

# CHAPTER

## 1

### Preoperative Evaluation

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Preoperative patient evaluation is necessary and mandatory before any surgical procedure. Every attempt should be made to accurately assess each patient and arrive at an appropriate medical plan.

Oral and maxillofacial surgeons have many anesthetic options at their disposal: general anesthesia, conscious sedation, local anesthesia, or a combination. Each method has its advantages and disadvantages. The overall goal of the preoperative evaluation is to reduce perioperative morbidity and mortality. By being fully aware of the patient's physical and medical state, the surgeon should be able to anticipate and prepare for adverse events both expediently and appropriately. In addition, the practitioner can make alterations and adjustments in a patient's medical therapy to reduce perioperative adverse events. This chapter reviews the preoperative evaluation for oral and maxillofacial surgery patients.

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#### History and Physical Examination

Any patient undergoing an anesthetic for surgery requires a history and physical examination. To expedite the process, it is usually helpful if the patient fills out a medical history form before meeting with the surgeon. This form should clearly point out medical problems, previous surgery, social history, medications, and allergies. In addition,

the primary care physician, insurance information, employer demographics, important telephone numbers, date of birth, and other useful data can be included. Figure 1-1 is an example of a typical medical questionnaire. The oral and maxillofacial surgeon should review the medical questionnaire and explore any pertinent positives or negatives. For example, if the patient checked off allergy to penicillin, the surgeon should try to determine the type of reaction that occurred, the outcome, and any treatment that was performed.

Once the history and examination are completed, the patient's physical status can be determined, using the American Society of Anesthesiologists (ASA) classification system (Table 1-1). Depending on the patient's classification, additional preoperative studies or consultations may be required. Patients in class III or IV should be considered for further preoperative evaluation and possible hospitalization if they are deemed unable to tolerate a simple outpatient procedure. Patients in ASA class V will always require hospitalization.

Organization is critical in a patient evaluation. A useful method of achieving a thorough and accurate patient evaluation is through the systems approach, which may be thought of as a head-to-toe evaluation. This evaluation begins with the neurologic system and progresses through the cardiovascular, pulmonary, gastrointestinal, renal, endocrine, hematologic, immunologic, and musculoskeletal systems.

TABLE 1-1. American Society of Anesthesiologists Physical Status Classification

ASA Class*	Physical Status
I	A normal, healthy patient
II	A patient with mild to moderate systemic disease that is not functionally limiting
III	A patient with severe systemic disease that limits the patient's activity
IV	A patient with severe disease that is a constant threat to life
V	A moribund patient who is not expected to survive with or without an operation

\*An "E" may be added to each class to denote an urgent or emergent patient.

## Neurologic Evaluation

The neurologic evaluation is a necessary part of every preoperative work-up. If a history of a neurologic disease is elicited by survey or during the examination, further detailed questioning should ensue, such as length of time with the condition, present medications, and how the existing disease alters daily living. Basic principles of neurology and neuropathophysiology should be understood by surgeons treating patients with neurologic diseases.

The patient history should elicit any frank neurologic disease (Table 1-2). The review of symptoms (Table 1-3) records findings that may signify worsening of the disease process or alert the surgeon to other problems. The physical examination (Table 1-4) is then used to gauge progression and severity of the condition.

## CEREBROVASCULAR DISEASE

Cerebrovascular disease is the third most common cause of death in the United

TABLE 1-3. Review of Neurologic Symptoms

Dizziness
Headaches
Diplopia
Seizures
Weakness
Memory loss

States.<sup>1</sup> It occurs secondary to arteriosclerosis of the carotid, vertebral, and smaller branching arteries. Notably, atherosclerosis is also the major cause of coronary artery disease and peripheral vascular disease. In addition to being at risk for stroke, these patients are at risk for myocardial infarction (MI) perioperatively. Oddly, the risk for heart attack is higher than for stroke in this patient population. In 1981, Hertzner and Lees reported that the mortality rate for MI was much higher than that for neurologic diseases in post-carotid endarterectomy patients.<sup>2</sup>

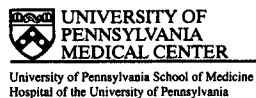
Evaluation of patients who have a history of cerebrovascular disease is critical. These patients may have findings ranging from stroke to transient ischemic attacks. Again, the review of symptoms and physical examination should gauge the level of disease progression and detect any new exacerbations. In acute stroke victims and patients with recent transient ischemic attacks, elective surgery should be delayed until the patient stabilizes. Additionally, the surgeon should confer with the primary care provider concerning preoperative recommendations. The waiting period involved is variable, depending on the patient and his or her associated premorbid medical conditions, such as coronary artery disease. Ferguson recommends waiting 3 to 4 weeks before evaluating post-cerebrovascular accident patients for surgery, unless surgery is urgently needed.<sup>3</sup> Additionally, if a new carotid bruit is picked up on physical examination, sur-

TABLE 1-2. Common Neurologic Diseases

Cerebrovascular disease
Epilepsy
Multiple sclerosis
Mental retardation
Parkinson's disease
Spinal cord injury

TABLE 1-4. Neurologic Physical Examination

Mental status examination
Sensory examination
Motor examination
Deep tendon reflexes
Cranial nerve examination



## HEALTH SURVEY

PATIENT NAME: \_\_\_\_\_

DATE OF BIRTH: \_\_\_\_\_ SEX: M F HT: \_\_\_\_\_ WT: \_\_\_\_\_

DAY PHONE: ( ) \_\_\_\_\_ EVENING PHONE: ( ) \_\_\_\_\_

FAMILY DOCTOR: \_\_\_\_\_

CITY: \_\_\_\_\_ PHONE: ( ) \_\_\_\_\_

DATE LAST SEEN: \_\_\_\_\_

## A. To your knowledge, do you now have or have you ever had any of the following:

	YES	NO		YES	NO		YES	NO
Any Loose or Chipped Teeth Now			Irregular Heart Beat			Scoliosis (curvature of spine)		
Caps/Bridges/Dentures/Bonding Root Canal/Crowns			Mitral Valve Prolapse			Weaknesses or Paralysis (Temporary or Permanent)		
Temporal Mandibular Joint Dis.			Heart Murmur			Head Injury		
Recent Cold, Bronchitis or Pneumonia			Rheumatic Fever			Epilepsy/Seizures		
History of Asthma or Wheezing			Liver Disease/Jaundice/Hepatitis			History of Anemia (low blood count)		
Tuberculosis or Silicosis			Stomach Ulcer			Sickle-Cell Anemia/Trait		
Sleep Apnea/Excessive Snoring			Chronic Heartburn			History of Bleeding or Bruising		
Shortness of Breath at Rest			Hiatal Hernia			Excess Bleeding from Surgery		
Shortness of Breath with Limited Exercise or at Night			Kidney Disorder			Blood Transfusion		
Cough or Lung Problems			Thyroid Disorder			Phlebitis/Blood Clots		
High Blood Pressure			Diabetes			Problems with poor circulation to feet/legs		
Heart Attack			Stroke/TIA			Skin Problems		
Heart Failure			Multiple Sclerosis or Polio			Hearing Problems		
Chest Discomfort or Tightness (Angina)			Chronic Back Problems			Vision Problems		

## B. Have you ever had any of the following:

	YES	NO			
An exam by a cardiologist (heart doctor)			If yes, Dr.'s Name	City	Phone: ( )
Heart Catheterization			If yes, where		Year
Exercise Stress Test			If yes, where		Year
Ultrasound of Heart (Echocardiogram)			If yes, where		Year
Pacemaker			If yes, Dr.'s Name	City	Phone: ( )

C. 1. Do you or have you ever smoked (including pipe/cigars)? ☐ No ☐ Yes

Number of packs/cigars per day \_\_\_\_\_ Number of years \_\_\_\_\_ When was your last cigarette, cigar, pipe? \_\_\_\_\_

2. Do you drink alcoholic beverages on a weekly basis? ☐ No ☐ Yes

If yes, how much do you typically drink in one week? \_\_\_\_\_

3. Are you pregnant? ☐ Not Applicable ☐ No ☐ Yes ☐ Not Sure ☐ Date of last menstrual period \_\_\_\_\_

(Please advise your anesthesiologist if there is any possibility you may be pregnant)

4. Do you now use a cane, crutches, walker or wheelchair? ☐ No ☐ Yes

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PLEASE COMPLETE BACK OF PAGE

FIGURE 1-1. A typical medical questionnaire required when undergoing an anesthetic for surgery. (Courtesy of University of Pennsylvania Medical Center.)

Illustration continued on following page

D. Are you on a special diet? ☐ No ☐ Yes If yes, describe: \_\_\_\_\_

E. Are you allergic to: Adhesive Tape? ☐ No ☐ Yes Any Medications? ☐ No ☐ Yes  
 Iodine on your skin? ☐ No ☐ Yes Any Food? ☐ No ☐ Yes  
 Latex? ☐ No ☐ Yes

Please List Allergies and the reaction they cause: \_\_\_\_\_

F. Please List all Medications you are presently taking, including dosage and frequency. Please include non-prescription medications, such as iron, aspirin, antacid, laxatives.

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

G. Have you taken any Aspirin or Aspirin-like product (Motrin, Advil, Nuprin) in the last 10 days? ☐ No ☐ Yes  
 If yes, what medication did you take? \_\_\_\_\_ When? \_\_\_\_\_

H. Please list all previous hospitalizations (surgery, childbirth, medical illness):

Date (approx. year)	Reason	Place (hospital or city)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

If you are scheduled for surgery or a hospital stay, please complete the following questions:

1. Have you or a blood relative ever had a problem with anesthesia? ☐ No ☐ Yes If yes, describe: \_\_\_\_\_

2. Do you have religious or moral objections to medically necessary blood transfusions? ☐ No ☐ Yes  
 If yes, describe: \_\_\_\_\_

3. Do you have any other special concerns? \_\_\_\_\_

Signature of Patient

Today's Date

FIGURE 1-1 Continued

gery should be delayed until an adequate work-up is performed.<sup>1</sup> This may involve ultrasonography, duplex scanning of the carotid arteries, and possibly carotid endarterectomy. It is always critical that the neurologist and/or primary care provider be involved in the surgical work-up. These providers are most familiar with the patient's disease progression and should be involved in perioperative management.

Patients with cardiovascular and cerebrovascular disease are often on some form of anticoagulation therapy, such as aspirin, warfarin (Coumadin), heparin, or low-molecular-weight heparin (Lovenox). As a general rule, anticoagulation is a contraindication to elective surgery because of the increased incidence of severe bleeding. Knowing which medications these patients are taking and their coagulation profile is a primary concern. To reduce the incidence of bleeding, these therapies are usually discontinued upon the approval of both the surgeon and the primary care physician (Table 1-5).<sup>4, 5</sup>

The coagulation profile includes the platelet count, prothrombin time (PT), and partial thromboplastin time (PTT), along with a bleeding time. Normal values for these tests are given in Table 1-6.<sup>6, 7</sup>

## EPILEPSY

Epilepsy, like cerebrovascular disease, is a relatively common neurologic disease. It results from abnormal neural discharges in the brain that spread and perpetuate themselves. Important questions to ask during the preoperative evaluation include those in Table 1-7.

The type of seizure disorder should be

TABLE 1-5. Presurgical Discontinuation of Common Oral Anticoagulants

Drug	Guidelines
Aspirin	Hold 1 wk or more before surgery, resume 6 h after surgery <sup>4</sup>
Warfarin	Hold 3-5 d before surgery, resume the day of surgery, strongly consider heparinization while off warfarin <sup>5</sup>
Heparin	Hold 4-6 h before surgery, resume 6-12 h after surgery

TABLE 1-6. Normal Values for Coagulation Studies

Study	Value
Prothrombin time	10.5-12.5 sec <sup>6</sup>
Partial thromboplastin time	24-38 sec <sup>6</sup>
Bleeding time	2-9 min <sup>7</sup>
Platelet count	140,000-450,000 cubic mm <sup>6</sup>

known. This can range from grand mal seizures with loss of consciousness to petit mal or absence seizures. The frequency of seizures and a patient's awareness of seizure onset are important to discern. Some patients may experience an aura before having a seizure, which is important for the surgeon to know.

As in all histories, medications that the patient takes should be known. If the therapeutic range is exceeded, these medications can have toxic side effects. The surgeon should be familiar with therapeutic range and potential side effects of all the common antiseizure medications (Table 1-8).<sup>8</sup> It is important to continue these medications up until the time of surgery and to keep their levels therapeutic. If the patient is unable to tolerate oral drugs, they should be given intravenously. Presently, however, there is no intravenous form of valproic acid or carbamazepine.<sup>9</sup> Patients who take these drugs for seizures need to be loaded with phenytoin or phenobarbital,<sup>9</sup> both of which can be continued intravenously at the same dose as is given orally.

## OTHER NEUROLOGIC CONDITIONS

Cerebrovascular disease and epilepsy are the neurologic diseases most commonly encountered by oral and maxillofacial sur-

TABLE 1-7. Questions to Ask Epileptic Patients

What type of seizure disorder do you have?
How long have you had this disorder?
When was your last seizure?
Do you lose bowel or bladder function?
What medication are you taking to control your seizures?

TABLE 1-8. Antiepileptic Drug Profile

Medication	Major Side Effects	Therapeutic Range
Phenytoin	Tremor, ataxia, vertigo, drowsiness	10–20 µg/mL
Phenobarbital	Dysarthria, drowsiness, mental slowing	15–35 µg/mL
Carbamazepine	Mental slowing, ataxia, aplastic anemia	2–10 µg/mL
Valproic acid	Increased appetite, hair loss, hepatic toxicity	50–100 µg/mL

From Ferri FF: Care of the Medical Patient, ed 2. St. Louis, Mosby, 1991.

geons. However, there is an ever increasing elderly population that may be affected by a variety of neurologic conditions, including degenerative processes of the brain such as Alzheimer's disease and Parkinson's disease. Medical and surgical decisions and treatment will be influenced by these processes. With this elderly patient group, potential drug interactions are a real concern, particularly when anesthesia is involved. Proper planning and adjustments are critical to the patient's well-being.

Mention should also be made of mentally challenged patients. These patients often present with significant medical histories and may have unique behavioral derangements. The usual surgical situation involves performing dentoalveolar procedures. Depending on the degree of intellectual impairment and the level of anxiety, office procedures may be next to impossible. Even routine extractions may require a general anesthetic. In these instances, hospitalization is recommended, which allows for a controlled environment. Preoperative planning should be carried out through a competent mediator for such patients, usually a parent or guardian.

### Cardiovascular Evaluation

Hypertension is the most prevalent form of cardiovascular disease (affecting 60 mil-

lion people), but coronary artery disease causes the highest morbidity (7 million people) in the United States.<sup>10</sup> Perioperative cardiac morbidity is the most common cause of death following noncardiac surgical procedures.<sup>10</sup> In patients with a history of coronary artery disease, there is a 2.4% mortality rate, versus 0.5% for patients without coronary artery disease.<sup>11</sup>

The history and physical examination should evaluate whether a patient is at increased risk for a significant cardiac event. Table 1-9 lists common cardiovascular diseases that should be evaluated in the preoperative work-up. In addition, the review of symptoms (Table 1-10) can quantitate the severity of cardiovascular compromise. The physical examination should evaluate for the conditions listed in Table 1-11.

In 1977, Goldman and colleagues reported a study that gave each patient a cardiac risk index.<sup>12</sup> The cardiac risk index reports the perioperative outcome but does not diagnose cardiac disease. They gave a point value to each independent variable that affected risk for life-threatening complications and cardiac death (Table 1-12). They then took these variables and combined them to come up with a point range to signify the potential for cardiac complications in each patient (Table 1-13). It is helpful to understand the potential for cardiac risk when performing noncardiac surgery

TABLE 1-9. Common Cardiovascular Diseases

Coronary artery disease
Hypertension
Congestive heart failure
Valvular disorders
Arrhythmias
Cardiomyopathy

TABLE 1-10. Review of Cardiovascular Symptoms

Angina
Exercise intolerance
Dyspnea
Syncope
Orthopnea
Paroxysmal nocturnal dyspnea
Palpitations

TABLE 1-11. Cardiovascular Physical Examination Findings

Hypertension
Jugular venous distention
Heart murmurs
Rales
Peripheral edema
S3 or S4 heart sounds
Rapid or irregular pulse

on a patient. The Goldman study is just one of many that attempt to predict cardiac morbidity and mortality based on history and examination findings. Although it provides useful guidelines, its predictive value is limited by the low numbers of patients in the study.<sup>13</sup>

### CORONARY ARTERY DISEASE

Coronary artery disease occurs as a result of chronic arteriosclerosis. Angina typically occurs when the oxygen supply to the heart is inadequate. Angina is commonly expressed as left-sided chest pain that may or may not radiate to the left arm or jaw. It may be associated with exercise or occur at rest.

Patients with coronary artery disease should be questioned carefully about symptoms of angina. A determination should be made whether it is stable or unstable (i.e., increasing in severity, frequency, or duration). Patients with unstable angina should

be seen by a cardiologist to determine the need for additional medical or surgical intervention. Present medications are elicited, as is any significant surgical history. Crawford and associates showed that coronary artery bypass grafting (CABG) is protective to patients with a history of coronary artery disease undergoing noncardiac surgery, but the elective procedure should be performed at least 30 days after the CABG.<sup>14</sup> This study also showed that 6 of 358 patients who underwent 484 noncoronary operations after CABG suffered MIs, and 4 of the 6 died.<sup>14</sup> Of those 6 patients, all had noncardiac surgery within 30 days of CABG.

Preoperative testing should include a chest radiograph and an electrocardiogram (ECG). The ECG is an excellent study to evaluate for arrhythmias, ischemia, and electrolyte abnormalities. A chest radiograph is useful in the evaluation of the lung fields and the heart. For example, pulmonary edema, pleural effusions, and cardiomegaly, which are findings consistent with congestive heart failure, may all be demonstrated on the chest radiograph. Hospitals have set forth guidelines for obtaining chest radiographs and ECGs based on age and presence of disease. Further tests may be required upon consultation with the patient's cardiologist, including stress testing, transthoracic echocardiography, dipyridamole thallium scan, dobutamine stress testing and coronary angiogram, to name a few.

Patients should delay elective surgery at least 3 months following an MI. This delay is supported by studies by Tarhan and co-

TABLE 1-12. Cardiac Risk Index Independent Values

Variable	Point Value	Life-Threatening Complication (Number of Patients)	Cardiac Death (Number of Patients)
Third heart sound or jugular venous distention	11	5/35	7/35
Recent myocardial infarction	10	3/22	5/22
Nonsinus rhythm or premature atrial contractions	7	11/112	10/112
More than 5 premature ventricular contractions	7	7/44	6/44
Age >70 yr	5	19/324	16/324
Emergency surgery	4	16/197	10/197
Poor general medical condition	3	25/362	13/362
Intraperitoneal/thoracic/aortic procedure	3	32/437	11/437
Significant valvular stenosis	3	1/23	3/23

From Goldman L, Caldera DL, Nussbaum SR, et al: Multifactorial index of cardiac risk in noncardiac surgical patients. *N Engl J Med* 1977;297:845. Copyright © 1977 Massachusetts Medical Society. All rights reserved.

TABLE 1-13. Goldman Classification for Potential Cardiac Complications

Class	Number of Patients	Point Range	Percent Cardiac Complaint
I	5/537	0-5	1
II	21/316	6-12	7
III	18/130	13-25	14
IV	14/18	>26	78

From Goldman L, Caldera DL, Nussbaum SR, et al: Multifactorial index of cardiac risk in the noncardiac surgical patients. *N Engl J Med* 1977;297:845. Copyright © 1977 Massachusetts Medical Society. All rights reserved.

workers<sup>15</sup> and Steen and colleagues<sup>16</sup> (Table 1-14).

### HYPERTENSION

Hypertension can be defined as persistent systolic blood pressure greater or equal to 140 mm Hg or diastolic blood pressure greater than or equal to 90 mm Hg. This disease affects nearly 60 million Americans and leads to significant end-organ damage.<sup>17</sup> These patients have a two- to threefold higher incidence of coronary artery disease and an eightfold higher incidence of stroke.<sup>18</sup>

All preoperative patients should have their vital signs recorded, including temperature, pulse, blood pressure, and respiratory rate. If an elevated pressure is noted, it should be rechecked at three separate intervals. This may lead to a new diagnosis or to an adjustment in the patient's medication profile. Persistent hypertension requires evaluation by the patient's primary care physician.

TABLE 1-14. Incidence of Perioperative Reinfarction Following a Myocardial Infarction

Time Since Myocardial Infarction (months)	Percent Reinfarction
0-3	30
4-6	13
7-12	5.5
13-24	4.2
>24	4.1

From combined Mayo Clinic data from Tarhan S, Moffitt EA, Taylor WF, et al: Myocardial infarction after general anesthesia. *JAMA* 1972;220:1451; and Steen PA, Tinker JH, Tarhan S: Myocardial reinfarction after anesthesia and surgery. *JAMA* 1978;239:2566.

A list of medications taken and their doses should be elicited. This enables the surgeon to manage baseline hypertension and adjust medications accordingly. Patients with hypertension and/or coronary artery disease are instructed to continue their medication up until the time of surgery, except for diuretics, which are discontinued the day before surgery.<sup>19</sup> If any question arises, the cardiologist or primary care provider should be consulted. Table 1-15 lists cardiac medications and their use before surgery.

### VALVULAR HEART DISEASE

The preoperative evaluation of patients with valvular heart disease should determine the type of valvular disorder. Most patients can inform the practitioner that they have a heart murmur, but they may not know the type. Cardiac auscultation by the surgeon may help isolate the site of a murmur. An accurate test in determining the type of valvular disorder is echocardiography. To supplement this study, cardiac catheterization can be performed to assess the severity of valvular disease.<sup>20</sup> These tests are usually ordered in conjunction

TABLE 1-15. Cardiac Medications and Surgery

Condition	Guidelines
Hypertension	All medications should be continued before surgery except diuretics to prevent intravascular volume depletion <sup>19</sup>
Coronary artery disease	All medications except diuretics are continued



TABLE 1-16. Valvular Defects Associated with Endocarditis

**High-Risk Category**

Prosthetic cardiac valves, including bioprosthetic and homograft valves  
Previous bacterial endocarditis  
Complex cyanotic congenital heart disease (e.g., single ventricle states, transposition of great arteries, tetralogy of Fallot)  
Surgically constructed systemic pulmonary shunts or conduits

**Moderate-Risk Category**

Most other cardiac malformations  
Acquired valvular dysfunction  
Hypertrophic cardiomyopathy  
Mitral valve prolapse with valvular regurgitation and/or thickened leaflets

with the primary care physician or cardiologist.

The valvular disease associated with the highest perioperative morbidity and mortality is aortic stenosis, as proved by Skinner and Pearce.<sup>21</sup> Aortic stenosis has the highest predictive value of all the valvular diseases in leading to perioperative cardiac morbidity and mortality.<sup>12</sup> If the patient is unsure of his or her diagnosis, a cardiologist or the primary care provider should be consulted.

Valvular heart disease may be congenital or acquired and result in an individual valve being stenotic or regurgitant (insufficient). The majority of valvular heart abnormalities require systemic bacterial endocarditis prophylaxis. Table 1-16 shows valvular defects requiring antibiotic prophylaxis according to the American Heart Association,

TABLE 1-17. American Heart Association Recommendations for Antimicrobial Prophylaxis for Dental Procedures

Dental extractions  
Periodontal procedures, including surgery, scaling and root planing, probing, and recall maintenance  
Dental implant placement and reimplantation of avulsed teeth  
Endodontic (root canal) instrumentation and surgery beyond the apex  
Subgingival placement of antibiotic fibers or strips  
Initial placement of orthodontic bands but not brackets  
Intraligamentary local anesthetic injections

Table 1-17 lists procedures that require antibiotic prophylaxis, and Table 1-18 lists the antibiotics used in systemic bacterial endocarditis prophylaxis.

## OTHER CARDIAC DISEASES

Other cardiac conditions that the surgeon should be familiar with include congestive heart failure and arrhythmias. Some cardiac diseases, such as cardiomyopathies and cardiac tumors, are uncommon and are not discussed here.

The S3 heart sound and jugular venous distention were given the highest point values in Goldman's cardiac risk index.<sup>12</sup> Both these findings are suggestive of congestive heart failure. Patients with this condition often have a history of long-standing coro-

TABLE 1-18. American Heart Association (AHA) Guidelines for Antibiotic Prophylaxis

AHA Class	Drug and Dose
I: standard general prophylaxis for patients at risk	Amoxicillin: adults, 2 g (children, 50 mg/kg) given 1 h before procedure
II: unable to take oral medications	Ampicillin: adults, 2 g (children, 50 mg/kg) given IM or IV 30 min before procedure
III: amoxicillin/ampicillin/penicillin allergic patients	Clindamycin: adults, 600 mg (children, 20 mg/kg) given orally 1 h before procedure or Cephalexin* or cefadroxil*: adults, 2 g (children, 50 mg/kg) orally 1 h before procedure or Azithromycin or clarithromycin: adults, 500 mg (children, 15 mg/kg) orally 1 h before procedure
IV: amoxicillin/ampicillin/penicillin allergic patients unable to take oral medications	Clindamycin: adults, 600 mg (children, 20 mg/kg) IV 30 min before procedure or Cephazolin: adults, 1 g (children, 20 mg/kg) IM or IV 30 min before procedure

\*Cephalosporins should not be used in patients with immediate-type hypersensitivity reaction to penicillins.

nary artery disease that, over time, has caused a decrease in cardiac function and reserve. If the ejection fraction is reduced significantly, clinical signs of congestive heart failure may occur, including peripheral edema, pulmonary edema, and reduced exercise tolerance. These patients are often on medications such as digitalis to augment the ejection fraction and diuretics to reduce fluid overload. Preoperatively, one should assess the degree of congestive heart failure, determine which medications are being taken, check the digitalis level, and know the current cardiac function and ejection fraction.

The preoperative evaluation should also include questions about history, signs, and symptoms of arrhythmias. There are numerous cardiac arrhythmias, including atrial fibrillation, paroxysmal atrial tachycardia, sinus arrhythmias, and premature ventricular contraction, to mention a few (Table 1-19). The most significant preoperative arrhythmias are atrial fibrillation, frequent premature ventricular contractions, and any rhythm other than normal sinus rhythm. These arrhythmias are independent predictors of morbidity and mortality in patients undergoing noncardiac surgery. Asymptomatic heart block does not appear to increase perioperative risk.<sup>10</sup> Patients with symptomatic heart block, such as sick sinus syndrome and second- and third-degree heart block, may require a temporary pacemaker before surgery.<sup>22</sup> The importance of the perioperative ECG cannot be stressed enough for these patients. Patients with atrial fibrillation may be on anticoagulation and antiarrhythmic therapies. Anticoagulants may need to be discontinued before surgery, but antiarrhythmic medications should be continued until the time of surgery.

TABLE 1-19. Arrhythmias

Bradyarrhythmias	Tachyarrhythmias
Sinus	Sinus
Sinus node dysfunction	Ectopic
Sick sinus syndrome	Paroxysmal atrial
Wolff-Parkinson-White syndrome	tachycardia
Atrioventricular nodal block	Atrial flutter
	Atrial fibrillation

TABLE 1-20.

## Common Pulmonary Conditions

Chronic obstructive pulmonary disease (asthma, chronic bronchitis, emphysema, bronchiectasis)  
Upper respiratory tract infection  
Pneumonia  
Cystic fibrosis

Finally, checking electrolyte levels, such as potassium, magnesium, and calcium, is important, especially in this patient population. Correcting any imbalances preoperatively may reduce the incidence of intraoperative and postoperative arrhythmias.

## Pulmonary Evaluation

Pulmonary insufficiency is a major cause of mortality in the United States, second only to coronary artery disease.<sup>23</sup> Patients with preexisting lung disease have a higher risk of postoperative pulmonary complications.<sup>24</sup> History taking informs the surgeon of the type of pulmonary disease, the duration of disease, and the need for further evaluation. Common pulmonary entities include chronic obstructive pulmonary disease, upper respiratory infection, and restrictive lung disease (Table 1-20); additionally, smoking has an effect on pulmonary function. The severity of disease should be assessed, and the system review should elicit symptoms of pulmonary disease (Table 1-21). The physical examination identifies markers or signs of pulmonary disease (Table 1-22).

It is important to identify all these factors before surgery. There is always the risk of postoperative pulmonary morbidity, even in a healthy patient. The prevalence of postoperative pulmonary complications is much

TABLE 1-21.

## Symptoms of Pulmonary Disease

Dyspnea  
Cough  
Hemoptysis  
Sputum production  
Rhinorrhea

higher in patients with active pulmonary disease.<sup>24</sup> These complications include atelectasis, infection, exacerbation of existing pulmonary disease, prolonged mechanical ventilation, and respiratory failure.<sup>24</sup> In patients with mild pulmonary disease, a chest radiograph may be the only study needed. Patients with moderate to severe disease may require pulmonary function testing, arterial blood gas analysis, and medical management. The goal is to evaluate and optimize pulmonary function preoperatively.

Rhoads recommends that patients with new-onset upper respiratory infections postpone surgery for 2 to 3 weeks, or until complete resolution of the infection.<sup>25</sup> If the surgery is emergent, the surgeon should realize that there is an increased incidence of postoperative complications following general anesthesia in these patients.

## ASTHMA

Asthma is a common pulmonary disorder that may have significant perioperative morbidity and mortality. The asthmatic history should include prior hospitalizations, emergency department visits over the past 2 years, steroid use, and present treatments (Table 1-23). This will help determine disease severity. Pulmonary function studies may also need to be obtained to assess the severity of disease and the degree of improvement, if any, with bronchodilators.

In managing these individuals, all preoperative medications should be continued. Active asthmatics on inhalers should use their inhalers the night before and the morning of surgery.<sup>23</sup> Theophylline therapy, corticosteroid therapy, and avoidance of beta blockers are important considerations when general anesthetics and intubation are performed on asthmatics.<sup>26</sup>

In individuals who have taken supra-

TABLE 1-23.

### Questions to Ask Asthmatic Patients

Have you ever been hospitalized? If yes, how many times?
How many visits to the emergency department have you made over the past year?
Are you taking any medications for your asthma?
Have you taken them today?
Have you taken any systemic steroids for your asthma in the past 2 years?
Have you ever needed to be intubated or mechanically ventilated for your asthma?

physiologic doses of systemic steroids for prolonged periods over the past 2 years, one should consider the possibility of adrenal suppression. Stress-dose steroids both preoperatively and postoperatively require strong consideration.

## SMOKING

It is known that smokers have a higher incidence of postoperative pulmonary complications than nonsmokers. In a study by Wightman, the rate of postoperative pulmonary complications in patients undergoing abdominal procedures was 14.7% in smokers and 6.3% in nonsmokers.<sup>27</sup> Pearce and Jones determined a time frame within which discontinuing smoking preoperatively would reduce postoperative morbidity and mortality.<sup>28</sup> They looked at the effects of carbon monoxide and nicotine systematically and determined how long it took for these substances to exit the body. They found that 48 hours' abstinence from smoking would reduce both carbon monoxide and nicotine levels, which would benefit patients undergoing general anesthesia.<sup>28</sup>

Smoking also decreases the function of bronchial cilia, which increases the incidence of chronic tracheobronchitis. The buildup of mucus in the bronchial tree requires frequent coughing for clearance, and postoperatively, many patients have a decreased ability to cough secondary to pain or the latent effects of anesthesia. Abstinence from smoking for 4 to 8 weeks improves ciliary function and decreases sputum production.<sup>29</sup> In addition, this longer period of cessation has been shown to improve pulmonary function to some extent.<sup>28</sup>

Smoking is a difficult habit to break, but

TABLE 1-22.

### Signs of Pulmonary Disease

Wheezing
Crackles
Rales
Clubbing
Cyanosis
Barrel-shaped chest
Accessory muscle use

**TABLE 1-24. Prophylactic Measures for Patients with Pulmonary Disease**

Smoking cessation
Bronchodilators
Corticosteroids
Antibiotics
Chest physiotherapy
Weight reduction in obese patients
Preoperative education, including incentive spirometry use

all patients who smoke should be given this information and weigh the risks and benefits for themselves. Patients who stop smoking 12 to 24 hours before surgery do not have a decreased incidence of postoperative pulmonary complications.<sup>30</sup>

In summary, pulmonary diseases are significant causes of postoperative morbidity and mortality. Careful evaluation and appropriate medical therapy should continue throughout the perioperative period. In addition, patients with severe disease should undergo pulmonary function testing and possible evaluation by a pulmonary specialist. New medications should be started preoperatively if needed for moderate to severe disease. Postoperative pulmonary toilet in any surgical patient has proved to be beneficial. Preoperative prophylactic measures in patients with pulmonary risk factors are shown in Table 1-24.

## Gastrointestinal Evaluation

Evaluation begins by inquiry into gastrointestinal-related disorders (Table 1-25). A thorough history includes evaluation for dis-

**TABLE 1-25. Gastrointestinal-Related Disorders**

Gastroesophageal reflux disease
Hiatal hernia
Gastritis
Gastroparesis
Pancreatitis
Peptic ulcer disease
Inflammatory bowel disease
Cirrhosis
Hepatitis

**TABLE 1-26. Review of Gastrointestinal Symptoms**

Dyspepsia (heartburn)	Gastrointestinal bleeding
Abdominal pain	Steatorrhea
Nausea	Pruritus
Vomiting	Fatigue
Diarrhea	Melena
Hematochezia	

ease progression, therapeutic treatments, and onset of new symptoms (Table 1-26). If new symptoms are present, a physical examination and necessary laboratory testing should be performed. Table 1-27 lists examination findings that may lead one to suspect a gastrointestinal disorder. Many of these findings indicate a chronic form of gastrointestinal disease.

The gastrointestinal system is involved in absorption of nutrients, systemic metabolism, drug metabolism, hormonal production, and protein synthesis. Overall, gastrointestinal disease can affect wound healing, fluid and electrolyte balance, the clotting cascade, and the half-lives of many medications.

## GASTROESOPHAGEAL REFLUX DISEASE

Esophageal reflux occurs when gastric contents percolate through a loose lower esophageal sphincter. This can occur in patients with esophageal motility disorders, obesity, gastroparesis, hiatal hernia, and peptic ulcer disease. When performing the history, all these disorders should be ruled out.

Patients with gastroesophageal reflux disease (GERD) often complain of dyspepsia either following meals or when lying in bed at night. The surgeon should always be

**TABLE 1-27. Gastrointestinal Physical Examination Findings**

Palpable abdominal mass	Spider angioma
Ascites	Palmar erythema
Icterus	Heme-positive stool
Hepatosplenomegaly	Delirium
Jaundice	

aware of these symptoms because of the increased risk of aspiration during anesthesia in these patients.<sup>23</sup> Aspiration of gastric contents is a critical concern to all practitioners performing general anesthesia and conscious sedation, because sequelae from aspiration can be disastrous. These include airway obstruction, chemical pneumonitis, and the development of adult respiratory distress syndrome. Fasting for elective surgical patients is mandatory. A usual protocol is for patients to take nothing by mouth (NPO) after midnight before a morning procedure. For an afternoon procedure, a liquid breakfast is allowed, and the patient is told to be NPO 6 hours before the surgery. Prophylactic H<sub>2</sub> blockers or a nonparticulate antacid (e.g., Bicitra) is useful before the surgical procedure in patients with GERD or gastrointestinal dysmotility.<sup>31</sup> These drugs may not prevent aspiration, but they raise the gastric pH to greater than 2.5. This, in turn, protects the pulmonary tissues from the low pH of gastric acid, which, when aspirated, can cause a severe chemical pneumonitis in the lungs. This chemical pneumonitis has the potential to develop into adult respiratory distress syndrome or aspiration pneumonia.

Additional airway protection in the form of rapid-sequence intubation with cricoid pressure is often used when these patients undergo general anesthesia.<sup>23</sup> Finally, to assist with gastric emptying, medications such as metoclopramide (Reglan) can be used before the surgical procedure.<sup>31</sup> This reduces the volume of gastric contents that can potentially be aspirated. Table 1-28 lists several drugs that may be useful when aspiration is a major concern, especially in patients with GERD, peptic ulcer disease, obesity, diabetics with dysmotility, and pregnancy.

Patients with peptic ulcer disease should be told to continue their gastrointestinal medications before surgery. These might in-

clude antacids, H<sub>2</sub> blockers, and other drugs that inhibit gastric acid secretion, such as omeprazole.<sup>32</sup> These patients are at higher risk for postoperative gastrointestinal bleeding, usually from the upper gastrointestinal tract.

## INFLAMMATORY BOWEL DISEASE

Inflammatory bowel disease encompasses a variety of gastrointestinal disorders, including ulcerative colitis and Crohn's disease. These patients have often undergone multiple intestinal explorations and resections. This can lead to nutritional deficiencies and electrolyte disorders secondary to a reduced intestinal surface area and malabsorption states.<sup>32</sup> Nutritional deficiency, in turn, can lead to poor wound healing. In a patient treated with supraphysiologic doses of steroids, impaired wound healing, adrenal suppression, and immunosuppression may result. One needs to consider stress-dose steroids, nutritional supplementation, and careful wound management in this patient population.<sup>32</sup>

## HEPATITIS AND CIRRHOSIS

Hepatitis can be viral, alcoholic, or drug induced. Of major concern to every health care provider is the hepatitis B virus, which can be transferred via blood and body fluids. Strict universal precautions should be adhered to when working on any patient, but especially on those known to have the hepatitis B or C virus.

On physical examination, an enlarged, palpable liver may be noted. Laboratory values may reveal clotting abnormalities and protein synthesis impairment. If the chronic hepatitis has led to cirrhosis, it is almost certain that there will be many systemic effects, including altered drug metabolism; altered clotting function; altered carbohydrate, fat, and protein metabolism; and altered nitrogen balance.<sup>33</sup> Many drugs, including those used for anesthesia, are metabolized by the liver. With liver failure, the breakdown of these drugs is slowed, and drug effects (therapeutic and toxic) can be prolonged if the dosing is not adjusted. Some drugs to be concerned about in patients with cirrhosis who are to undergo

TABLE 1-28. Gastrointestinal Medications

Ranitidine
Cimetidine
Omeprazole
Antacids
Metoclopramide
Cisapride

anesthesia include those listed in Table 1-29.<sup>33</sup> Many of these drugs are commonly used when performing conscious sedation and general anesthesia. A safe technique when administering these agents to patients with cirrhosis is to use significantly lower dosages and to titrate to a desired effect. In a study by Cayer and Sohmer, the presence of ascites, hypoalbuminemia, prolonged PT, and anemia correlated with an increased operative mortality.<sup>34</sup> It is therefore suggested that these findings be known before surgery in this patient population.

Clotting function may be altered considerably by this disease process. The liver is intimately involved in the production of clotting factors, especially factors II, VII, IX, and X. With liver failure, these proteins are produced in much lower amounts,<sup>35</sup> and patients may experience severe bleeding problems during surgery. The PT, PTT, international normalized ratio (INR), and platelet levels should be checked. If the INR is greater than 1.5 times normal, replacement of clotting factor with fresh frozen plasma (FFP) is necessary.<sup>32</sup> The effect of FFP is limited in duration by factor VII, which has a half-life of 4 to 8 hours.<sup>36</sup> Therefore, FFP is given immediately before and/or during surgery. A platelet count of greater than 50,000 should be the cutoff in considering platelet transfusion before surgery.<sup>32</sup> Bleeding time can be checked to determine qualitative platelet function. If this is abnormal, one must consider both platelet and FFP transfusion.

Vitamin K therapy may be useful in some patients with liver disease, and its effects may be noticed within 24 hours.<sup>32</sup> Vitamin K is required for the production of factors II, VII, IX, and X (vitamin K-dependent clotting factors). When there is a deficiency

of vitamin K, the PT is elevated. This can significantly affect operative blood loss.

The liver is also intimately involved in carbohydrate, fat, and protein metabolism. Dysfunction may lead to malnutrition and poor wound healing. Additionally, albumin production is often reduced. This leads to the collection of ascites (third spacing) within the abdominal cavity, which may lead to hepatorenal syndrome.

Finally, the liver is responsible for urea synthesis during protein catabolism. In liver failure, serum ammonia levels may build up secondary to reduced urea synthesis, and this may lead to hepatic encephalopathy.<sup>37</sup> For this reason, a careful mental status examination should be performed on these patients.

To fully assess liver function, liver function tests, including aspartate aminotransferase, alanine aminotransferase, gamma glutamyl transpeptidase GGT bilirubin, alkaline phosphatase, lactate dehydrogenase, albumin, and a coagulation profile, are performed when indicated. The patient should also be questioned concerning alcohol use, intravenous drug use, and recent travel.

In summary, gastrointestinal disorders can have an impact on operative morbidity and mortality in managing elective oral and maxillofacial surgery cases. It is imperative to understand the disease processes and to manage them appropriately preoperatively. The goal is to optimize clotting function, nutritional status, and electrolyte levels, as well as to decrease the risk of aspiration and gastrointestinal bleeding.

## Renal Evaluation

Preoperative evaluation of a patient suspected of having renal disease should address multiple issues, including fluid and electrolyte imbalances, anemia, infection, clotting abnormalities, and drug clearance issues. To gain an understanding of the type and severity of the renal condition, several questions should be asked (Table 1-30). The examiner should be able to elicit a history of kidney disease. Renal diseases that should concern the oral and maxillofacial surgeon are listed in Table 1-31. The review of symptoms should attempt to elicit specific symptoms of kidney disease (Table 1-32),

TABLE 1-29.

### Drug Metabolism Altered by Cirrhosis

Diazepam  
Midazolam  
Demerol  
Morphine  
Beta blockers  
Lidocaine  
Cimetidine

TABLE 1-30.

**Questions to Ask Patients with Renal Disease**

Do you have any kidney or renal problems?  
 Have you ever had kidney failure in the past?  
 Have you ever been treated with dialysis?  
 Have you ever had a kidney stone or infection?

although many may be nonspecific. The physical examination may reveal signs of renal disease (Table 1-33).

Whether the patient has end-stage renal disease or mild renal insufficiency, the objective is to perform the necessary surgery while minimizing complications. When patients are diagnosed with a renal infection before elective surgery, a few important steps need to be taken. Before antibiotic therapy, a clean-catch urine sample needs to be obtained. Patients with urinary tract infections can be started on the appropriate antibiotic, beginning with coverage for gram-negative organisms. A urology consultation should be considered if a more severe infection, such as pyelonephritis, is suspected.

A complete laboratory evaluation, including a urinalysis, chemistry panel, blood urea nitrogen, and creatine levels, should be obtained to assess renal function. Additionally, it is prudent to check the complete blood count and bleeding time in patients with end-stage renal disease to evaluate for a possible anemia or coagulopathy.

The perioperative goal in managing patients with mild to moderate renal failure is to avoid worsening their renal function. Several drugs are capable of causing acute renal failure perioperatively (Table 1-34).<sup>38</sup>

**END-STAGE RENAL DISEASE**

Altered physiology in end-stage renal disease presents many challenges to surgeons. These patients must be evaluated at many

TABLE 1-31.

**Common Renal Diseases**

Nephrolithiasis  
 Pyelonephritis  
 Congenital disorders (polycystic kidney disease)  
 End-stage renal disease  
 Renal failure

TABLE 1-32.

**Symptoms of Renal and Urologic Diseases**

Urgency to void  
 Frequent voiding  
 Pain upon voiding  
 Fluid overload  
 Congestive heart failure  
 Fatigue  
 Decreased exercise capacity  
 Easy bruising  
 Bleeding

levels, including a search for anemia, coagulopathy, cardiovascular insufficiency, electrolyte imbalance, altered drug clearance, and the potential for infectious complications.<sup>39</sup> The kidney is the only source of erythropoietin, which is essential for the production of red blood cells from hematopoietic tissues. In end-stage renal disease, the lack of erythropoietin leads to anemia. This can be partially corrected with an erythropoietin substitute (Epogen).<sup>40</sup>

Bleeding abnormalities may occur because of platelet malfunction. The uremic state of end-stage renal disease leads to qualitative platelet defects, which may lead to easy bruising and hemorrhage.<sup>40</sup> Because of the kidney's involvement in fluid balance, when dysfunction occurs, intravascular volume control and cardiac function may be compromised. Additionally, rapid changes in volume with dialysis may be poorly tolerated by some patients.

Abnormalities occur secondary to the kidney's regulatory role in the regulation of many electrolytes (Table 1-35 shows normal values). There is also an impairment of immunologic function in patients with renal failure, secondary to malnutrition.<sup>41</sup> Additionally, patients on chronic dialysis have functional defects of neutrophils, monocytes, and macrophages.<sup>42</sup> These factors lead to poor wound healing and an increased incidence of wound infection in this patient population.

TABLE 1-33.

**Renal Physical Examination Findings**

Costovertebral angle tenderness  
 Peripheral/pulmonary edema  
 Hypertension

TABLE 1-34. Nephrotoxic Drugs

Aminoglycosides
Contrast material
Nonsteroidal anti-inflammatory drugs in high doses
Chemotherapeutic agents

Because the clearance of drugs and their metabolites is reduced in renal failure, the pharmacologic effects of many drugs may be prolonged if the dose is not adjusted for renal function.<sup>43</sup> For example, narcotic analgesics are associated with excessive sedation and apnea, secondary to the impairment in renal elimination.<sup>44</sup> Therefore, lower doses of many drugs are required in renal failure. The function of the kidney can be assessed with a creatine level and calculation of the creatinine clearance. The creatinine clearance can be determined with the formula

$$\text{Clearance} = \frac{\text{urine creatinine} \times \text{total urine volume}}{\text{plasma creatinine} \times \text{time}}$$

Recommendations for the evaluation of patients with end-stage renal disease include<sup>40</sup>:

1. Check the hemoglobin level. If it is low (8 g/dL) but sustained and tolerated (i.e., chronic), no treatment is necessary in minimal blood loss procedures. If the hemoglobin level is decreased acutely, the patient may need a transfusion. Further investigation is warranted.
2. Get a coagulation profile. Platelet function, which may be decreased by uremia, needs to be evaluated.<sup>45</sup> This is accomplished by performing a bleeding time. If platelet function is altered,

consider desmopressin, dialysis 24 hours before surgery, and/or cryoprecipitate.<sup>40</sup> Dialysis 24 hours in advance of surgery is the standard hemostatic therapy in patients with end-stage renal disease.<sup>40</sup>

3. Evaluate the patient for both coronary artery disease and congestive heart failure by history, physical examination, ECG, and peridialysis volume status. Consider normal saline without potassium for fluid supplementation and invasive hemodynamic monitoring preoperatively.<sup>40</sup> Also note the location of arteriovenous (AV) fistulae. It's important to avoid the placement of intravenous lines in extremities with AV fistulae. Additionally, antibiotic prophylaxis should be considered when an AV fistula is present.
4. Check serum electrolytes and attempt to correct imbalances with preoperative dialysis at least 24 hours before surgery. A high potassium level can cause many undesirable phenomena, such as cardiac arrhythmias. Once the level exceeds 5.5 to 6.0 mEq/L, one must consider correcting the serum potassium (Table 1-36).
5. Protect the patient from infection. This involves aseptic technique and prophylactic use of antibiotics. Universal precautions must be adhered to with this patient population, owing to the potential risk for hepatitis B and hepatitis C virus transmission.
6. Adjust anesthetic and medication dosages appropriately. This can be done by carefully titrating the anesthetic drug until a desired effect is achieved. The creatinine clearance can be useful in determining proper dosing.

In conclusion, patients with end-stage renal disease present a complicated picture.

TABLE 1-35. Normal Serum Electrolyte Values

Element	Value
Phosphorus	2.3-4.7 mg/dL
Calcium	9.2-11 mg/dL
Potassium	3.8-5 mEq/L
Sodium	136-142 mEq/L
Magnesium	1.8-3 mg/dL
Bicarbonate	21-28 mEq/L

TABLE 1-36. Correction of Potassium Overload

Dialysis—removes potassium through ultrafiltration methods
Kayexalate—binds to potassium in the gastrointestinal tract
Insulin/glucose infusion—drives potassium into cells
Bicarbonate infusion—stabilizes cardiac membranes to reduce arrhythmias



Many factors must be considered before elective or emergent surgery. It is often best to consult with the a nephrologist on appropriate management options for these patients.

## Endocrine Evaluation

Perioperative morbidity and mortality are increased by endocrine diseases and their end-organ effects. Table 1-37 lists some of the more common endocrine diseases that need to be addressed in the preoperative examination. Many of these diseases are uncommon, but diabetes and thyroid disease are relatively common in the general population. Diabetes mellitus has been estimated to affect 5 to 6 million people in the United States, and thyroid disease is thought to affect 3% to 5% of the adult U.S. population.<sup>23</sup> The remaining conditions are rarely seen by oral and maxillofacial surgeons but may lead to significant morbidity and mortality if undetected.

### DIABETES MELLITUS

Diabetes mellitus is a relatively common clinical disease. There are two types: insulin-dependent diabetes mellitus (IDDM) and non-insulin-dependent diabetes mellitus (NIDDM), formerly known as type I and type II, respectively. Diabetes can be diagnosed by a fasting blood sugar greater than 120 mg/dL and a 2-hour glucose tolerance test level of 140 mg/dL.<sup>23</sup> IDDM carries the additional risk of the development of significant end-organ disease, including retinopathy, neuropathy, nephropathy, hypertension, coronary artery disease, and gastroparesis. Insulin-dependent diabetics

TABLE 1-38. Preoperative Recommendations for Insulin-Dependent Diabetics

- Take only half a dose of NPH insulin 1 h before the planned procedure.
- Hold regular insulin or short-acting insulin preparations.
- Nothing by mouth after midnight the night before surgery.
- Schedule the patient as the first case in the morning.
- Check a preoperative blood glucose level; if elevated, consider a small dose of regular insulin.
- Have an IV infusion of 5%–10% dextrose available.

From Lieblisch SE: Preanesthetic evaluation for outpatient anesthesia. In Kelly JPW (ed): Oral and maxillofacial surgery knowledge update, Vol. I, Part 1. Chicago, IL, American Association of Oral and Maxillofacial Surgery, August 1994, pp 3–12.

are at risk for hyperglycemia, hypoglycemia, acidosis, and ketosis. NIDDM is a disease of lesser severity and has a lower incidence of such metabolic and end-organ effects.

When performing an evaluation of a diabetic, the following should be considered: type of diabetes, recent glucose control, medications, and severity of end-organ dysfunction. It is particularly important to evaluate a diabetic patient for coronary artery disease and hypertension. Cardiovascular events are the major cause of perioperative mortality in such patients.<sup>46</sup> In age-matched patients, it was found that diabetics have a fourfold greater risk of perioperative myocardial ischemia and infarction than their nondiabetic counterparts.<sup>47</sup> Similarly, diabetics with symptoms of or with known peripheral vascular disease may also have coronary artery disease.

Preoperative recommendations for patients with IDDM are listed in Table 1-38.<sup>48</sup> The overall goal is to maintain blood sugar in the range of 100 to 250 mg/dL. If glucose levels get too high, neutrophil function is diminished, the inflammatory response is blunted, and wound healing is impaired.<sup>49</sup> Hypoglycemia is also undesirable in the perioperative period because it is poorly tolerated by many patients and can lead to coma. Signs of hypoglycemia include mental status changes, lethargy, confusion, tremor, seizures, and eventual coma. Because of the increased incidence of infectious complications in this patient population, both prophylactic and postoperative antibiotic therapy should be seriously considered.

TABLE 1-37. Common Endocrine Disease

- Diabetes mellitus (non-insulin-dependent and insulin-dependent)
- Thyroid disorders
- Parathyroid disorders
- Adrenal insufficiency
- Cushing's disease
- Pheochromocytoma
- Multiple endocrine neoplasia syndromes
- Carcinoid syndrome

TABLE 1-39. Hyperthyroidism versus Hypothyroidism

	Hyperthyroidism	Hypothyroidism
General	Weight loss Heat intolerance Moist skin	Cold intolerance Coarse, dry skin
Cardiac	Tachycardia Atrial fibrillation Congestive heart failure	Bradycardia Cardiomegaly Congestive heart failure Pericardial effusion
Neurologic	Nervous Tremor Hyperactive reflexes	Slow mental function Slowed reflexes
Musculoskeletal	Muscle weakness Bone resorption	Large tongue Amyloidosis
Gastrointestinal	Diarrhea	Delayed gastric emptying
Hematologic	Anemia Thrombocytopenia	
Renal	—	Impaired free water clearance
Examples	Graves' disease Toxic multinodular goiter Toxic adenoma Thyroiditis	Hashimoto's thyroiditis Subtotal thyroidectomy

Patients with NIDDM may be on oral hypoglycemic medications for glucose control. It is critical to determine a preoperative glucose level and administer small doses of intravenous regular insulin, if needed, while following blood sugars. Additionally, the oral hypoglycemic medication should be discontinued once the patient's status is nothing by mouth.<sup>50</sup> Otherwise, hypoglycemia may occur while the patient is in a fasting state.

The possibility of significant end-organ damage is present and needs to be evaluated preoperatively. From a cardiac standpoint, coronary artery disease and hypertension should be ruled out. In some instances, patients may require cardiac stress testing to be cleared for surgery.<sup>47</sup> Renal function should also be evaluated with serum blood urea nitrogen and creatine levels. Neuropathy involving both peripheral and autonomic nerves may be present. This can have a significant impact on autonomic regulation of the heart and gastric emptying.<sup>47</sup> Overall, these patients are likely to have significant disease processes and need to be evaluated thoroughly.

### THYROID DISEASE

There are many diseases that affect the thyroid gland, leading to one of two clinical

entities: hyperthyroidism or hypothyroidism (Table 1-39 compares the two). The more common in the adult population is hypothyroidism. As shown by Weinberg and colleagues, surgical management of uncontrolled hypothyroid patients had no increased morbidity and mortality when compared with euthyroid subjects,<sup>51</sup> but there is still a potential for complications. Before elective surgery, hypothyroidism should be properly managed to achieve a euthyroid state.

The major concern with a hyperthyroid patient is initiation of thyroid storm. Patients with uncontrolled hyperthyroidism are not candidates for elective surgery.<sup>52</sup> Optimal treatment of hyperthyroidism consists of 1 to 2 months of propylthiouracil and alpha- and beta-adrenergic blocking

TABLE 1-40. Thyroid Function Tests and Normal Values

Hormone	Normal Range
Thyroid-stimulating hormone	0.5–5.0 $\mu$ U/ml
Triiodothyronine	80–200 ng/dL
Thyroxine	5–12 $\mu$ g/dL
Triiodothyronine resin uptake	10–60 ng/dL

TABLE 1-41. Findings Associated with Adrenal Insufficiency

Hypotension	Tachycardia
Orthostatic hypotension	Hypercalcemia
Fever	Nausea
Vomiting	Azotemia
Confusion	Myalgia
Hyponatremia	Arthralgias
Hypoglycemia	Malaise
Metabolic acidosis	

agents.<sup>52</sup> Ultimately, these patients must be made euthyroid before elective surgery.<sup>53</sup>

Laboratory studies can be performed to determine thyroid function if indicated. Table 1-40 lists the thyroid function tests and their normal values.

### ADRENAL INSUFFICIENCY

Adrenal insufficiency signifies a reduced ability of the adrenal cortex to produce cortisol to meet physiologic demands. Often this condition is caused by chronic administration of corticosteroids to treat a number of disease states. The insufficiency may occur during times of stress, for example, when a patient is to undergo surgery and the surgeon neglects to give a stress dose of steroids. Therefore, in all patients who have had as little as 7 days of supraphysiologic corticosteroid dosing over the past year, stress-dose steroids should be considered before and after surgery.<sup>52</sup> The findings of adrenal insufficiency are listed in Table 1-41.

With chronically elevated levels of cortisol or chronic administration of exogenous corticosteroids, patients are known to develop Cushing's syndrome.<sup>52</sup> The findings associated with Cushing's syndrome are listed in Table 1-42. The preoperative man-

TABLE 1-42. Findings Associated with Cushing's Syndrome

Truncal obesity	Moon face
Hypertension	Hypovolemia
Hirsutism	Hypokalemia
Easy bruising	Muscle wasting
Striae	Compression fractures
Menstrual disorders	

TABLE 1-43. Preoperative Management of Cushing's Syndrome

Correct fluid and electrolyte abnormalities
Treat existing hypertension
Give steroid supplementation
Consider degree of surgical stress

agement of patients with both Cushing's syndrome and mineralocorticoid excess is outlined in Table 1-43.<sup>52</sup>

### PHEOCHROMOCYTOMA

Pheochromocytoma is a tumor of the chromaffin cells in the adrenal medulla that periodically releases large quantities of epinephrine and norepinephrine. The clinical manifestations are listed in Table 1-44. Usually, these signs and symptoms are intermittent. To confirm a suspected diagnosis, the patient's urine can be tested for epinephrine, norepinephrine, metanephrine, and vanillylmandelic acid.<sup>52</sup> If these levels are elevated, computed tomography or magnetic resonance imaging is used to confirm the diagnosis.

No elective surgical procedure should be performed on a patient with this disorder. Surgical mortality is between 1% and 3%, and morbidity is 16% in patients with pheochromocytoma.<sup>54</sup> Once the adrenal tumor is excised and the patient has had an adequate recovery period, elective procedures can be performed. If emergent procedures are necessary, these patients should be managed with alpha- and beta-adrenergic blocking drugs.<sup>52</sup> However, the beta-adrenergic therapy must never be given first, because of the risk of severe hypertension.<sup>23</sup>

TABLE 1-44. Manifestations Associated with Pheochromocytoma

Signs	Symptoms
Hypertension	Headache
Tachycardia	Sweating
Dysrhythmias	Weight loss
Myocarditis	Nervousness
Hyperglycemia	Irritability
Polycythemia	Palpitations

Once hypertension, dysrhythmias, and hypovolemia are corrected, it is safe to proceed with surgery.

## Hematologic Evaluation

The evaluation of the hematologic system largely relies on the results of laboratory tests, such as the complete blood count. Of course, patients with hematologic diseases may present with signs and symptoms of their disease, but laboratory results are used to differentiate the multiple types of hematologic disorders. These provide the necessary information for appropriate preoperative management. Important hematologic diseases are listed in Table 1-45.

### ANEMIA

The degree of anemia affects the oxygen carrying capacity intravascularly. As the hemoglobin level drops, the blood becomes less viscous and flows better. Unfortunately, the blood carries and transports less oxygen to the bodily tissues. As the anemia worsens, the demand for oxygen exceeds the supply, resulting in hypoxia, end-organ injury, and/or death.

In the past, surgeons would transfuse patients with a preoperative hemoglobin of less than 10 g/dL.<sup>23</sup> Because of the risk of transmitting life-threatening infectious diseases with transfusions, this baseline level has changed. With a hemoglobin level between 8 and 10 g/dL, the patient's medical condition requires careful consideration. For example, a patient with mild coronary artery disease may require transfusion to optimize oxygen carrying capacity. In contrast, a young, healthy patient with this degree of anemia will most likely tolerate a minor

TABLE 1-46.

### Questions to Consider in Chronic Anemia

If chronic bleeding is suspected, what is the source?  
Does the patient have sickle cell anemia?  
Is there a component of malnutrition here (vitamins and minerals)?  
Does the patient have chronic renal failure?

procedure quite well. One must always consider iron and multivitamin therapy preoperatively to optimize hemoglobin synthesis in anemic patients. Once the level drops below 8 g/dL, transfusion must be strongly considered, regardless of the medical condition.<sup>23</sup>

In addition to hemoglobin level, the medical history and type of anemia—acute or chronic—must be evaluated. The oral and maxillofacial surgeon needs to differentiate between acute anemias (trauma patients) and chronic anemias (e.g., sickle cell disease, renal disease). Questions to consider in cases of chronic anemia are listed in Table 1-46. If anemia is found to be due to chronic bleeding, the source should be identified and corrected before elective surgery.

If the patient gives a history of sickle cell anemia, the type should be known. Sickle cell disease is more severe than sickle cell trait. Sickle cell disease (homozygous state) affects approximately 0.4% of the African American population in the United States, and sickle cell trait (heterozygous state) affects 6% to 8%.<sup>55, 56</sup> Patients with sickle cell disease are at increased risk for a sickle cell crisis with acidosis, hypoxia, dehydration, or hypercarbia.<sup>57</sup> Sickled erythrocytes adhere to vascular endothelium, causing platelet aggregation and eventual thrombus formation. Thrombus formation in capillary beds leads to vaso-occlusive crisis and the resulting end-organ injury.<sup>57</sup> Preoperatively, the surgeon must ensure adequate hydration, be aware of a sickle cell crisis within the last 12 months, and know that the patient is in good general health.<sup>56</sup> Additionally, a hemoglobin level of 8 g/dL or greater is desirable before surgery.<sup>57</sup> Any level below this is a strong indication for transfusion before elective and emergent surgery. In certain medically compromised individuals, levels under 10g/dL should be considered for transfusion before surgery.

TABLE 1-45.

### Hematologic Diseases

Anemia  
Sickle cell anemia  
von Willebrand's disease  
Hemophilia A  
Hemophilia B  
Thrombocytopenia

Exchange transfusion, which is commonly done before major cardiovascular procedures in sickle cell disease, is usually not required in elective oral surgical procedures.<sup>57</sup> If significant blood loss and a lengthy procedure are contemplated, exchange transfusion may be considered upon consultation with a hematologist.

Finally, one must consider estimated blood loss intraoperatively. If large amounts of blood loss are expected, banked blood or donor-directed blood should be made available for surgery.

### BLEEDING DISORDERS

There are many types of bleeding disorders, including thrombocytopenia, von Willebrand's disease, and hemophilia A and B.

One of the more common disorders is thrombocytopenia (platelets  $<100,000/\text{mm}^3$ ).<sup>58</sup> Once the platelet count drops below  $50,000/\text{mm}^3$ , easy bruising and bleeding may be witnessed on examination, and elective surgery is contraindicated.<sup>59</sup> Once the platelet count falls below  $10,000/\text{mm}^3$ , spontaneous bleeding may occur.<sup>58</sup>

Thrombocytopenia can occur through a variety of mechanisms, including dilutional, consumptive, immunologic, productive, and qualitative causes.<sup>60</sup> The platelet count is checked with a complete blood count, and platelet function is evaluated by the bleeding time. If the platelet level is below  $50,000/\text{mm}^3$  preoperatively, platelet transfusion is needed, especially in cases of an acute decrease.<sup>61</sup> For qualitative defects in platelet function, one must treat the cause. For example, in uremia, one must consider dialysis and even platelet transfusion if the bleeding time indicates that this is necessary.

Von Willebrand's disease is the most common inherited bleeding disorder.<sup>59</sup> Its mild bleeding symptoms are usually not evidenced until the hemostatic stress of an operation is experienced as an adult.<sup>62</sup> It is an autosomal dominant disease and is caused by a lack of von Willebrand's factor. This plasma factor is essential for platelets to interact with the collagen in vessel walls.<sup>60</sup> Clinically, patients may complain of easy bruising and possibly a significant bleeding history with surgery. The bleeding time and PTT are prolonged. Preoperatively, the sur-

TABLE 1-47. Options for Treatment of Bleeding Disorders

Fresh frozen plasma
Cryoprecipitate
Factor VIII or IX concentrates
Desmopressin acetate (DDAVP)
Platelet transfusion dialysis

geon should consider replacement of von Willebrand's factor with cryoprecipitate or factor VIII concentrates.<sup>62</sup> Additionally, desmopressin causes a three- to fourfold increase in von Willebrand's and factor VIII activities.<sup>62</sup>

Hemophilia A is a sex-linked (male) disorder resulting from a deficiency of factor VIII. An 80% reduction in factor VIII causes this bleeding disorder's clinical manifestations to appear.<sup>62</sup> When mild disease is present, the patient may have a significant bleed with surgery; with severe disease, there may be spontaneous hemarthrosis.<sup>59</sup> Laboratory results reveal an elevated PTT.<sup>63</sup>

Hemophilia B is also a sex-linked disorder caused by a deficiency in factor IX (Christmas factor). Its presentation is identical to that of hemophilia A, and the two are differentiated by factor assays.

Treatment of these bleeding disorders consists of proper diagnosis followed by replacement therapy. In some instances, other treatment modalities may improve coagulation function, such as dialysis in uremia. The options for treatment are listed in Table 1-47. A useful equation for the calculation of factor replacement is given in Table 1-48.

Desmopressin acetate acts by stimulating

TABLE 1-48. Calculations for Factor VIII and IX Replacement (Amount in Units)

Factor VIII requirement = weight (kg) $\times$ 0.5 $\times$ desired percentage change in factor
Factor IX requirement = weight (kg) $\times$ 1.0 $\times$ desired percentage change in factor
For minor surgery: 50% increase in factor VIII and IX activity is recommended
For major surgery: 80%–100% increase in factor VIII or IX activity is recommended

From: Gonty AA: Hemostasis: A review. In Kelly JPW and Dembo JB: Oral and Maxillofacial Surgery Knowledge Update. Patient Evaluation Section, Vol 1, Part II. AAOMS, November 1995, pp 47–59.

TABLE 1-49. Immunologic Diseases

HIV/AIDS
Hematologic malignancies (lymphomas and leukemias)
Diseases leading to nutritional deficiency (e.g., cirrhosis, chronic alcohol abuse)
Diabetes
Drug induced (chemotherapy and transplant patients)

the release of factor VIII and von Willebrand's factor from epithelial cells. This usually raises the level of factor VIII and von Willebrand's factor three to four times, with a maximal effect in 15 to 20 minutes and a half-life of 6 hours.<sup>62</sup> Repeated doses have a decreasing effect, because the storage of factor VIII in the endothelium is limited.<sup>62</sup>

### Immunologic Evaluation

Several disease processes, notably human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS), need to be evaluated when contemplating elective surgical procedures on immunologically compromised patients. In addition, medications may compromise patients' immune systems. For example, organ transplant patients receive immunosuppressive therapy to blunt their immune response to donated organs. Chemotherapy patients take medications that destroy tumor cells but in the process also kill important stem cells needed for white blood cell production. Examples of immunologic diseases are listed in Table 1-49. Common immunosuppressive drugs are listed in Table 1-50.

### HIV AND AIDS

By the year 2000, 30 to 40 million people will be infected with HIV, as predicted by

the World Health Organization.<sup>64</sup> There is a higher postoperative complication rate of sepsis, wound infection, and delayed wound healing in this group of patients.<sup>65</sup> These complications were found to be higher when the risk factors of poor nutrition, opportunistic infections, and AIDS-related malignancies were present.<sup>65</sup>

In evaluating these patients, the history and physical examination should act as a gauge to determine disease progression. Inquiries should be made about several factors, such as those listed in Table 1-51. Additional evaluation includes rapid plasma reagin test (RPR), albumin and transferrin levels, and purified protein derivative (PPD) with anergy screen. The CD4 count and other clinical indicators of immune function should be known. The CD4 count in a healthy person should measure at or above 1000 cells/mm<sup>3</sup>.<sup>65</sup> One year following HIV seroconversion, the CD4 count typically drops 200 to 300 cells/mm<sup>3</sup>,<sup>66</sup> followed by a loss of 85 cells/mm<sup>3</sup> per year thereafter.<sup>67</sup>

AIDS patients may have additional abnormalities, including adrenal insufficiency, anemia, thrombocytopenia, granulocytopenia, and nutritional deficiencies.<sup>65</sup>

Preoperative consideration should be given to nutritional supplementation, stress-dose steroids, blood product transfusion, antibiotic prophylaxis, sterile technique, and universal precautions.<sup>65</sup>

### CANCER

Patients with cancer can have multiple systemic abnormalities. Often, the oral and maxillofacial surgeon is asked to evaluate the oral health of these patients. The usual scenario involves a patient with a hematologic malignancy who is commencing chemotherapy and/or radiation therapy. Bone marrow suppression is a side effect of many

TABLE 1-50. Common Immunosuppressive Drugs

Corticosteroids
Cyclosporin
Azathioprine
Methotrexate

TABLE 1-51. Considerations in Immunocompromised Patients

CD4 lymphocyte count
Use of antiviral or antimicrobial medications
Presence of any AIDS-defining illness
Nutritional status

of the commonly used chemotherapeutic agents and may lead to pancytopenia.<sup>68</sup> Additionally, multiple organ systems may be affected by these therapies, including the hematopoietic, gastrointestinal, cardiovascular, pulmonary, hepatic, renal, and neurologic systems.

An odontogenic infection may carry significant morbidity and mortality in this patient population. Preoperative evaluation of a cancer patient should investigate for nutritional deficiencies, metabolic effects of a paraneoplastic process, hematologic disorders, and infection.<sup>68</sup> In many cases, physical examination fails to demonstrate the cause of infection. These patients have an impaired immune response and may not show the typical indicators of infection (pain, erythema, heat, and loss of function). Instead, infection may be suspected only because of a fever above 101°F.<sup>68</sup> Radiographic examination (panoramic radiograph) may reveal findings of periodontal or periapical disease not evidenced on clinical examination.

The most critical laboratory study is the complete blood count and differential. Most importantly, leukocyte abnormalities need to be carefully investigated for. Susceptibility to infection is enhanced by granulocytopenia ( $<500$  cells/mm<sup>3</sup>).<sup>68</sup> Severe granulocytopenia may exist in patients who received chemotherapeutic agents. These patients can be considered for treatment with granulocyte colony-stimulating factor (GCSF), white blood cell transfusion, and antibiotic coverage before emergency surgery.<sup>68</sup> Granulocyte transfusions are most effective in granulocytopenic patients (counts  $<500$  cells/mm<sup>3</sup>) who do not respond to antibiotic therapy alone.<sup>69</sup> GCSF accelerates neutrophil recovery following chemotherapy and may provide an alternative to granulocyte transfusion.<sup>68</sup> Most importantly, all elective surgical procedures should be postponed until the granulocytopenia resolves.<sup>68</sup>

In summary, patients with immunologic compromise have special needs. There are many modalities that can boost the host immune response, such as GCSF and white blood cell transfusions. Supportive measures to reduce infectious risk include aggressive oral hygiene and oral rinses. Additionally, special measures can be taken to improve bony and soft tissue healing, such

as hyperbaric oxygen therapy in irradiated patients.

## Musculoskeletal Evaluation

Patients with chronic musculoskeletal diseases need to be evaluated carefully. The more common diseases that oral and maxillofacial surgeons should be familiar with are listed in Table 1-52. As with any disease process, severity, progression, and current therapies need to be known. The history and physical examination can help in determining these states.

### RHEUMATOID ARTHRITIS

Less common than osteoarthritis, rheumatoid arthritis affects approximately 1% of the U.S. population.<sup>70</sup> This disease commonly affects multiple joints and may have other systemic manifestations,<sup>71</sup> including cardiovascular (pericarditis, valvular insufficiency, conduction disturbances), pulmonary (pleural effusions, pneumonitis), and salivary gland (Sjögren's syndrome<sup>72</sup>) involvement.

Some major preoperative concerns with this disease include the present use of nonsteroidal anti-inflammatory agents; the potential for cervical instability, especially C1-2 instability<sup>71</sup>; temporomandibular joint (TMJ) dysfunction; and corticosteroid use.<sup>71</sup> The surgeon should examine the patient, particularly the neck, for signs and symptoms of instability (Table 1-53). Cervical spine instability during intubation and direct laryngoscopy may lead to spinal cord compression and permanent motor and sensory deficits. This most commonly occurs when there is posterior subluxation and vertical migration at C1-2.<sup>71</sup> In patients with TMJ ankylosis or dysfunction, fiberoptic intubation is usually strongly advised.

TABLE 1-52. Musculoskeletal Conditions

Degenerative arthritis
Systemic lupus erythematosus
Spondyloarthropathies
Rheumatoid arthritis
Myasthenia gravis

TABLE 1-53.

**Potential Physical Examination Findings in Rheumatoid Arthritis**

Pain upon joint palpation  
Pain with motion  
Decreased range of motion  
Symptoms of cord compression with motion

Preoperative instructions should include the discontinuation of any nonsteroidal anti-inflammatory agent 10 to 14 days before elective surgery to allow platelet function to return to normal. Additionally, it is wise to obtain a cervical spine series (C-spine and flexion-extension films) to assess for evidence of cervical spine instability. If findings consistent with instability are noted, the surgeon and/or anesthesiologist can alter the anesthetic plan to reduce the potential for spinal cord injuries. This can be done by performing the surgery under conscious sedation, by using a fiberoptic intubation technique, or by stabilizing the cervical spine during intubation. Some patients may require C1-2 fusion before an elective general surgical procedure.<sup>71</sup>

**DEGENERATIVE JOINT DISEASE**

Degenerative joint disease is the most common musculoskeletal disorder in the U.S. adult population.<sup>23</sup> Approximately 40% of people aged 18 to 24 years and 80% of those aged 75 to 79 years have some evidence of this disease.<sup>73</sup> Degenerative joint disease presents the preoperative physician with conditions similar to but not as severe as those with rheumatoid arthritis. C1-2 subluxation is not a significant concern; instead, concern should focus on the lumbar spine.<sup>71</sup> Preoperatively, a thorough examination to determine disease severity and joint involvement is undertaken. Special at-

TABLE 1-54.

**Physical Examination Findings in Myasthenia Gravis**

Muscle weakness  
Fatigue  
Ptosis, diplopia, ophthalmoplegia  
Facial muscle weakness  
Dysphagia  
Dysarthria  
Difficulty handling secretions  
Respiratory compromise

tention should be given to the TMJ. This disease often affects the TMJ, and the patient may suffer from pain and limited motion. Fiberoptic intubation or alternative means of anesthesia can be considered.

Nonsteroidal anti-inflammatory agents are discontinued 10 to 14 days preoperatively. Many of these patients suffer from knee and lower back disease and should understand that an exacerbation is possible following surgery. These exacerbations are often secondary to long periods of immobility while undergoing surgery. The effects of an acute exacerbation of lower back degenerative joint disease can be crippling, with time lost from work and significant suffering.

**MYASTHENIA GRAVIS**

Myasthenia gravis is an autoimmune disorder involving destruction of the postsynaptic acetylcholine receptors.<sup>74</sup> It is characterized by fluctuating weakness of the extraocular, facial, bulbar, and extremity muscles.<sup>9</sup> A careful history and physical examination may note the findings listed in Table 1-54.

Patients should be questioned regarding prior treatments, including surgery (thymectomy), medications (anticholinesterases), and plasmapheresis. The surgeon should be aware that anticholinesterases

TABLE 1-55

**Medication Requiring Caution in Myasthenia Gravis**

Antibiotics	Narcotics	Sedative Agents	Psychoactive Drugs
Clindamycin Aminoglycosides	Morphine Demerol	Diazepam Midazolam	Phenothiazines Amitriptyline



TABLE 1-56.

**Laboratory and Diagnostic Studies**

Complete blood count  
Chemistry panel  
Chest roentgenogram  
Urinalysis  
Coagulation studies  
Liver function tests  
Electrocardiogram

(pyridostigmine) can prolong the effects of ester local anesthetics, whereas amides are not affected.<sup>9</sup> These patients are commonly on long-term anticholinesterases.

A major preoperative concern with these patients focuses on the airway. Respiratory compromise is a common complication of this disease and may necessitate intubation during an exacerbation. Many medications, including those used in anesthesia and particularly muscle relaxants, may lead to rapid respiratory compromise when administered in regular doses. These medications have increased potency and length of efficacy in this patient population.<sup>9</sup> Medications of significance in myasthenia gravis are listed in Table 1-55.

### Preoperative Studies, Orders, and Consent

Oral and maxillofacial surgeons should have an intimate knowledge of the preoperative work-up. Every patient, whether young or old, sick or healthy, requires a thorough evaluation. The history and physical examination are done first, allowing the clinician to determine which laboratory and diagnostic studies are necessary. This evaluation allows the surgeon to probe into the present disease state and possibly diagnose new disease.

Many health care institutions have standardized forms for the selection of preoperative laboratory and diagnostic tests. Figure 1-2 is an example of a standardized form from the Hospital of the University of Pennsylvania. It lists the criteria necessary for obtaining the individual studies. This reduces health care spending and eliminates unnecessary testing. This form can be completed by ancillary personnel and reviewed

TABLE 1-57.

**Preoperative Instructions**

Take nothing by mouth after midnight  
Continue or hold medications  
Bring escort if outpatient procedure is planned

by the surgeon. Some of the more common laboratory and diagnostic studies obtained preoperatively are listed in Table 1-56. Then, special studies and specialty consultations can be obtained.

Following completion of the history and physical examination and diagnostic testing, preoperative orders can be given to the patient or to house staff performing preoperative duties. With same-day and outpatient procedures, patients are contacted the night before surgery, and several points are discussed (Table 1-57). If the patient is an inpatient, similar orders are given to hospital staff in a written format. These are similar to the outpatient orders, except that intravenous fluids are begun after midnight the night before surgery.

Finally, consent must be obtained, usually consisting of both a surgical and a blood consent. These are legal documents that should cover several important points (Table 1-58).

### Conclusion

The preoperative evaluation of oral and maxillofacial surgery patients requires a careful and stepwise approach. The surgeon should be familiar with the diagnosis and management of many disease processes. By thoroughly evaluating and managing these disease processes preoperatively, morbidity and mortality can be reduced.

TABLE 1-58.

**Important Aspects of the Legal Documentation**

Operating surgeon's name  
Diagnosis  
Treatment  
Risks and benefits of procedure  
Dated signature of patient or legal guardian  
Witness signature  
Surgeon's signature



# UNIVERSITY OF PENNSYLVANIA HEALTH SYSTEM

Hospital of the University of Pennsylvania

Patient Name _____		Surgeon _____	
Admission _____		Diagnosis _____	
Operative _____		Procedure _____	
Day phone# _____		Evening _____	
Admission date _____		Surgery date _____	
Inpatient _____		Outpatient _____	
Reason for preop days (2° diagnosis) _____		IR# _____	
AEC appt date/time _____		DOB _____	
<input type="checkbox"/> Full Service AEC (testing, H&P, anesthesia consult if indicated) <input type="checkbox"/> TESTING per Guidelines <input type="checkbox"/> per Pathway <input type="checkbox"/> Anesthesia Consult <input type="checkbox"/> Admission within 30 days <input type="checkbox"/> Use Medical Records for clinical data <input type="checkbox"/> Updated H&P provided		<b>NON-AEC preoperative testing</b> Primary MD _____ <input type="checkbox"/> H&P by primary <input type="checkbox"/> Testing by primary (attach request) <input type="checkbox"/> H&P by surgeon <input type="checkbox"/> Testing other source <input type="checkbox"/> Admission within 30 day <input type="checkbox"/> Use Medical Records for data <input type="checkbox"/> Updated H & P provided <input type="checkbox"/> AEC Anesthesia Consult date/time _____ (scheduled after testing completed and returned to Hospital)	
<b>Preoperative Testing/Consults/Chart Contents</b>			
Consents: Surgical _____ Blood _____ Hospital _____ (circle what is sent to TAC) surgeon's H&P _____ primary MD H&P _____ AEC H&P _____		Sent to TAC (office) _____ Received (CRNP or sec) _____ Reviewed _____ to APU (chart mgr) _____	
<input type="checkbox"/> EKG <input type="checkbox"/> CXR _____ <input type="checkbox"/> CBC <input type="checkbox"/> Diff <input type="checkbox"/> PT <input type="checkbox"/> PTT <input type="checkbox"/> Platelets <input type="checkbox"/> P4 <input type="checkbox"/> P6 <input type="checkbox"/> P7 (Na, K, Cl, CO2) (P4+ BUN + glucose) (P6+ creatinine) <input type="checkbox"/> Chem batt <input type="checkbox"/> UA <input type="checkbox"/> other _____ <input type="checkbox"/> other _____		<input type="checkbox"/> Autodonation of blood <input type="checkbox"/> Directed Donated date/time _____ <input type="checkbox"/> of units _____ <input type="checkbox"/> Type and Screen _____ <input type="checkbox"/> consults _____ date/time _____ <input type="checkbox"/> consults _____ date/time _____ <input type="checkbox"/> Pulmonary Function Study _____ date/time _____ <input type="checkbox"/> Echocardiogram <input type="checkbox"/> stress test specify type _____ date/time _____ date/time _____ <input type="checkbox"/> other _____	
Additional Studies needed for Surgeon _____ date/time _____ date/time _____ date/time _____ date/time _____		<b>For AEC use only</b> _____ _____ _____ _____	
<b>For Surgical Office use only</b> _____ _____ _____ _____		_____ _____ _____ _____	
Physician Signature _____		Physician secretary _____	
AEC secretary _____		CRNP _____	
		CM _____	

PRE-OPERATIVE TESTING REQUEST FORM/WORKSHEET

FIGURE 1-2. A standardized form from the Hospital of the University of Pennsylvania, used for the selection of preoperative laboratory and diagnostic tests. (Courtesy of University of Pennsylvania Health System.)

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