchitis, wheezing
- **Hematological:** bruising, epistaxis
- **Neurological:** mental status changes, transient ischemic attacks, numbness, paresis
- **Endocrine:** polydipsia, polyuria, polyphagia, weigh gain/loss

Under each medical topic, we present "key questions to ask the patient" to allow improved risk assessment and determination of dental treatment modifications.

Communication with the Patient's Physician

Evidence-based dental practice relies on patients, physicians, and dentists working together collaboratively to use scientific evidence, clinician experience, and patients' values/preferences in the decision-making process to customize an individual treatment plan to improve patient care. The dentist should consult with the patient's physician to clarify areas of the patient's health that are unclearly communicated by the patient who is a poor historian or where a reported medical condition is monitored and the patient does not have complete information. This includes consultations about current laboratory assessments, prescribed medications, and other medical and surgical therapies, and coordination of care. Under each medical topic, we present "key questions to ask the physician" to facilitate improved communication and coordination of care.

Influence of Systemic Disease on Oral Disease and Health

The health history should give the dentist an appreciation of oral conditions that may have a systemic origin and thus require systemic management as an aspect of treatment. Several abnormal signs and symptoms in the facial region, oral structures, and teeth with systemic origin are listed in Table 1.2 and illustrated in Figs 1.3, 1.4, 1.5, and 1.6.

Table 1.2 Facial, Oral, and Dental Signs Possibly Related to Medical Disease or Therapy

	Possible Causative Medical Disease or Therapy
Facial Signs	
Cachexia	Wasting from cancer, malnutrition, HIV/AIDS
Cushingoid facies	Cushing syndrome, steroid use
Jaundiced skin/sclera	Liver cirrhosis
Malar rash	Systemic lupus erythematosus
Ptosis	Myasthenia gravis
Taught skin and microstomia	Scleroderma, facial burns
Telangiectasias	Liver cirrhosis
Weak facial musculature	Neurologic disorder, facial nerve palsy, tardive dyskinesia, myasthenia gravis
Oral Signs	
Bleeding, ecchymosis, petechiae	Thrombocytopenia, thrombocytopathy, hereditary coagulation disorder, liver cirrhosis, aplastic anemia, leukemia, vitamin deficiency, drug induced
Burning mouth/tongue	Anemia, vitamin deficiency, candida infection, salivary hypofunction, primary or secondary neuropathy
Dentoalveolar trauma	Interpersonal violence, accidental trauma, seizure disorder, gait/balance instability, alcoholism
Drooling	Neoplasm; neurologic: amyotropic lateral sclerosis, Parkinson's disease cerebrovascular accident, cerebral palsy; medications (e.g., tranquilizers, anticonvulsants, anticholinesterases)

(Continued)

Table 1.2 *(Continued)*

	Possible Causative Medical Disease or Therapy
Dry mucosa	Drug-induced xerostomia, salivary hypofunction from Sjogren's syndrome, diabetes or head and neck cancer radiation therapy
Gingival overgrowth	Leukemia, drug induced (phenytoin, cyclosporine, calcium-channel blockers)
Hard tissue enlargements	Neoplasm, acromegaly, Paget's disease, hyperparathyroidism
Mucosal discoloration of hyperpigmentation	Addison's disease, lead poisoning, liver disease, melanoma, drug induced (e.g., zidovudine, tetracycline, oral contraceptives, quinolones)
Mucosal erythema and ulceration	Cancer chemotherapy, uremic stomatitis, autoimmune disorders (systemic lupus, Bechet's syndrome), vitamin deficiency, Celiac disease, Crohn's disease, drug induced, self-injurious behavior
Mucosal pallor	Anemia, vitamin deficiency
Nondental source oral/jaw pain	Referred pain (e.g., cardiac, neurologic, musculoskeletal), including myofascial and temporomandibular joints; drug induced (e.g., vincristine chemotherapy); primary neoplasms; cancer metastases; sickle cell crisis pain; primary or secondary neuropathies
Opportunistic infections	Immune suppression from HIV, cancer chemotherapy, hematologic malignancy; primary immune deficiency syndromes; poorly controlled diabetes; stress
Oral malodor	Renal failure, respiratory infections, gastrointestinal conditions
Osteonecrosis	Radiation to the jaw; current or prior use of antiresorptive agents such as bisphosphonates or receptor activator of NFκB ligand inhibitors, and certain cancer antiangiogenic agents
Poor wound healing	Immune suppression from HIV, cancer chemotherapy, primary immune deficiency syndromes; poorly controlled diabetes; malnutrition; vitamin deficiency
Soft tissue swellings	Neoplasms, amyloidosis, hemangioma, lymphangioma, acromegaly, interpersonal violence or accidental trauma
Trismus	Neoplasm, post-radiation therapy, arthritis, post-traumatic mandible condyle fracture
Dental Signs	
Early loss of teeth	Neoplasms, nutritional deficiency (e.g., hypophosphatemic vitamin D resistant rickets, scurvy), hypophosphatasia, histiocytosis X, Hand–Schuller–Christian disease, Papillon–Lefèvre syndrome, acrodynia, juvenile-onset diabetes, immune suppression (e.g., cyclic neutropenia, chronic neutropenia), interpersonal violence or other traumatic injury, radiation therapy to the jaw, dentin dysplasia, trisomy 21–Down syndrome, early-onset periodontitis
Rampant dental caries	Salivary hypofunction from disease (e.g., Sjögren's syndrome), post-radiation, or xerogenic medications; illegal drug use (e.g., methamphetamines); inability to cooperate with oral hygiene and diet instructions
Tooth discoloration	Genetic defects in enamel or dentin (e.g., amelogenesis imperfecta, dentinogenesis imperfect), porphyria, hyperbilirubinemia, drug induced (e.g., tetracycline)
Tooth enamel erosion	Gastroesophageal reflux disease (GERD), bulimia nervosa

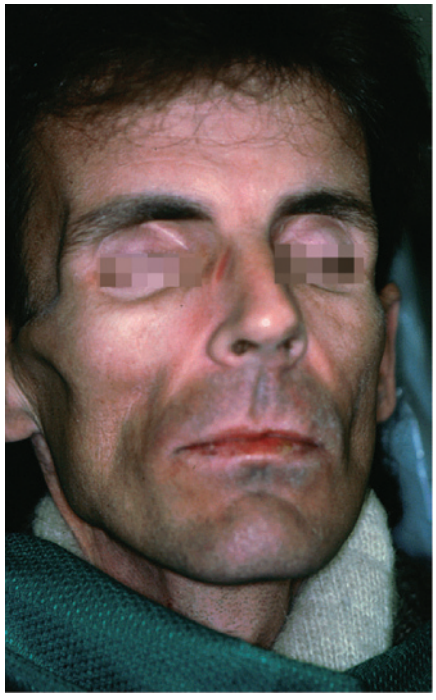


Figure 1.3 Cachexia due to HIV wasting syndrome.

Figure 1.4 Cushingoid faces and malar rash due to systemic lupus erythematosus and chronic steroid use.

Figure 1.5 Taught facial skin and microstomia due to systemic sclerosis (scleroderma).

Figure 1.6 Facial port-wine stain of Sturge–Weber syndrome (encephalotrigeminal angiomatosis).

The astute dental provider also has the opportunity to observe physical and oral conditions that might indicate undiagnosed or poorly managed systemic disease. Examples are oral candidiasis that might indicate a poorly controlled

immune-suppressing medical condition, significant inflammatory periodontal disease as an indicator of poorly controlled diabetes, gingival enlargements that are leukemic infiltrates, or mucosal pallor indicating an anemia. Tooth erosion in adolescent females might raise suspicion for an eating disorder such as bulimia, while in older adults might indicate a history of GERD. Acutely declining oral hygiene and self-care in the elderly might indicate physical disability or mental decline with dementia onset. On panoramic radiographs, carotid artery calcifications may be detected that correlate with hypertension, hyperlipidemia, and heart disease, and may warrant patient referral for further medical evaluation.[5] Dental radiographic signs suggestive of systemic disease or therapy are shown in Table 1.3.

Framework for Key Risks of Dental Care

The scope of dental practice is wide, encompassing aspects of both medicine and surgery. Dental care plans and individual procedures vary in their level of invasiveness and risk to the patient. Systemic health may alter the healing response to surgery, response to and effectiveness of surgical and nonsurgical therapies, and risks of precipitating a medical emergency.

Impaired hemostasis

A bleeding risk assessment must consider both patient-related factors of medical history, medications, review of systems, and physical exam assessment for inherited and acquired defects of hemostasis, as well as procedure-related factors including intensity of the planned surgery. Hemostatic risk can result from inherited or acquired disorders and may necessitate medical support management by a hematologist or other physician, particularly for surgical procedures. When more than one of the four phases of hemostasis is defective, the clinical bleeding response from surgery is generally more severe than when there is an isolated defect in only one phase of hemostasis.

Table 1.3 Dental Radiographic Signs Suggestive of Medical Disease or Therapy

Dental Radiographic Signs	Possible Causative Medical Disease or Therapy
Carotid artery calcification	Carotid arteritis, stroke or transient ischemic attack-related disease, hypertension, hyperlipidemia, heart disease
Condyle/temporomandibular joint articular space destruction	Rheumatoid arthritis, osteoarthritis
Marrow hyperplasia, increased spacing of bony trabeculae, generalized radiolucency	Sickle cell anemia, osteopenia, osteoporosis, malnutrition, secondary hyperparathyroidism from renal disease or renal osteodystrophy
Marrow hypoplasia, generalized increased density or radiopacity	Osteopetrosis, Paget disease, hypoparathyroidism
Reduced cortical bone density	Primary hyperparathyroidism
Resorption of angle of the mandible	Scleroderma
Well-defined radiolucencies not associated with teeth	Neoplasms, multiple myeloma, metastatic cancer

The four phases of hemostasis

- Vascular
- Platelet
- Coagulation
- Metabolic/fibrinolytic

Oral and physical examination findings indicating increased risk for hemostatic defects include the following:

- skin and mucosal petechiae, ecchymoses, or purpura (see Figs 1.7, 1.8, and 1.9);
- skin and mucosal hematomas (see Fig. 1.10);
- spontaneous gingival hemorrhage (see Fig. 1.11);
- hemosiderin staining of calculus on teeth (see Fig. 1.12);
- jaundice of sclera, mucosa, and skin (see Fig. 1.13);
- spider angioma skin stigmata of severe liver disease (see Fig. 1.14).

Anticoagulant medications (warfarin, low-molecular-weight heparins, dabigatran, rivaroxiban, apixaban) and antiplatelet agents (clopidogrel, prasugrel, ticagrelor, ticlopidine, and aspirin/dipyridamole sustained release) are commonly prescribed for cardio-

Figure 1.7 Petechiae and mucosal pallor due to aplastic anemia.

Figure 1.8 Petechiae and ecchymoses of tongue and lip due to severe thrombocytopenia.

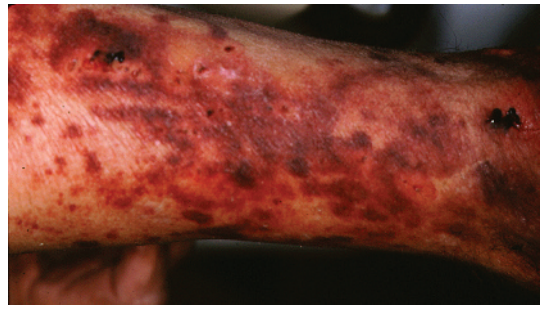


Figure 1.9 Purpura of arm skin due to alcoholic cirrhosis.

Figure 1.10 Hematoma of finger due to severe hemophilia A.

Figure 1.11 Spontaneous gingival bleeding due to severe thrombocytopenia.

Figure 1.13 Jaundice of sclera of eye due to severe liver cirrhosis.

Figure 1.12 Hemosiderin-stained calculus on teeth from chronic oral bleeding due to severe hemophilia A.

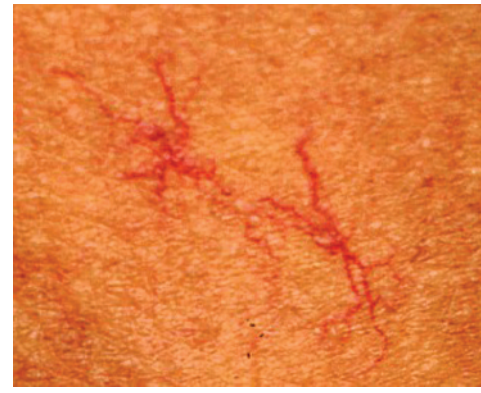


Figure 1.14 Spider angioma of skin due to severe liver disease.

vascular diseases and clotting-prone conditions, and some of the most commonly used over-the-counter analgesic medicines (aspirin, ibuprofen) may alter hemostasis. Dental providers also need to be aware that use of herbal supplements, often not revealed in the health history, can enhance bleeding risk. Four of the top five supplements (green tea, garlic, ginko biloba, and ginseng) taken by dental patients in a dental-school-based study are reported to enhance bleeding risk.[6]

Weighing against the need to discontinue aspirin therapy for dental extractions, a recent case–control study demonstrated no

difference in bleeding outcome from a single tooth extraction for patients on 325 mg daily aspirin compared with those receiving placebo.[7] The small, but fatal, risk of thromboembolic complications of discontinuing antiplatelet therapy for dental surgery, compared with the remote chance of a nonfatal bleeding episode, weights against interrupting antiplatelet therapy for dental surgery.[8] The informed consent discussion should specifically address the added risk of bleeding and bruising for anyone undergoing surgery while on antiplatelet or anticoagulant medications.

Because of the importance of anticoagulation for certain cardiac conditions, the management of dental patients on warfarin has been controversial with a trend toward little or no modification in warfarin use around the time of dental treatment for most procedures except surgical procedures anticipating significant blood loss.[9] In addition, in an attempt to reduce coronary events after coronary artery stent placement, an advisory group involving representatives from dentistry stresses the importance of maintaining 12 months of dual antiplatelet therapy after placement of a drug-eluting stent and educating patients and health-care providers about hazards of premature discontinuation.[10] This advisory statement also recommends postponing elective dental surgery for 1 year, and considering the continuation of aspirin during the perioperative period in high-risk patients with drug-eluting stents if surgery cannot be deferred.[10]

Local measures to control bleeding—such as pressure, local hemostatic materials, epinephrine, electrocautery, bone wax, surgical stents, and the antifibrinolytic drug ε-aminocaproic acid 25% syrup—may be used to supplement any modification in the dental management plan. Hemorrhage control might be easier to obtain with local measures when a single tooth is extracted, compared with a more intense surgery such as removal of all the teeth in an arch.

Susceptibility to Infection

The oral cavity is host to numerous bacteria and fungi, raising the concern of local infection and the potential for distant hematogenous spread of oral microorganisms. Transient bacteremias of various magnitudes are common as a result of eating, daily oral hygiene, and almost all dental procedures and are generally cleared in less than 30 min. Among patients with chronic periodontitis, a recent study demonstrated that the incidence, magnitude, and bacterial diversity of bacteremia due to flossing (30%) was not significantly different compared with scaling and root planing (43.3%), and both caused the same incidence of viridans streptococcal bacteremia (26.7%).[11] The adverse health impact of transient bacteremias is not fully understood. Antibiotics given before a dental procedure decrease the risk of bacteremia from the oral cavity, but this is of uncertain clinical importance.

Expert panel consensus statements or guidelines exist for antibiotic prophylaxis for invasive dental procedures for patients with several medical conditions, including infectious endocarditis,[12] implanted nonvalvular cardiac devices,[13] and other nonvalvular cardiovascular devices.[14] After years of controversy, the American Academy of Orthopaedic Surgeons and the ADA 2012 guidelines proposed that the practitioner consider changing the long-standing practice of routinely prescribing prophylactic antibiotics for patients with orthopedic implants who undergo dental procedures, that the benefit of oral topical antimicrobials in the prevention of periprosthetic joint infections is inconclusive, and maintenance of good oral hygiene is beneficial.[15] This paper was the first to overtly state that patient preference was an important consideration.[15] Jevsevar[16] created

a doctor–patient shared decision-making tool, including four multiple-choice questions for the patient and a checklist to help determine whether taking an antibiotic prior to dental procedures is prudent or necessary for patients with prosthetic joints. In 2015, the ADA Council on Scientific Affairs, updating the 2012 review, reported their evidence-based clinical guideline for dental practitioners.[17] They recommended: "In general, for patients with prosthetic joint implants, prophylactic antibiotics are not recommended prior to dental procedures to prevent prosthetic joint infection."[17] They further acknowledged the importance of consideration of the health history, and for some patients with a history of joint complications, the patient's orthopedic surgeon, in consultation with the patient, may recommend and write a specific antibiotic regimen for a specific patient.[17]

A systematic review of patients with eight medical conditions or medical devices who are often given antibiotics prior to invasive dental procedures found little or no evidence to support this practice or to demonstrate that antibiotic coverage prevents distant site infections for any of these eight groups of patients.[18] The conditions and devices reviewed included cardiac-native heart valve disease; prosthetic heart valves and pacemakers; hip, knee, and shoulder prosthetic joints; renal dialysis shunts; cerebrospinal fluid shunts; vascular grafts; immunosuppression secondary to cancer and cancer chemotherapy; systemic lupus erythematosus; and insulin-dependent (type 1) diabetes mellitus. However, the host defense against bacteria in the blood may be weakened by various diseases and conditions, making antibiotic use for certain at-risk individuals a rational approach to care.

The general paradigm shift occurring in health-care professional advisory statements and guidelines related to concern about distant site infection resulting from dental treatment is to emphasize the importance of the patient maintaining good oral hygiene and good gingival, periodontal, and dental health as a method of preventing distant site infection rather than using pretreatment antibiotic coverage for many unproven and low-risk conditions or conditions for which treatment of the infection would not be especially morbid.

Drug Actions/Interactions

Patients with complex medical conditions are likely to be on multiple medications for management of their systemic disease. Pharmaceutical agents taken as directed have both therapeutic (desired) effects and adverse (unwanted) effects. Most adverse effects can be anticipated from the known pharmacology of the drug and tend to be tolerable, although unpleasant. Patients should be informed of the most common side effects of medications and given advice at the time of prescription as to how to manage them.

A large US ambulatory adult population-based phone survey in 1998–1999 indicated that most adults (81%) routinely take at least one medication and many take multiple medications with substantial overlap between use of prescription medications, over-the-counter medications, and herbals/supplements, raising concerns about unintended interactions.[19] The top 25 most commonly used prescription and over-the-counter drugs reported in this study are shown in Table1.4. Vitamins and minerals are taken by 40% and herbals/supplements by 14% of adults. The most commonly used dietary supplements are shown in Table1.5. Overall, 16% of prescription medication users also used one or more herbals/supplements, with greatest use among middle-aged women.[19]

In a subsequent study in 2005–2006 of nationally representative community-dwelling older adults (aged 57–85 years) in the USA, 81% used at least one prescription medication, 42% used at least one over-the-counter medication,

Table 1.4 Top 25 Most Commonly Used Prescription and Over-the-Counter Drugs, 1-Week Prevalence, by Gender/Age (in Years (y))

			Use in Age Group (%)					
			Men			Women		
Rank	Total Adult Use (%)	Drug[a]	18–44 y	45–64 y	≥65 y	18–44 y	45–64 y	≥65 y
1	23	Acetaminophen	20	16	16	28	25	27
2	17	Ibuprofen	15	13	7	24	22	8
3	17	Aspirin	10	22	39	10	21	23
4	8.1	Pseudoephedrine	8	6	2	12	9	3
5	5.2	**Conjugated estrogens**	0	0	0	1	21	17
6	4.4	Diphenhydramine hydrochloride	4	3	5	5	6	4
7	4.2	**Levothyroxine sodium**	<1	2	4	3	9	13
8	4.2	**Ethinyl estradiol**	0	0	0	14	2	0
9	3.9	Caffeine[b]	3	2	2	6	5	1
10	3.7	**Hydrochlorothiazide**	1	4	6	1	6	12
11	3.5	Dextromethorphan hydrobromide	4	1	<1	6	3	3
12	3.5	Naproxen	1	3	3	5	4	4
13	2.9	Chlorpheniramine maleate/tannate	2	3	1	4	2	2
14	2.6	**Atrovastatin calcium**	2	7	7	<1	2	3
15	2.6	**Linsinopril**	1	3	7	<1	4	7
16	2.6	**Medroxyprogesterone acetate**	0	0	0	<1	12	4
17	2.5	**Loratadine**	3	2	0	3	4	1
18	2.3	**Furosemide**	<1	2	12	0	2	9
19	2.3	Phenylpropanolamine	2	2	1	3	2	3
20	2.2	Ranitidine hydrochloride	1	5	4	1	2	3
21	2.2	**Atenolol**	<1	2	7	<1	3	8
22	2.1	**Omeprazole**	1	3	5	1	3	3
23	2.1	**Albuterol**	2	1	4	2	3	2
24	1.9	Guanifenesin	2	<1	2	2	2	3
25	1.8	**Hydrocodone**	1	1	<1	3	2	3

Source: Adapted from Kaufman et al. 2002.[19]

[a]Prescription drugs in bold.

[b]Excluding caffeine in food and beverages.

Table 1.5 Top 10 Most Commonly Used Vitamins/Minerals and Herbal/Supplements, 1-Week Prevalence

Rank	Total Adult Use (%)	Dietary Supplements
Vitamin/Mineral		
	40	Any use
1	26	Multivitamin
2	10	Vitamin E
3	9.1	Vitamin C
4	8.7	Calcium
5	3.0	Magnesium
6	2.2	Zinc
7	2.2	Folic acid
8	2.1	Vitamin B_{12}
9	1.9	Vitamin D
10	1.8	Vitamin A
Herbal/Supplements		
	14	Any use
1	3.3	Ginseng
2	3.2	*Ginko biloba* extract
3	1.9	*Allium sativum* (garlic)
4	1.9	Glucosamine
5	1.3	St. John's wort
6	1.3	*Echinacea augustifolia*
7	1.1	Lecithin
8	1.0	Chondroitin
9	0.9	Creatine
10	0.9	*Serenoa repens* (saw palmetto)

Source: Adapted from Kaufman et al. 2002.[19]

and 49% used at least one dietary supplement.[20] Twenty-nine percent used at least five prescription medications concurrently. Overall, 4% of these older adults were potentially at risk of having a major drug–drug interaction; half of these involved the use of nonprescription medications. These regimens were most prevalent in older men, and nearly half involved concurrent use of anticoagulants.[20]

Drug actions or reactions can be predictable or unpredictable. Common drug interactions in the dental setting can be minor to life threatening. Minor interactions are not absolute contraindications to drug use.

Special precautions are needed when prescribing drugs for patients who are compromised in their ability to metabolize and excrete drugs and drug breakdown products:

- liver disease;
- renal impairment;
- young children;
- the very old.

For such patients, reduced drug dosages, extended intervals between doses, or avoidance of certain drugs may be indicated. Pregnant patients require consideration of teratogenic effects of all drugs, especially during the first trimester during embryogenesis, and some systemic medications can be found in the breast milk of nursing mothers.

Serious adverse effects may result from allergic reactions, overdosage, or drug interactions when certain medications are taken concomitantly. For safe patient management, the dentist must obtain a medication use, dietary supplement, and allergy history from the patient and have an understanding of the actions and interactions of all medications they prescribe. Drug classes used in dentistry and potential interactions with patient medications are shown in Table1.6. Table1.7 shows interactions with drugs prescribed in dentistry by users of the dietary supplements calcium, evening primrose, ginko, St. John's wort, and valerian.[21]

Table 1.6 Common Dental Drug Interactions[a]

Patient-reported Medication	Dentist Prescribed Drug	Consequence
Antimicrobial Drugs		
Alcohol	Metronidazole	Disulfuram-like reaction of nausea, vomiting, headache, flushing
Antacids and iron supplements	Tetracyclines	Loss of antibacterial action of tetracyclines
Atorvastatin, simvastatin, pravastatin	Erythromycin, clarithromycin	Increased statin level precipitating possible muscle weakness and breakdown
Carbamazepine	Erythromycin, clarithromycin, doxycycline, itraconazole, ketoconazole	Increased risk of carbamazepine toxicity
Cyclosporin	Fluconazole, itraconazole, ketoconazole, amphotericin, clarithromycin	Increased risk of nephrotoxicity
Digoxin	Erythromycin, tetracyclines, itraconazole, clarithromycin	Digoxin toxicity
Lithium	Metronidazole, tetracycline	Increased lithium toxicity
Methotrexate	Penicillins	Methotrexate toxicity
Midazolam and other benzodiazepines	Erythromycin, Clarithromycin, ketoconazole, Itraconazole	Profound sedation
Oral contraceptives	Amoxicillin, erythromycin, tetracyclines, metronidazole, ampicillin, possibly other antibiotics	Contraceptive failure (low risk). (Patient should discuss with physician additional nonhormonal contraception use during antibiotic use and subsequent week)

(Continued)

Table 1.6 *(Continued)*

Patient-reported Medication	Dentist Prescribed Drug	Consequence
Phenytoin	Fluconazole, ketoconazole, metronidazole	Increased plasma levels of phenytoin
Theophylline	Erythromycin, clarithromycin, ketoconazole, itraconazole	Theophylline toxicity
Warfarin	Erythromycin, metronidazole, tetracyclines, ketaconazole, clarithromycin, cephalosporins	Enhanced anticoagulation effect
Anti-inflammatory Drugs		
Alcohol	Aspirin	Increased risk of damage to gastric mucosa
Captopril, other ACE inhibitors	Aspirin, ibuprofen	Reduction in antihypertensive effect
Corticosteroids	Aspirin	Risk of salicylate toxicity on steroid withdrawal; increased risk of damage to gastric mucosa
Cyclosporin	Aspirin, NSAIDs	Increased risk of nephrotoxicity
Digoxin	Aspirin, ibuprofen	Digoxin toxicity
Heparin, warfarin	Aspirin, NSAIDs	Risk of hemorrhage
Insulin, chlorpropamide, other hypoglycemics	Aspirin	Risk of hypoglycemia
Lithium	Ibuprofen, naproxen, celecoxib	Lithium toxicity
Methotrexate	Aspirin, ibuprofen, naproxen	Methotrexate toxicity
Phenytoin	Aspirin, NSAIDs	Increased plasma levels of phenytoin
Valproic acid	Aspirin	Risk of hemorrhage; increased valproate toxicity
Other Drugs		
Alcohol, sedative H1 antagonists, neuroleptics, antiepileptics	Diazepam	Excessive sedation; impaired psychomotor skills; possible respiratory depression
Levothyroxine	Epinephrine	Coronary insufficiency in patients with coronary artery disease
Propranolol, other beta blockers	Epinephrine	Marked hypertension and reflex bradycardia
Tricyclic antidepressants	Epinephrine	Hypertensive reaction and possible cardiac arrhythmias

NSAID: nonsteroidal anti-inflammatory drug.

[a]This list is constantly changing, with new medications and new drug interactions and toxicities reported. The dentist should consult with a contemporary electronic drug interaction program, pharmacist, or the treating physician before prescribing drugs.

Table 1.7 Common Dietary Supplement–Dental Drug Interactions

Dietary Supplement–Dental Drug	Potential Interaction[a]	Implication
Calcium		
+Doxycycline	Moderate	Reduced anti-infective effectiveness
+Tetracycline	Moderate	Reduced anti-infective effectiveness
Evening Primrose *(Oenothera biennis)*		
+Aspirin	Moderate	Enhanced bleeding
+Ibuprofen	Moderate	Enhanced bleeding
Ginko biloba extract		
+Aspirin	Major	Enhanced bleeding
+Ibuprofen	Major	Enhanced bleeding
St. John's wort *(H. perforatum)*		
+Azithromycin	Major	Possible photosensitivity reactions
+Benzodiazepines	Major	Reduced benzodiazepine effectiveness
+Clarithromycin	Major	Reduced anti-infective effectiveness
+Clindamycin	Major	Reduced anti-infective effectiveness
+Codeine	Major	Increase narcotic-induced sleep time and analgesia
+Dexamethasone	Major	Reduce dexamethasone effectiveness
+Diphenhydramine	Major	Possible photosensitivity reactions
+Doxycycline	Major	Reduced anti-infective effectiveness and Possible photosensitivity reactions
+Erythromycin	Major	Reduced anti-infective effectiveness
+Hydrocodone	Major	Increase narcotic-induced sleep time and analgesia
+Ibuprofen	Major	Possible photosensitivity reactions
+Oxycodone	Major	Increase narcotic-induced sleep time and analgesia
+Prednisone	Major	Reduced prednisone effectiveness
+Tetracycline	Major	Reduced anti-infective effectiveness
+Zaleplon	Major	Reduced zaleplon effectiveness
+Zolpidem	Major	Reduced zaleplon effectiveness

(Continued)

Table 1.7 *(Continued)*

Dietary Supplement–Dental Drug	Potential Interaction[a]	Implication
Valerian		
+Benzodiazepines	Major	Excess sedation
+Codeine	Major	Excess sedation
+Diphenhydramine	Major	Excess sedation
+Hydrocodone	Major	Excess sedation
+Oxycodone	Major	Excess sedation
+Zaleplon	Major	Excess sedation
+Zolpidem	Major	Excess sedation

Source: Adapted from Donaldson and Touger-Decker 2013.[21]
[a]Major: high severity and probable occurrence; moderate: moderate severity and probable occurrence or high severity and possible occurrence.

The dentist must ask about known drug "allergies." If an allergy is reported, the patient should be asked what physical response resulted from taking the medication. True drug allergy is most often an immediate type I immunoglobulin E (IgE)-mediated hypersensitivity involving inflammatory mediators, such as histamine and bradykinin, released from mast cells. This is often not seen at the first exposure to a drug that creates sensitization to the allergen, with the exception of the rare anaphylactoid toxic drug reaction. The inflammatory mediator release in true drug allergy leads to vasodilation, increased capillary permeability, and bronchoconstriction. Symptoms of true allergy include skin rash, pruritis (itching), urticaria (hives), and swelling of the lips, tongue, and throat; angioedema, shortness of breath, and wheezes and stridor; and syncope and cardiovascular collapse in anaphylaxis. True allergy to ester local anesthetics (procaine–novocaine, benzocaine) most often relates to the preservative para-aminobenzoic acid; however, true allergy to amide local anesthetics (lidocaine, mepivacaine, bupivacaine, prilocaine, articaine) is rare. More common reactions to local anesthetics are vasovagal or to the epinephrine.

Other drug reactions may be known side effects that are predictable negative consequences of a therapeutic dose of the drug, such as nausea and vomiting resulting from narcotics. There are additional known effects from overdosage or sensitivity to drugs, such as apnea and oversedation from benzodiazepines, or delirium from excessive pain medication use or toxicity from use of too much local anesthetic. Drug actions important to dentistry include alteration of hemostasis (anticoagulants and platelet inhibitors), immune suppression (cytotoxic chemotherapy, immunosuppressants, corticosteroids), and ability to withstand treatment (corticosteroids).

Medications taken for systemic disease management may also have oral sequelae, a common one being xerostomia related to salivary hypofunction. Side effects that involve the oral cavity may be first detected by the dentist (e.g., antihypertensive-induced lichenoid drug reaction) or may require management by the dental team (antidepressant/antipsychotic-induced xerostomia, dilantin-induced gingival overgrowth) when alternatives are unavailable. Common or important oral consequences of systemic drugs are shown in Table 1.8.

Table 1.8 Oral Consequences of Systemic Drugs

Oral Manifestation/Side Effect	Medications with Reported Oral Side Effect
Angioedema	ACE inhibitors, H2 blockers
Chemo-osteonecrosis of the jaw	Intravenous bisphosphonates (zolendronic acid, pamidornate, clodronate), oral bisphosphonates (alendronate, ibandronate, risedronate, etidronate, tilurdronate), other bone-modifying agents, such as denosumab
Erythema multiforme	Antimalarials, barbiturates, busulfan, carbamazepine, cefaclor, chlorpropamide, clindamycin, codeine, isoniazid, H2 blockers, methyldopa, penicillins, phenylbutazone, phenytoin, rifampin, salicylates, sulfonamides, tetracyclines
Gingival overgrowth	Calcium channel blockers (especially nifedipine and verapamil), cyclosporine, phenytoin
Glossitis/coated tongue	Amoxicillin, nitrofurantoin, tetracyclines, triamterine/hydrochlorothiazide
Lichenoid reactions	ACE inhibitors, allopurinol, chloropropamide, chloroquine, chlorothiazide, dapsone, furosemide, gold salts, methyldopa, NSAIDs, palladium, penicillamine, propranolol, phenothiazines, quinidine, spironolactone, streptomycin, tetracyclines, tolbutamide, triprolidine
Lupus erythematosus-like lesions	Griseofulvin, hydralazine, isoniazid, methyldopa, nitrofurantoin, penicillin, phenytoin, primidone, procainamide, rifampin, streptomycin, sulfonamides, tetracyclines, thiouracil, trimethadione
Stomatitis/oral ulceration	Carbamazepine, dideoxycytosine, enalapril, erythromycins, fluoxetine, ketoprofen, ofloxacin, piroxicam, cancer chemotherapeutic agents
Taste alteration	ACE inhibitors, albuterol, benzodiazepines, carbimazole, chlorhexidine, clofibrate, ethionamide, dimethyl sulfoxide, d-penicillamine, gold salts, griseofulvin, guanfacin, levodopa, lincomycin, lithium, methamphetamines, methocarbamol, metronidazole, nicotine, nortriptyline, phenindione, prednisone, sertraline, tranquilizers
Tooth discoloration	Chlorhexidine, nitrofurantoin, tetracyclines
Xerostomia	Anticholinergics, anticonvulsants, antidepressants, antihistamines, antihypertensives, antineoplastics, antiparkinsonians, antipsychotics, antispasmodics, central nervous system stimulants, diuretics, gastrointestinals, muscle relaxants, narcotics, HIV protease inhibitors, sympathomimetics, systemic bronchodilators

Ability to Tolerate Dental Care

A patient's ability to withstand dental treatment relates to both physiological and psychological stress that accompanies treatment. One response of the body to stress is release of catecholamines (epinephrine and norepinephrine) from the adrenal medulla into the cardiovascular system that results in an increased workload on the heart.[22] ASA classification[2] can provide a baseline health and stress tolerance status, with ASA 1 patients being the most stress tolerant and ASA 4 patients being the least tolerant, and most likely to need additional stress reduction techniques. Stress reduction should begin before and continue during and after dental treatment.

Physical or physiological stress of dental treatment may relate to the following:

- pain;
- time of day or length of appointment;
- dental chair position;
- use of local anesthetic with or without epinephrine.

Adequate pain control during the dental procedure is essential for patient comfort and safety. Most medically complex patients will prefer morning appointments when they are more rested and stress tolerant; however, patients with osteoarthritis may prefer short, afternoon appointments. Those with arthritis or skeletal deformities may require frequent positional changes and pillow or other supports. While full supine chair position is comfortable for many patients, those with congestive heart failure will have a limit to how far back they can be comfortably reclined without having breathing distress, and women in the third trimester of pregnancy may also need the back of the dental chair slightly elevated, with the ability to roll their torso to the left to treat or prevent supine positional hypotension. All patients will have small rises in their systolic and diastolic blood pressure and heart rate when given local anesthetic, with or without epinephrine, for dental treatment, and this effect is more marked in patients with underlying hypertension.[23]

Psychological stress of dental treatment may relate to:

- anxiety and
- fear.

Dental anxiety and fear are significant barriers to dental treatment. Stress reduction protocols are procedures and techniques used to minimize the stress during treatment, thus decreasing the risk to the patient.[22] A medical consultation may be needed to help gain information to determine the degree of risk and the modifications that might be helpful. Patient anxiety can be further reduced by the dental provider preoperatively reviewing with the patient the procedure and anticipated postoperative expectations for pain and the intended methods for obtaining adequate postoperative pain control, management of other anticipated consequences of care, and availability of and means of accessing the dentist should unanticipated after-hours questions or concerns arise.

Stress reduction considerations

- **Anxiolytic premedication:** benzodiazepine at bedtime night before appointment and 1 h prior to appointment
- **Appointment scheduling:** early in the day
- **Minimize waiting time:** in waiting room and dental chair
- **Preoperative and postoperative vital signs**: blood pressure, heart rate and rhythm, respiratory rate, pain score
- **Sedation during treatment:** iatrosedation (music and video distraction, hypnosis), nitrous oxide–oxygen analgesia or pharmacosedative procedures including oral, inhalational, intramuscular, intranasa, or intravenous (minimal or moderate) sedation or general anesthesia
- **Treatment duration:** short appointments

IV. Dental Management Modifications

When a medical risk assessment screening is completed, the dental provider develops an awareness of the medical complexity or risk status of the patient and can predict the possible complications related to the planned dental procedures. Complications may vary from minor to major or life threatening. Minor complications can be prevented or managed easily at home or at chairside, while major complications may require medical management and possible hospitalization. An understanding of the patient's underlying medical condition allows the dental provider to recommend modification before, during, or after the dental procedures in order to safely provide dental care.

Examples of modification *before dental treatment* include the following:

1. antibiotic prophylaxis;
2. scheduling the treatment at a certain time of day or day of the week around medical therapy such as insulin management, chemotherapy, or hemodialysis;
3. altering medication timing or dose, in consultation with the patient's physician;
4. steroid supplementation;
5. preoperative drug use (e.g., bronchodilator or hemostasis supportive medications);
6. preoperative blood product administration;
7. verification of last food intake;
8. obtaining day-of-procedure baseline blood pressure and heart rate;
9. verification of metabolic hemostasis with laboratory tests, such as glycosylated hemoglobin (HbA1C), blood glucose from finger stick, prothrombin time/international normalized ratio, platelet count, white blood cell count with absolute neutrophil count;
10. obtaining hyperbaric oxygen wound-healing enhancement;
11. defer care due to complexity;
12. choice of setting—outpatient clinic or operating room setting.

Examples of modification *during dental treatment* include the following:

1. stress management with anxiolytic oral agents or nitrous oxide–oxygen;
2. providing physical supports or rest breaks;
3. limiting dosage of local anesthetic;
4. avoiding use of certain medications;
5. maintaining adequacy of pain control;
6. assuring aseptic surgical technique or using preoperative oral antiseptic rinse;
7. application of local hemostatic agents;
8. using supplemental oxygen by nasal cannula.

Examples of modification *after dental treatment* include the following:

1. prescribing a therapeutic course of antibiotics;
2. use of postoperative antifibrinolytics;
3. postoperative stress management;
4. maintaining adequacy of pain control;
5. avoiding use of certain medications;
6. assuring appropriate and understood postoperative instructions.

V. Recommended Readings and Cited References

Recommended Readings

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