Chapter

13 PREOPERATIVE EVALUATION AND MEDICATION

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OVERVIEW

The American Society of Anesthesiologists (ASA) has published a practice advisory that suggests a preanesthesia visit should include the following:[1]

- An interview with the patient or guardian to establish a medical, anesthesia and medication history
- An appropriate physical examination
- Indicated diagnostic testing
- Review of diagnostic data (laboratory, electrocardiogram, radiographs, consultations)
- Assignment of an ASA physical status score (ASA-PS) (Table 13-1).
- A formulation and discussion of anesthesia plans with the patient or a responsible adult before obtaining informed consent

A battery of tests is commonly used when evaluating patients. This practice may be based on institutional policies or on the mistaken belief that tests can substitute for taking a history or performing a physical examination. Preoperative tests without specific indications lack utility and may lead to patient injury because they prompt further testing to evaluate abnormal results, unnecessary interventions, delay of surgery, anxiety, and even inappropriate therapies. Complete and thorough histories are necessary to plan appropriate and safe anesthesia care; they are more accurate and cost effective in establishing diagnoses than screening laboratory tests.[2] Gathering the necessary information and sharing that information among the various providers can be challenging.

History and Physical Examination

The important components of the anesthesia history are shown in Figure 13-1. The patient or surrogate can provide the information on paper, via Internet-based programs, during a telephone interview, or in person. The patient's medical conditions, medications, allergies, past operations,

Table 13-1 American Society of Anesthesiologists Physical Status Classification*

ASA 1	Healthy patient without organic, biochemical, or psychiatric disease.
ASA 2	A patient with mild systemic disease, e.g., mild asthma or well-controlled hypertension. No significant impact on daily activity. Unlikely impact on anesthesia and surgery.
ASA 3	Significant or severe systemic disease that limits normal activity, e.g., renal failure on dialysis or class 2 congestive heart failure. Significant impact on daily activity. Likely impact on anesthesia and surgery.
ASA 4	Severe disease that is a constant threat to life or requires intensive therapy, e.g., acute myocardial infarction, respiratory failure requiring mechanical ventilation. Serious limitation of daily activity. Major impact on anesthesia and surgery.
ASA 5	Moribund patient who is likely to die in the next 24 hours with or without surgery.
ASA 6	Brain-dead organ donor.

*"E" added to the above classifications indicates emergency surgery, Available at www.asahq.org.

and use of tobacco, alcohol, or illicit drugs are documented. Cardiovascular, pulmonary, and neurologic symptoms are noted. The presence of disease is identified as well as its severity, stability, current or recent exacerbations, treatment, and planned interventions. Cardiorespiratory fitness or functional capacity not only predicts outcome and perioperative complications, but also indicates a need for further evaluation.[3,4] Better fitness improves cardiorespiratory reserve and decreases morbidity through improved lipid and glucose profiles and reductions in arterial blood pressure and obesity. Conversely, an inability to exercise may be a result of cardiopulmonary disease. Patients unable to attain average levels of exercise (4 to 5 metabolic equivalents or METs, such as walking four blocks or up two flights of stairs) are at increased risk of perioperative complications (Table 13-2).[4] A personal or family history of adverse events with anesthesia such as severe postoperative nausea or vomiting (PONV), prolonged emergence or delirium, or susceptibility to malignant hyperthermia or pseudocholinesterase deficiency should be noted and considered in planning the anesthetic.

At a minimum, the preanesthetic examination includes an airway, heart, and lung examination; review of vital signs, including oxygen saturation; and measurement of height and weight. Figure 13-2 illustrates the Mallampati classification and Table 13-3 lists the key components of the airway examination (also see Chapter 16). When airways which are difficult to manage are identified, necessary equipment and skilled personnel must be made available. Auscultation of the heart and inspection of the pulses, peripheral veins, and extremities for the presence of edema are important diagnostically and may affect care plans. The pulmonary examination includes auscultation for wheezing, listening for decreased or abnormal breath sounds, and notation of cyanosis or clubbing and effort of breathing. For patients with functional deficits or disease, or planning neurologic procedures or regional anesthesia, a neurologic examination is performed to document abnormalities that may aid in diagnosis or interfere with positioning and to establish a baseline. The following section discusses selected co-morbidities that may impact the administration of anesthesia.

Co-Morbidities Impacting Administration of Anesthesia

Coronary artery disease (CAD) varies from mild, stable disease with little impact on perioperative outcome to severe disease accounting for significant complications during anesthesia and surgery. The history and the physical examination form the foundation for the cardiac assessment. Medical records and previous diagnostic studies are reviewed, especially noninvasive stress tests and catheterization results. Often a phone call to the primary care physician or cardiologist will yield important information and obviate the need for further testing or consultation.

The most recent American College of Cardiology/American Heart Association (ACC/AHA) guidelines for cardiovascular evaluation for noncardiac surgery have decreased recommendations for testing or revascularization.[4] An algorithm for patients with perioperative cardiac risk is followed in stepwise fashion, stopping at the first point that applies to the patient (Fig. 13-3). Step 1 considers the urgency of surgery. For emergency surgery, the focus is perioperative surveillance (e.g., serial electrocardiograms, enzymes, monitoring) and risk reduction (e.g., β-adrenergic blockers, statins, pain management). Step 2 focuses on active cardiac conditions such as acute myocardial infarction (MI), unstable or severe angina, decompensated heart failure, severe valvular disease, and significant arrhythmias. Active cardiac conditions warrant postponement for all except life-saving emergency procedures. Step 3 considers the surgical risk or severity. Patients without active cardiac conditions (see Step 2) who will undergo low-risk surgery can proceed without further cardiac testing. Step 4 assesses functional capacity as defined by METs (see Table 13-2).[3] Asymptomatic patients with average functional capacity can proceed to surgery. Step 5 considers patients with poor or indeterminate functional capacity who need intermediate-risk or vascular surgery. The number of clinical predictors (CAD, compensated heart failure, cerebrovascular disease, diabetes, and renal insufficiency) determines the likely benefit of further cardiac testing. Patients with no clinical predictors proceed to surgery. Those patients with risk predictors

Patient's Name _____ Age _____ Sex _____ Date of Surgery _____
Proposed Operation _____
Primary care physician name/phone # _____ Cardiologist/phone # _____

1. Please list **all previous operations** (and approximate dates)

a.	d.
b.	e.
c.	f.

2. Please list any **allergies** to medications, latex, food or other (and your reactions to them)

a.	c.
b.	d.

3. Circle **TESTS** that you have already completed, list where and when you had them. Please bring all existing reports for your visit. We are NOT suggesting that you require (or need to have) these tests.

a. **ECG** LOCATION:	Date:	d. **BLOOD WORK** LOCATION:	Date:
b. **STRESS TEST** LOCATION:	Date:	e. **SLEEP STUDY** LOCATION:	Date:
c. **ECHO/ultrasound of heart** LOCATION:	Date:	f. Other: LOCATION:	Date:

4. Please list **all medications** you have taken in the last month (include over-the-counter drugs, inhalers, herbals, dietary supplements and aspirin)

Name of Drug	Dose and how often	Name of Drug	Dose and how often
a.		f.	
b.		g.	
c.		h.	
d.		i.	
e.		j.	

(Please check YES or NO and circle specific problems)	YES	NO
4. Have you taken steroids (prednisone or cortisone) in the last year?	☐	☐
5. Have you ever smoked? (Quantify in ____ packs/day for ____ years)	☐	☐
Do you still smoke? (Quantify in ____ packs/day)	☐	☐
Do you drink alcohol? (If so, how much?) _____	☐	☐
Do you use or have you ever used any illegal drugs? (we need to know for your safety)	☐	☐
6. Can you walk up one flight of stairs without stopping?	☐	☐
7. Have you had any problems with your heart? **(circle all that apply)** (chest pain or pressure, heart attack, abnormal ECG, skipped beats, murmur, palpitations, heart failure)	☐	☐
8. Do you have high blood pressure?	☐	☐
9. Do you have diabetes?	☐	☐
10. Have you had any problems with your lungs or your chest? **(circle all that apply)** (shortness of breath, emphysema, bronchitis, asthma, TB, abnormal chest x-ray)	☐	☐
11. Are you ill now or were you recently ill with a cold, fever, chills, flu or productive cough? Describe recent changes _____	☐	☐
12. Have you or anyone in your family had serious bleeding problems? **(circle all that apply)** (prolonged bleeding from nose, gums, tooth extractions, or surgery)	☐	☐
13. Have you had any problems with your blood? **(circle all that apply)** (anemia, leukemia, lymphoma, sickle cell disease, blood clots, transfusions)	☐	☐
14. Have you ever had problems with your: **(circle all that apply)**		
Liver (cirrhosis; hepatitis A, B, C; jaundice)?	☐	☐
Kidney (stones, failure, dialysis)?	☐	☐
Digestive system (frequent heartburn, hiatus hernia, stomach ulcer)?	☐	☐
Back, Neck or Jaws (TMJ, rheumatoid arthritis, herniation)?	☐	☐
Thyroid gland (underactive or overactive)?	☐	☐
15. Have you ever had: **(circle all that apply)**		
Seizures?	☐	☐
Stroke, facial, leg or arm weakness, difficulty speaking?	☐	☐
Cramping pain in your legs with walking?	☐	☐
Problems with hearing, vision or memory?	☐	☐
16. Have you ever been treated with chemotherapy or radiation therapy? **(circle all that apply)** List indication and dates of treatment: _____		
17. Women: Could you be pregnant? Last menstrual period began: _____	☐	☐

Figure 13-1 The important components of patient history for preoperative evaluation.

Continued

18. Have you ever had problems with anesthesia or surgery? **(circle all that apply)** ☐ ☐
(severe nausea or vomiting, malignant hyperthermia [in blood relatives or self], breathing difficulties, or problems with placement of a breathing tube)
19. Do you have any chipped or loose teeth, dentures, caps, bridgework, braces, problems opening your mouth or swallowing, or choking while eating? **(circle all that apply)** ☐ ☐
20. Do your physical abilities limit your daily activities? ☐ ☐
21. Do you snore? ☐ ☐
22. Do you have sleep apnea? ☐ ☐
23. Please list any medical illnesses not noted above:

_____

_____

24. Additional comments or questions for the anesthesiologist?

_____

_____

THANK YOU FOR YOUR HELP!

Figure 13-1, cont'd. For legend see p. 167

Table 13-2 Metabolic Equivalents of Functional Capacity

MET	Functional Levels of Exercise
1	Eating, working at computer, dressing
2	Walking down stairs or in your house, cooking
3	Walking 1-2 blocks
4	Raking leaves, gardening
5	Climbing 1-2 flights of stairs, dancing, bicycling
6	Playing golf, carrying clubs
7	Playing singles tennis
8	Rapidly climbing stairs, jogging slowly
9	Jumping rope slowly, moderate cycling
10	Swimming quickly, running or jogging briskly
11	Skiing cross country, playing full-court basketball
12	Running rapidly for moderate to long distances

MET, metabolic equivalent. 1 MET = consumption of 3.5 mL O_2/min/kg of body weight.
From Jette M, Sidney K, Blumchen G. Metabolic equivalents (METS) in exercise testing, exercise prescription, and evaluation of functional capacity. Clin Cardiol 1990;13:555-565.

may benefit from further testing but only if the results will alter management. Many traditional risk factors for CAD such as smoking, hypertension, older age, male gender, hypercholesterolemia, and family history may not actually increase perioperative risk.

The benefits versus the risks of coronary revascularization before noncardiac surgery are controversial. The only randomized prospective study of preoperative revascularization versus medical management failed to show a difference in outcome.[5] Noncardiac surgery soon after revascularization is associated with frequent rates of morbidity and mortality.[6] Patients who have had a percutaneous coronary intervention (PCI), especially with a drug-eluting stent (DES), require months, if not a lifetime, of antiplatelet therapy to prevent restenosis or acute thromboses. The type of stent, DES or bare metal stent (BMS), must be identified and managed in collaboration with a cardiologist. A scientific advisory with recommendations for managing patients with coronary stents

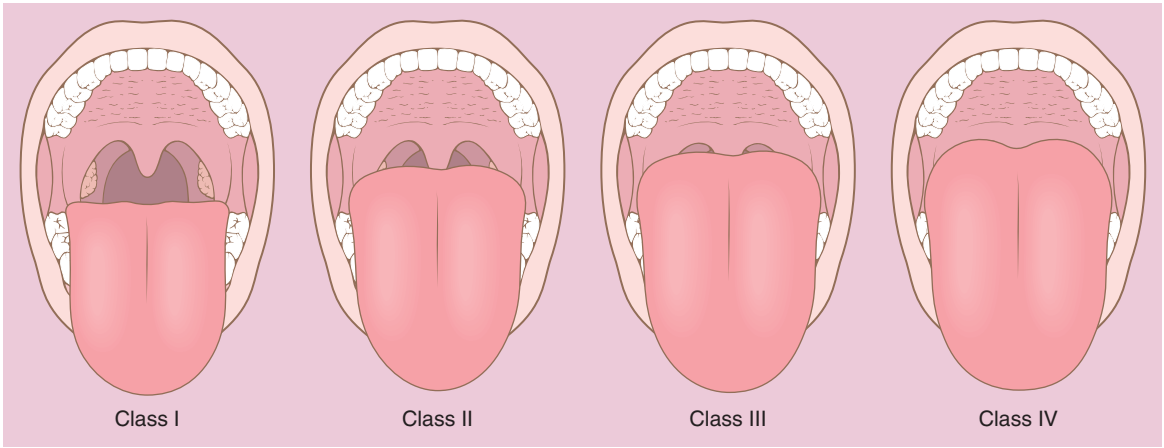


Figure 13-2 The Mallampati Airway Classification.

Table 13-3 Components of the Airway Examination

Length of upper incisors
Condition of the teeth
Relationship of upper (maxillary) incisors to lower (mandibular) incisors
Ability to protrude or advance lower (mandibular) incisors in front of upper (maxillary) incisors
Interincisor or intergum (if edentulous) distance
Tongue size
Visibility of the uvula
Presence of heavy facial hair
Compliance of the mandibular space
Thyromental distance with head in maximum extension
Length of the neck
Thickness or circumference of the neck
Range of motion of the head and neck

appears in Table 13-4.[7] Taking antiplatelet drugs should not be stopped without consultation with a cardiologist familiar with coronary stents and an in-depth discussion with the patient regarding the risks of terminating these drugs.[7] Elective procedures that necessitate interrupting dual antiplatelet therapy should be delayed during the high-risk period (see Table 13-4). If at all possible, aspirin is continued throughout the perioperative period, and the thienopyridine (typically clopidogrel) restarted as soon as possible. Evidence supports the small risk of bleeding complications with continued aspirin during most procedures (Fig. 13-4).[8] Premature discontinuation of dual antiplatelet therapy can cause catastrophic stent thrombosis, MI, or death. Noncardiac surgery and most invasive procedures increase the risk of stent thrombosis, which is associated with high mortality rate.[7,9,10] Stent thrombosis is best treated with PCI, which can be performed safely even

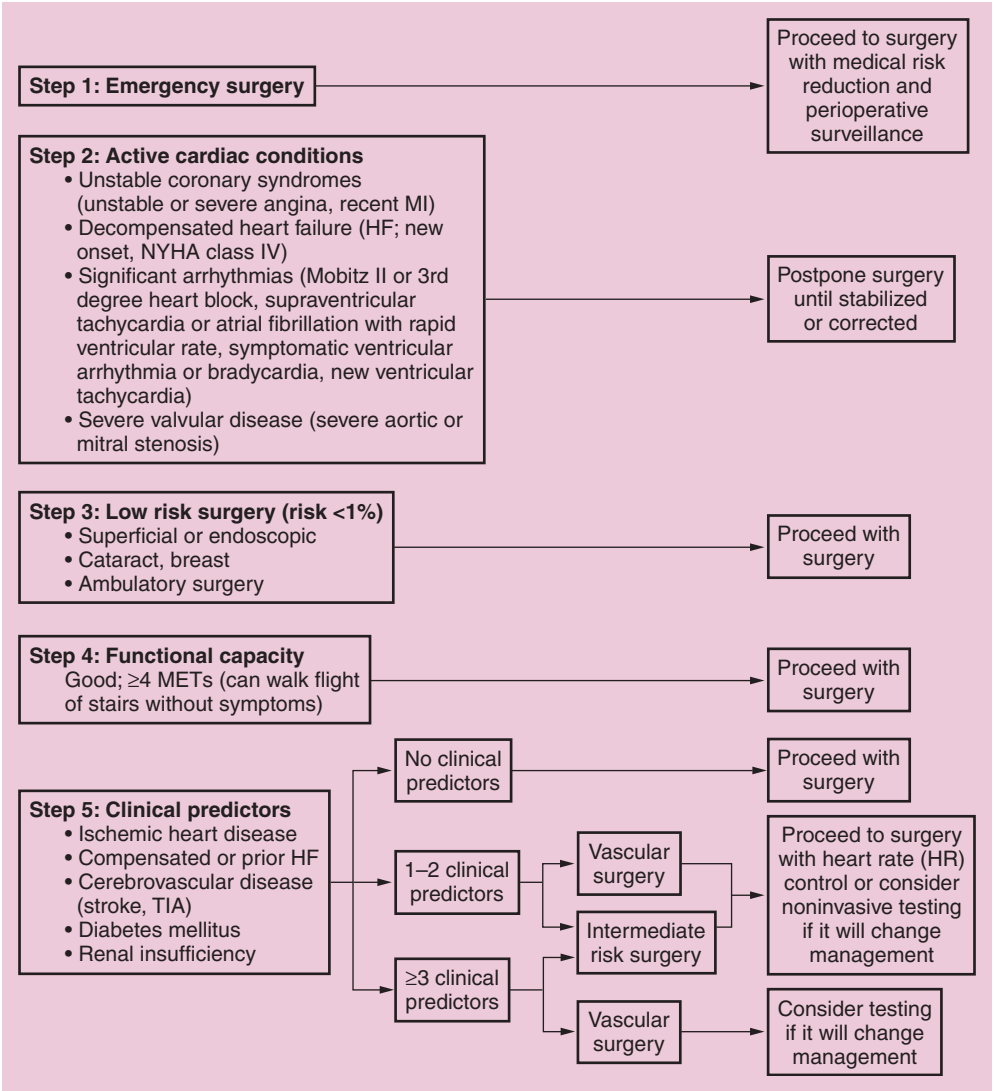


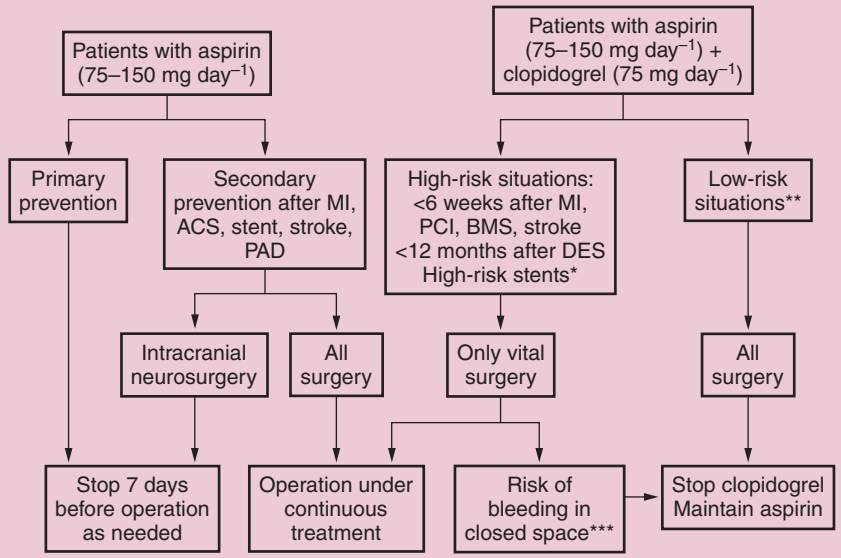
Figure 13-3 Simplified algorithm for cardiovascular evaluation of patients for noncardiac surgery. (From Fleisher LA, Beckman JA, Brown KA, et al: ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery, J Am Coll Cardiol 50:1707–1732, 2007.)

III

Table 13-4 Recommendations for Perioperative Management of Antiplatelet Drugs in Patients with Coronary Stents

- Health care providers who perform invasive procedures must be aware of the potentially catastrophic risks of premature discontinuation of thienopyridine (e.g., clopidogrel or ticlopidine) therapy. Such professionals should contact the patient's cardiologist to discuss optimal strategies if issues regarding antiplatelet therapy are unclear.
- Elective procedures involving risk of bleeding should be deferred until an appropriate course of thienopyridine therapy (12 months after placement of drug-eluting stent [DES] and 1 month after placement of bare-metal stent [BMS]) has been completed.
- Patients with DES who must undergo procedures after the 12-month waiting period that mandate discontinuing thienopyridine therapy should continue aspirin if at all possible and have the thienopyridine restarted as soon as possible.

Adapted from Grines CL, Bonow RO, Casey DE, et al. Prevention of premature discontinuation of dual antiplatelet therapy in patients with coronary artery stents: A science advisory from the American Heart Association, American College of Cardiology, Society for Cardiovascular Angiography and Interventions, American College of Surgeons, and American Dental Association, with Representation from the American College of Physicians. J Am Coll Cardiol 2007;49:734-739.



MI, myocardial infarction; ACS, acute coronary syndrome; PAD, peripheral arterial disease; PCI, percutaneous coronary intervention; BMS, bare metal stent; DES, drug eluting stent.

*High-risk stents: long (>36 mm), proximal, overlapping, or multiple stents, stents in chronic total occlusions, or in small vessels or bifurcated lesions.

**Examples of low-risk situations: >3 months after BMS, stroke, uncomplicated MI, PCI without stenting.

***Risk of bleeding in closed space: intracranial neurosurgery, intra-medullary canal surgery, posterior eye chamber ophthalmic surgery. In these situations, the risk/benefit ratio of upholding vs withdrawing aspirin must be evaluated for each case individually; in case of aspirin upholding, early postoperative re-institution is important.

Figure 13-4 Algorithm for perioperative management of patients taking antiplatelet therapy. (From Chassot PG. Perioperative antiplatelet therapy: The case for continuing therapy in patients at risk of myocardial infarction. Br J Anaesth 2007;99:316-328.)

in the immediate postoperative period.[11] High-risk patients may best be managed in facilities with immediate access to interventional cardiology.[9]

Heart failure is a significant risk factor for perioperative adverse events. Patients with compensated heart failure have a 5% to 7% risk of perioperative cardiac complications, and those with decompensation have an even higher rate—a 20% to 30% incidence. Heart failure may be caused by systolic dysfunction (decreased ejection fraction from abnormal contractility), diastolic dysfunction (increased

filling pressures with abnormal relaxation but normal contractility and ejection fraction), or a combination of the two. Diastolic dysfunction accounts for almost half of all cases of heart failure, but there is little science to guide care in the perioperative period. Hypertension can cause diastolic dysfunction, and left ventricular hypertrophy on an electrocardiogram (ECG) raises suspicion of dysfunction. Ischemic heart disease is a common cause of systolic dysfunction (50% to 75% of cases). Recent weight gain, complaints of shortness of breath, fatigue, orthopnea, paroxysmal nocturnal dyspnea, nocturnal cough, peripheral edema, hospitalizations, and recent changes in management are significant. Because decompensated heart failure is a high-risk cardiac condition elective surgery should be postponed (see Fig. 13-3).[4] Left ventricular and diastolic function may be evaluated with echocardiography (Table 13-5). Patients with class IV failure (symptoms at rest) need evaluation by a cardiologist before undergoing anesthesia. Minor procedures with conscious sedation may proceed as long as the patient's condition is stable.

Cardiac murmurs can be clinically unimportant or a sign of valvular abnormalities. Functional murmurs from turbulent flow across the aortic or pulmonary outflow tracts are found with high output states (hyperthyroidism, pregnancy, anemia). Elderly patients and those with risk factors for CAD, a history of rheumatic fever, excessive intravascular volume, pulmonary disease, cardiomegaly, or an abnormal ECG and a murmur are likely to have valvular disease. Evaluation with echocardiography is beneficial if general or spinal anesthesia is planned (Table 13-6). Diastolic murmurs are always pathologic and require evaluation.

Table 13-5 Recommendations for Preoperative Noninvasive Evaluation of Left Ventricular (LV) Function

Class IIa
(Reasonable to perform)
1. It is reasonable for patients with dyspnea of unknown origin to undergo preoperative evaluation of LV function.
2. It is reasonable for patients with current or previous heart failure with worsening dyspnea or other change in clinical status to undergo preoperative evaluation of LV function if not performed within 12 months.

Class IIb
(May be considered)
1. Reassessment of LV function in clinically stable patients with previously documented cardiomyopathy is not well established.

Class III
(Should NOT be performed because it is not helpful)
1. Routine perioperative evaluation of LV function in patients is not recommended.

Adapted from Fleisher LA, Beckman JA, Brown KA, et al. ACC/AHA 2007 Guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery. J Am Coll Cardiol 2007;50:3159-3241.

Table 13-6 ACC/AHA Guideline Summary: Echocardiography in Asymptomatic Patients with Cardiac Murmurs

Class I
There is evidence and/or general agreement that echocardiography is useful in asymptomatic patients with the following cardiac murmurs:
- Diastolic murmurs
- Continuous murmurs
- Late systolic murmurs
- Murmurs associated with ejection clicks
- Murmurs that radiate to the neck or back
- Grade 3 or louder systolic murmurs

Class IIa
The weight of evidence or opinion is in favor of usefulness of echocardiography in asymptomatic patients with the following cardiac murmurs:
- Murmurs associated with other abnormal physical findings on cardiac examination
- Murmurs associated with an abnormal electrocardiogram or chest radiograph

Class III
There is evidence and/or general agreement that echocardiography is not useful in asymptomatic patients with the following murmurs:
- Grade 2 or softer midsystolic murmurs considered innocent or functional by an experienced observer

From Bonow, RO, Carabello, BA, Chatterjee, K, et al. ACC/AHA 2006 guidelines for the management of patients with valvular heart disease. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing committee to revise the 1998 guidelines for the management of patients with valvular heart disease). J Am Coll Cardiol 2006;48:e1.

Regurgitant heart disease is better tolerated perioperatively than stenotic disease. Aortic stenosis is the most common valvular lesion in the United States (2% to 4% of adults older than 65 years). Severe stenosis is associated with a high risk for perioperative complications. Aortic sclerosis, present in 25% of people 65 to 74 years old and 50% of those more than 84 years old, causes a systolic ejection murmur similar to that heard with stenosis but does not compromise hemodynamics.[12] Patients with severe or critical stenosis should undergo only emergency and life-saving procedures without cardiology evaluation.[13] Antibiotic prophylaxis to prevent infective endocarditis is no longer recommended for patients with valvular abnormalities in native hearts (Tables 13-7 and 13-8).[14]

Pacemakers and implantable cardioverter-defibrillators (ICDs) can be affected by electrical or magnetic interference. Consultation with the device manufacturer or cardiologist may be needed. Patients usually have a wallet card with important designations and phone numbers. Patients with ICDs invariably have heart failure, ischemic or valvular disease, cardiomyopathies, or potentially lethal

Table 13-7 Summary of Major Changes in American Heart Association Infective Endocarditis Prophylaxis Guidelines

- Bacteremia from daily activities is much more likely to cause infective endocarditis (IE) than bacteremia from a dental procedure.
- An extremely small number of cases of IE may potentially be prevented by antibiotic prophylaxis.
- Prophylaxis is not recommended solely on the basis of an increased lifetime risk of IE.
- Recommendations for IE prophylaxis apply only to those conditions listed in Table 13-8.
- Prophylaxis is recommended for all dental procedures that involve manipulation of gingival tissues or periapical region of teeth or perforation of oral mucosa only for patients with conditions listed in Table 13-8.
- Prophylaxis is recommended for procedures on respiratory tract or infected skin, skin structures, or musculoskeletal tissue only for patients with conditions listed in Table 13-8.
- Prophylaxis is not recommended for GU or GI tract procedures.

GI, gastrointestinal; GU, genitourinary.
From Wilson W, Taubert KA, Gewitz M, et al. Prevention of infective endocarditis: Guidelines from the American Heart Association, Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. Circulation 2007;116:1736-1754.

Table 13-8 Cardiac Conditions Associated with the Highest Risk of Adverse Outcome from Endocarditis

Prosthetic cardiac valve
Previous infective endocarditis
Congenital heart disease (CHD)* Unrepaired cyanotic CHD, including palliative shunts and conduits Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure† Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization)
Cardiac valvulopathy developing in a cardiac transplant recipient

*Except for the conditions listed, antibiotic prophylaxis is no longer recommended for any other form of CHD.
†Prophylaxis is recommended because endothelialization of prosthetic material occurs within 6 months after the procedure.
From Wilson W, Taubert KA, Gewitz M, et al. Prevention of infective endocarditis: Guidelines from the American Heart Association, Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. Circulation 2007;116:1736-1754.

arrhythmias. Some monitors, ventilators, vibrations, or chest prepping may fool the sensors into increasing pacing, leading to ischemia or inappropriate treatment. Special features such as rate adaptive mechanisms in some pacemakers are disabled, or the device is reprogrammed to asynchronous pacing to prevent interference.[15] Anti-tachyarrhythmia functions are disabled before procedures if interference or unexpected patient movement is undesirable.[15] An unexpected discharge with patient movement can be catastrophic during delicate intracranial, spinal, or ocular procedures. Central line placement can trigger cardioversion. Typically ICDs are deactivated only after arrival to a facility with devices for monitoring and cardioversion. Many ICDs are complex and reliance on a magnet to disable them, except in emergencies, is not recommended. Some devices are programmed to ignore magnet placement, or magnets may permanently disable anti-tachyarrhythmic therapy. Magnets only suspend antishock therapies in some ICDs while they are in place. Magnets affect only the anti-tachycardia function, not the pacing function of an ICD. If a pacemaker or ICD is reprogrammed, or if a magnet is used at any time, the device must be re-interrogated and re-enabled before the patient leaves a monitored setting.

Hypertension severity and duration correlate with the degree of end-organ damage, morbidity, and mortality. Ischemic heart disease, heart failure, renal insufficiency, and cerebrovascular disease are common in hypertensive patients. Yet mild hypertension with a preoperative blood pressure (BP) less than 180/110 mm Hg is not clearly associated with perioperative cardiac risk. Elective surgery probably should be delayed for patients with severe hypertension (DBP $>$ 115 mm Hg; SBP $>$ 200 mm Hg) until BP is less than 180/110 mm Hg. If significant end-organ damage is present, or intraoperative hypotensive techniques are planned, the goal is to restore BP to normal levels as much as possible before surgery.[16] Decreased risk may require weeks of therapy for regression of vascular changes. Actually, rapid decreasing of BP may increase the chance of cerebral or coronary ischemia. Intraoperative hypotension is probably far more dangerous than hypertension.[16] Patients being evaluated preopertively ideally should have their BP controlled in an optimal state.

Pulmonary disease increases risk for both pulmonary and nonpulmonary perioperative complications. Postoperative pulmonary complications (PPC) are common and increase costs, morbidity rate, and mortality risk. Some predictors are advanced age, heart failure, chronic obstructive pulmonary disease (COPD), smoking, general health status (including impaired sensorium and functional dependency), and obstructive sleep apnea (Table 13-9).[17,18] Well-controlled asthma does not increase perioperative complications.[19] Patients with poorly controlled asthma,

Table 13-9 Risk Factors for Postoperative Pulmonary Complications, with Summary Strength of the Evidence for Association of Patient, Procedure, and Laboratory Factors with Specific Complications*

Factor	Strength of Recommendation†	Odds Ratios‡
Potential Patient-Related Risk Factor		
Advanced age	A	2.09-3.04
ASA class ≥II	>A	2.55-4.87
CHF	A	2.93
Functionally dependent	A	1.65-2.51
COPD	A	1.79
Weight loss	B	1.62
Impaired sensorium	B	1.39
Cigarette use	B	1.26
Alcohol use	B	1.21
Abnormal findings on chest examination	B	NA
Diabetes	C	
Obesity	D	
Asthma	D	
Obstructive sleep apnea	I	
Corticosteroid use	I	
HIV infection	I	
Arrhythmia	I	
Poor exercise capacity	I	
Potential Procedure-Related Risk Factor		
Aortic aneurysm repair	A	6.90
Thoracic surgery	A	4.24
Abdominal surgery	A	3.01
Upper abdominal surgery	A	2.91
Neurosurgery	A	2.53
Prolonged surgery	A	2.26
Head and neck surgery	A	2.21
Emergency surgery	A	2.21
Vascular surgery	A	2.10
General anesthesia	A	1.83
Perioperative transfusion	B	1.47
Hip surgery	D	
Gynecologic or urologic surgery	D	
Esophageal surgery	I	
Laboratory Tests		
Albumin level <35 g/L	A	2.53
Chest radiography	B	4.81
BUN level >7.5 mmol/L (>21 mg/dL)	B	NA
Spirometry	I	

*ASA, American Society of Anesthesiologists; BUN, blood urea nitrogen; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; HIV, human immunodeficiency virus; NA, not available.
†Recommendations: A = good evidence to support the particular risk factor or laboratory predictor; B = at least fair evidence to suggest a particular risk factor or laboratory predictor; C = at least fair evidence to suggest that the particular factor is not a risk factor or that the laboratory test does not predict risk; D = good evidence to suggest that the particular factor is not a risk factor or that the laboratory test does not predict risk; I = insufficient evidence to determine whether factor increases risk or whether the laboratory test predicts risk, and evidence is lacking, is of poor quality, or is conflicting.
‡For factors with A or B rating. Odds ratios are trim-and-fill estimates. When these estimates were not possible, we provide the pooled estimate.
Reproduced from: Smetana GV, Lawrence VA, Cornell JE. Preoperative pulmonary risk stratification for noncardiothoracic surgery: Systematic review for the American College of Physicians. Ann Intern Med 2006;144:158-595.

as evidenced by wheezing at the time of anesthetic induction, are at a higher risk for complications.[19] Unlike asthma, COPD increases the risk of pulmonary complications; the more severe the COPD, the greater the risk. However, there is no degree of severity that absolutely precludes surgery. Surprisingly the risks with COPD are less than those with heart failure, advanced age, or poor general health.

Administering corticosteroids and inhaled β-adrenergic agonists preoperatively markedly decreases the incidence of bronchospasm after tracheal intubation and may shorten

hospital and intensive care unit stays.[17] Brief preoperative administration of preoperative steroids (up to 1 week) are safe and do not appear to increase postoperative infections or delay wound healing. Prednisone 0.5 to 1 mg/kg orally for 1 to 4 days before surgery for patients who are likely to require endotracheal intubation and who have persistent airway obstruction despite use of inhaled medications is recommended.

Recovery time, pain, and reduction in lung volumes are less after laparoscopic procedures, but whether pulmonary complications are affected is unclear. PPC risk is less frequent after percutaneous interventions. In a study of endovascular versus open abdominal aortic aneurysm repair, PPC rates were 3% and 16%, respectively.[17] General anesthesia is associated with more risk for PPC than with peripheral nerve blocks. Two large meta-analyses and retrospective and randomized trials suggest that PPC rates are less frequent for patients who have spinal or epidural anesthesia or epidural analgesia postoperatively compared to general anesthesia.[20] Routine pulmonary function tests, chest radiography, or arterial blood gases do not predict PPC risk and offer little more information than can be determined by clinical evaluation. PPC rates are reduced by maximizing airflow in obstructive disease, treating infections and heart failure, and using lung expansion maneuvers such as coughing, deep breathing, incentive spirometry, positive end-expiratory pressure (PEEP), and continuous positive airway pressure (CPAP).

Obstructive sleep apnea (OSA), which is caused by intermittent airway obstruction, affects up to 9% of women and 24% of men. Most of them are unaware of the diagnosis.[21] Snoring, daytime sleepiness, hypertension, obesity, and a family history of OSA are risk factors for OSA.[22] A large neck circumference predicts an increased chance of OSA. The STOP-Bang questionnaire was developed and validated in an anesthesia preoperative clinic to screen for OSA (Fig. 13-5).[23] Patients with OSA have increased rates of diabetes, hypertension, atrial fibrillation, bradyarrhythmias, ventricular ectopy, stroke, heart failure, pulmonary hypertension, dilated cardiomyopathy, and CAD.[24] Ventilation via a mask, direct laryngoscopy, endotracheal intubation, and fiberoptic visualization of the airway are more difficult in patients with OSA. Such patients are likely to have perioperative airway obstruction, hypoxemia, atelectasis, ischemia, pneumonia, and prolonged hospitalizations.[18] Patients who use CPAP devices should bring them on the day of their procedures. The ASA has published recommendations for the perioperative care of

Have you been diagnosed with sleep apnea by a sleep study? Yes ☐ No ☐

Have you received treatment for sleep apnea, such as CPAP or Bi-PAP? Yes ☐ No ☐

Please answer the following four questions with a *yes* or *no* answer:

1) Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?
   Yes ☐ No ☐
2) Do you often feel tired, fatigued, or sleepy during the daytime?
   Yes ☐ No ☐
3) Has anyone observed you stop breathing during your sleep?
   Yes ☐ No ☐
4) Do you have or are you being treated for high blood pressure?
   Yes ☐ No ☐

FOR STAFF USE ONLY, DO NOT WRITE BELOW THIS LINE

5) Is the BMI ≥35 kg/m^2?
   Yes ☐ No ☐
6) Is the patient ≥50 years of age?
   Yes ☐ No ☐
7) Is the neck circumference greater than 15.7 inches (40 cm)?
   Yes ☐ No ☐
8) Is the patient male?
   Yes ☐ No ☐

Total number of questions answered YES: _____ Is the patient at high risk for OSA?
Yes ☐ No ☐

High risk of OSA: Yes to >3 items

Figure 13-5 STOP-Bang screening questionnaire for obstructive sleep apnea. (From Chung F, Yegneswaran B, Liao P, et al. STOP Questionnaire. A tool to screen patients for obstructive sleep apnea. Anesthesiology 108:812-821, 2008.)

patients with OSA, which includes preoperative diagnosis and treatment of OSA if possible, and appropriateness of ambulatory surgery.[25]

Dyspnea is caused by an increased respiratory drive or a respiratory system subject to an increased mechanical load. The most common causes of acute dyspnea are COPD, asthma, and heart failure (Fig. 13-6). Specific preoperative tests for patients with dyspnea are indicated by the results of the history and physical examination. Most of the conditions that cause dyspnea, except for the psychogenic ones, increase the risk of perioperative complications, especially if the condition is poorly controlled or unknown to the anesthesiologist. When preoperative evaluation yields a proper diagnosis, effective treatment can improve the patient's medical condition.

Renal disease is associated with hypertension, cardiovascular disease, excessive intravascular volume, electrolyte disturbances, metabolic acidosis, and often a need to alter the type and amount of anesthetic drugs administered. Renal insufficiency is a risk factor probably equal to CAD. In elective cases, dialysis is performed within 24 hours of surgery, but not immediately before, to avoid acute volume depletion and electrolyte alterations. Chronic hyperkalemia may not need treatment if potassium blood concentrations are less than 6 mEq/dL and within the range of a patient's established levels. Radiocontrast medium transiently decreases glomerular filtration rate (GFR) in almost all patients, but patients with diabetes or renal insufficiency are at highest risk. For patients with a GFR less than 60 $mL \cdot kg^{-1} \cdot min^{-1}$ alkalinizing renal tubular fluid with sodium bicarbonate or simple hydration may reduce injury.

Diabetic patients are at risk for multiorgan dysfunction, with renal insufficiency, strokes, peripheral neuropathies, visual impairment, and cardiovascular disease most prevalent. Tight glucose control in stroke, coronary bypass surgery, or critically ill individuals may improve outcomes but is controversial.[26] Whether tight control perioperatively for noncardiac surgery confers benefit or simply increases the risk of hypoglycemia is not clear. Chronically poor control increases co-morbid conditions such as vascular disease, heart failure, and infections and likely increases the risk of surgery. Chronically poor control predicts higher blood glucose levels perioperatively.[27] Targeting control in the immediate perioperative period likely will not have a substantial impact on

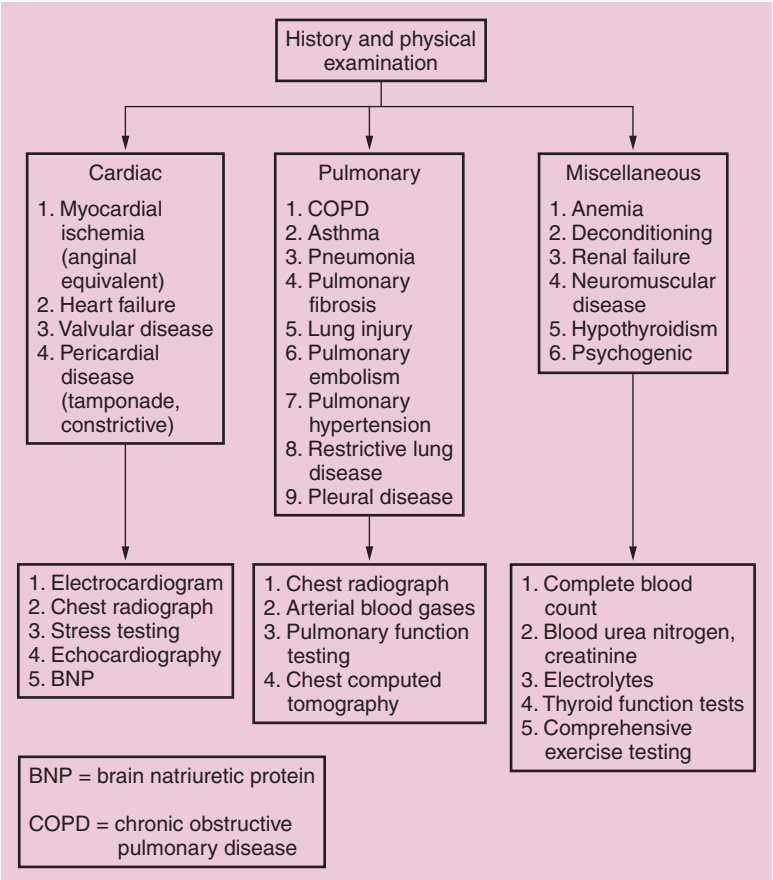


Figure 13-6 Guideline for the evaluation of dyspnea.

outcomes in diabetics having surgery. Increased levels of blood glucose or even treatment of high levels for noncardiac surgery. Diabetic ketoacidosis and hypoglycemia (glucose <50 g/dL) are the only conditions that absolutely warrant perioperative intervention. The goals of glucose control are to prevent hypoglycemia during fasting, extreme hyperglycemia, and ketosis.

Extreme obesity is defined by a body mass index (BMI) of 40 or more. Obese patients may have OSA, heart failure, diabetes, hypertension, pulmonary hypertension, difficult airways, decreased arterial oxygenation, and increased gastric volume. Special equipment is needed to care for obese patients: oversized blood pressure cuffs, airway management devices, and large procedure tables and gurneys to support excessive weight.

Anemia, common preoperatively, is a marker for increased risk of perioperative death, and a predictor of short- and long-term outcomes in the general population. Preoperative anemia is the strongest predictor of the need for transfusions, which increase morbidity and mortality rates.[28] If the cause of anemia is unknown, an evaluation is generally indicated before elective procedures, especially if blood loss or anticoagulation is anticipated. For asymptomatic patients with chronic anemia and no history of CAD who will undergo a low-risk procedure, the minimal physiologic perturbations during a well-conducted anesthetic are unlikely to pose enough risk to warrant transfusion unless the hemoglobin is less than 6 g/dL[29] (see Chapter 24). Patients with sickle cell disease should be managed in concert with a hematologist familiar with the disease.

Pregnant patients scheduled for nonobstetric procedures may require fetal monitoring. Management of preterm labor or even delivery should be anticipated. Perioperative plans are confirmed in consultation with the patient's obstetrician (also see Chapter 33).

Elderly patients (also see Chapter 35) have declines in organ function, respond differently to medications, and have a greater number of co-morbid conditions. Among the conditions are arthritis, hypertension, heart disease, diabetes, renal insufficiency, and vascular disease. Patients older than 85 years with a history of hospital admission within the previous 6 months are at high risk for postoperative admission after ambulatory surgery.[30] Yet, the rate of perioperative complications among the very elderly (>85 years old) does not exclude them from having surgical procedures.[31] Discharge planning in advance may lessen the costs of perioperative elder care. Preoperative clinics can be designed to offer multidisciplinary care and postdischarge planning that coordinates with surgical, nursing, and social service departments. Many elderly patients have or desire advanced directives or do-not-resuscitate (DNR) orders, which require special discussion. DNR orders should no longer automatically occur for patients undergoing anesthesia and surgery (Fig. 13-7 and Table 13-10).

CONSULTATIONS

Collaborative care of patients is often necessary and beneficial. Consultation initiated by the preoperative physician should seek specific advice regarding diagnosis and status of the patient's condition(s). Letters or notes stating "cleared for surgery" or "low risk" are not sufficient to help the anesthesia provider design a safe anesthetic. A summation of the patient's medical problems and condition and the results of diagnostic tests are necessary. Preoperative consultations should be sought for the following:

- Diagnosis, evaluation, and improvement of a new or poorly controlled condition
- Creation of a clinical risk profile that the patient, anesthesiologist, and surgeon use to make management decisions

Close coordination and good communication among the preoperative anesthesiologist, surgeon and consultant are vitally important.

TESTING

Diagnostic testing and the benefits of disease-indicated testing versus a screening battery of tests have been studied. Few abnormalities detected by routine testing result in changes in management and rarely have such changes had a beneficial effect.[32,33] Preoperative tests without specific indications lack utility and may lead to patient injury because of unnecessary interventions, delay of surgery, anxiety, and even inappropriate therapies. The evaluation of abnormal results is costly. On average, 1 in 2000 preoperative tests result in patient harm from pursuit of abnormalities detected by those tests.[2] Perhaps not following up on an abnormal result is a greater medicolegal risk than not identifying the abnormality to begin with.

In a pilot study of over 1000 patients undergoing ambulatory surgery, there was no increase in adverse perioperative events in patients who had no preoperative tests.[34] There was no increase in OR delays or cancellations or differences in outcome from lack of testing. Several other studies have shown that the information from resting 12-lead ECGs does not add value to the care of surgical patients.[4,35] The specificity of an ECG abnormality in predicting postoperative cardiac adverse events is only 26%, and a normal ECG does not exclude cardiac disease.[33] An ECG should not be done simply because the patient is of advanced age. Recommendations for age-based testing were derived from the frequent incidence of abnormalities found on ECGs of elderly patients. A prospective observational study in patients aged 50 years or older having major noncardiac surgery found

_____ Option 1 - Full Resuscitation

I, _____, desire that full resuscitation measures be employed during my anesthesia and in the postanesthesia care unit, regardless of the situation.

_____ Option 2 - Limited Resuscitation: Procedure-directed

During my anesthesia and in the postanesthesia care unit, I, _____, refuse the following procedures:

_____ Option 3 - Limited Resuscitation: Goal-directed

I, _____, desire attempts to resuscitate me during my anesthesia and in the postanesthesia care unit only if, in the clinical judgement of the attending anesthesiologist and surgeon, the adverse clinical events are believed to be both temporary and reversible.

_____ Option 4 - Limited Resuscitation: Goal-directed

I, _____, desire attempts to resuscitate me during my anesthesia and in the postanesthesia care unit only if, in the clinical judgement of the attending anesthesiologist and surgeon, such resuscitation efforts will support the following goals and values of mine: _____

_____ _____
Patient or surrogate signature Date

_____ _____
Physician signature Date

_____ _____
Witness signature Date

Figure 13-7 Anesthesia care for the patient with an existing do-not-resuscitate (DNR) order. (From Truog RD, Waisel DB. Do-not-resuscitate orders: From the ward to the operating room; from procedures to goals. Int Anesthesiol Clin 2001;39:53-65.)

Table 13-10 Do Not Resuscitate (DNR) Orders in the Perioperative Period

Policies automatically suspending DNR orders or other directives that limit treatment before procedures involving anesthetic care may not sufficiently address a patient's rights to self-determination in a responsible and ethical manner. Such policies, if they exist, should be reviewed and revised, as necessary, to reflect the content of these guidelines.
A. *Full Attempt at Resuscitation:* The patient or designated surrogate may request the full suspension of existing directives during the anesthetic and immediate postoperative period, thereby consenting to the use of any resuscitation procedures that may be appropriate to treat clinical events that occur during this time.
B. *Limited Attempt at Resuscitation Defined With Regard to Specific Procedures:* The patient or designated surrogate may elect to continue to refuse certain specific resuscitation procedures (for example, chest compressions, defibrillation, or tracheal intubation). The anesthesiologist should inform the patient or designated surrogate about (1) which procedures are essential to the success of the anesthesia and the proposed procedure and (2) which procedures are not essential and may be refused.
C. *Limited Attempt at Resuscitation Defined With Regard to the Patient's Goals and Values:* The patient or designated surrogate may allow the anesthesiologist and surgical team to use clinical judgment in determining which resuscitation procedures are appropriate in the context of the situation and the patient's stated goals and values. For example, some patients may want full resuscitation procedures to be used to manage adverse clinical events that are believed to be quickly and easily reversible, but to refrain from treatment for conditions that are likely to result in permanent sequelae, such as neurologic impairment or unwanted dependence upon life-sustaining technology.

From Ethical Guidelines for the Anesthesia Care of Patients with Do-Not-Resuscitate Orders or other Directives that Limit Treatment Committee of Origin: Ethics (Approved by the ASA House of Delegates on October 17, 2001, and last affirmed on October 22, 2008) accessed 11/17/2010.

abnormalities in 45% of the preoperative ECGs. Bundle branch blocks, associated with postoperative MI and death, had no added predictive value over clinical risk factors.[36] The Centers for Medicare and Medicaid Services (CMS) do not reimburse for "preoperative" or age-based ECGs.[37] The ASA Preoperative Evaluation Practice Advisory recognized that ECGs did not improve prediction beyond risk factors identified by patient history.[38] Indications for preoperative ECGs are shown in Table 13-11.[4] Chest radiographs do not predict postoperative pulmonary complications.[17]

Healthy patients of any age and patients with known, stable, chronic diseases undergoing low- to intermediate-risk procedures are unlikely to benefit from any *routine* tests. A test is ordered only if the results will impact the decision to proceed with the planned procedure or alter the care plans. It is misguided to believe that discovering abnormalities on ECGs, chest radiographs, or blood work impacts care or outcomes for many patients or procedures. Studies have shown that elimination of routine testing does not increase risk.[4,17,34] However, clinical evaluation of patients preoperatively is still necessary. Eliciting a history of increased dyspnea on exertion, new onset chest pain, or syncope, and providing patients with appropriate preoperative medication instructions is of greater benefit than ordering ECGs or blood tests. Tests to establish a diagnosis, evaluate a worsening condition, or aid in preoperative decisions and management for patients with severe co-morbidities are shown in Table 13-12. Tests for selected patients may be indicated simply because of planned anesthesia or surgery (Table 13-13).

The ASA Preoperative Evaluation Practice Advisory recognized that the literature "... *is insufficient to inform patients or physicians whether anesthesia causes harmful effects on early pregnancy*," and suggests that pregnancy testing be offered to women if the test result will alter management.[38] Some practices and facilities provide patients with information about the potential risks of anesthesia and surgery on pregnancy but allow them to decline testing. Other practices mandate that all females of childbearing age undergo a urine pregnancy test on the day of surgery. Perhaps in facilities with a mandatory testing policy, patients should be informed that consent for surgery and anesthesia includes consent for pregnancy testing.

Table 13-11 Recommendations for Preoperative Resting 12-Lead Electrocardiogram (ECG)

Class I
(Procedure is indicated)
1. Preoperative resting 12-lead ECG is recommended for patients with at least one clinical risk factor* who are undergoing vascular surgical procedures.
2. Preoperative resting 12-lead ECG is recommended for patients with known CHD, peripheral arterial disease, or cerebrovascular disease who are undergoing intermediate-risk surgical procedures.

Class IIa
(Procedure is reasonable to perform)
1. Preoperative resting 12-lead ECG is reasonable in persons with no clinical risk factors who are undergoing vascular surgical procedures.

Class IIb
(Procedure may be considered)
1. Preoperative resting 12-lead ECG may be reasonable in patients with at least one clinical risk factor who are undergoing intermediate-risk operative procedures.

Class III
(Procedure should NOT be performed because it is not helpful)
1. Preoperative and postoperative resting 12-lead ECGs are not indicated in asymptomatic persons undergoing low-risk surgical procedures.

*Clinical risk factors are ischemic heart disease, heart failure, cerebrovascular disease, diabetes, and renal insufficiency.
CHD, coronary heart disease.
Adapted from Fleisher LA, Beckman JA, Brown KA, et al. ACC/AHA 2007 Guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery. J Am Coll Cardiol 2007;50:e159-e241.

MEDICATIONS

Instructions to patients to continue or discontinue drugs will likely improve outcomes more than testing will. The co-morbidities and the nature of the procedure are considered when managing medications preoperatively. Some medications have beneficial effects during anesthesia and surgery, others are detrimental, and in still other cases, suddenly stopping therapy has a negative effect. A summary of recommendations for perioperative administration of medications is in Table 13-14. Several drug classes and emerging controversies deserve special mention.

Generally, cardiac medications and antihypertensive drugs are continued preoperatively. Angiotensin-converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), diuretics, and anticoagulants may be beneficial even on the day of surgery. Continuing or discontinuing these drugs depends on the intravascular volume and hemodynamic status of the patient, the degree of cardiac dysfunction, the adequacy of arterial blood pressure control, and the anticipated anesthetic and intravascular volume concerns. Continuing all medications for patients with severe disease, or those undergoing low- to intermediate-risk procedures, sedation or centroneuraxial anesthesia is likely best. If ACEIs and ARBs are continued, doses of induction and other anesthetic drugs may be altered. Vasopressin should be available to prevent or mitigate hypotension.[39] The potential for refractory hypotension must be balanced against the positive therapeutic impact of continuing these drugs perioperatively on a case-by-case basis.

Table 13-12 Preoperative Diagnostic Testing Recommendations

Albumin	Anasarca; liver disease; malnutrition; malabsorption
β-hCG	Suspected pregnancy
CBC	Alcohol abuse; anemia; dyspnea; hepatic or renal disease; malignancy; malnutrition; personal history of bleeding; poor exercise tolerance; recent chemotherapy or radiation therapy
Creatinine	Renal disease; poorly controlled diabetes
Chest radiograph	Active, acute or chronic significant pulmonary symptoms such as cough or dyspnea; abnormal unexplained physical findings on chest examination; decompensated heart failure; malignancy within the thorax; radiation therapy*
Electrocardiogram	Alcohol abuse; active cardiac condition (new or worsening chest pain or dyspnea, palpitations, tachycardia, irregular heart beat, unexplained bradycardia, undiagnosed murmur, S_3, decompensated heart failure); implanted cardioverter-defibrillator (ICD); obstructive sleep apnea; pacemaker; pulmonary hypertension; radiation therapy*; severe obesity; syncope; use of amiodarone or digoxin
Electrolytes	Alcohol abuse; cardiovascular, hepatic, renal or thyroid disease; diabetes; malnutrition; use of digoxin or diuretics
Glucose	Diabetes; severe obesity; use of steroids
LFTs	Alcohol abuse; hepatic disease; recent hepatitis exposure; undiagnosed bleeding disorder
Platelet count	Alcohol abuse; hepatic disease; bleeding disorder (personal or family history); hematologic malignancy; recent chemotherapy or radiation therapy; thrombocytopenia
PT	Alcohol abuse; hepatic disease; malnutrition; bleeding disorder (personal or family history); use of warfarin
PTT	Bleeding disorder (personal or family history); undiagnosed hypercoagulable state; use of unfractionated heparin
TSH, T_3, T_4	Goiter; thyroid disease; unexplained dyspnea, fatigue, palpitations, tachycardia
Urinalysis	Urinary tract infection (suspected)

*Only with radiation therapy to chest, breasts, lungs, thorax.
CBC, complete blood count; β-hCG, β-human chorionic gonadotropin [assay] (pregnancy test); LFTs, liver function tests (albumin, bilirubin, alanine and aspartate aminotransferases); PT, prothrombin time; PTT, partial thromboplastin time; T_3, triiodothyronine; T_4, thyroxine; TSH, thyroid-stimulating hormone.

Furosemide can always be administered intravenously after induction of anesthesia. It is recommended (class I indications) that β-blockers be continued in patients who take them to treat angina, symptomatic arrhythmias, or hypertension (Table 13-15).[40] Minimizing risk for high-risk patients scheduled for elective surgery may entail postponing surgery to optimize β-adrenergic blockers and statin therapy. Statins reduce length of hospital stay and risk of stroke, renal dysfunction, MI, and even death.[41-43] No study of perioperative statin therapy has reported serious risks with the use of these drugs.[42] Abruptly terminating statin administration may be associated with an increased risk, including death.[44] Statins should be continued in the perioperative period, and serious consideration should be given to starting them in patients with known, or risk factors for, atherosclerotic disease.

Aspirin is commonly used to decrease risk of events in patients with known, or risk factors for, vascular disease, diabetes, renal insufficiency, or simply advanced age. Traditionally aspirin has been withdrawn in the perioperative period because of concern of bleeding. However, this practice has come under scrutiny. A meta-analysis of almost 50,000 patients undergoing a variety of noncardiac surgeries (30% taking aspirin perioperatively) found that aspirin increased bleeding complications by a factor of 1.5, but not the severity, except in patients undergoing intracranial surgery and possibly transurethral resection of the prostate.[8] Surgeons blinded to aspirin administration could not identify patients taking or not taking aspirin based on bleeding.[11] There is an increased risk of vascular events when aspirin taken regularly is stopped perioperatively.[45] There may be a rebound hypercoagulable state when aspirin is withdrawn.[46] Acute coronary syndromes occurred 8.5 ± 3.6 days and acute cerebral events 14.3 ± 11.3 days after aspirin cessation, the typical duration of interruption for surgery, and events were twice as common in patients who had stopped taking aspirin in the previous 3 weeks when compared to those who continued aspirin.[8] Stopping aspirin for 3 to 4 days is usually sufficient, if aspirin is stopped at all, and dosing should be resumed as soon as possible. New platelets formed after aspirin (half-life of approximately 15 minutes) is stopped will not be affected. Normally functioning platelets at a concentration of more than 50,000/mm^3 are adequate to control surgical bleeding. For many minor, superficial procedures such as cataract extraction, endoscopies, and peripheral procedures, the risk of withdrawing aspirin in at-risk patients is greater than the risk of

Table 13-13 Recommendations for Patient-Specific Baseline Testing before Anesthesia*

Procedure/Patient Type	Test
Injection of contrast dye	Creatinine†
Potential for significant blood loss	Hemoglobin/hematocrit†
Likelihood of transfusion requirement	Type and screen
Possibility of pregnancy	Pregnancy test‡
End-stage renal disease	Potassium level§
Diabetes	Glucose level determination on day of surgery§
Active cardiac condition (e.g., decompensated heart failure, arrhythmia, chest pain, murmur)	Electrocardiogram

*Not to establish a diagnosis or to guide *preoperative* management.
†Results from laboratory tests within 3 months of surgery are acceptable unless major abnormalities are present or the patient's condition has changed.
‡A routine pregnancy test before surgery is not recommended before the day of surgery. A careful history and local practice determine whether a pregnancy test is indicated.
§No absolute level of either potassium or glucose has been determined to preclude surgery and anesthesia. The benefits of the procedure must be balanced against the risk of proceeding in a patient with abnormal results.

bleeding.[47] Aspirin should be discontinued if taken only for primary prevention (no history of stents, strokes, MI) (see Fig. 13-4 and Table 13-14).[48] Aspirin administration should be continued if taken for secondary prevention (history of stents or vascular disease), except for procedures with a risk of bleeding in closed spaces (e.g., intracranial, posterior chamber of the eye). Neuraxial and peripheral anesthesia in patients taking aspirin is safe and endorsed by the American Society of Regional Anesthesia (ASRA).[49] The risk of spinal hematoma with clopidogrel is unknown. Based on labeling and ASRA guidelines clopidogrel is discontinued 7 days before planned neuraxial blockade.

Low-molecular-weight heparin (LMWH) is discontinued 12 to 24 hours before procedures with a risk of bleeding or a planned neuraxial block (Table 13-16).[49] Warfarin may increase bleeding except during minor procedures such as cataract surgery without bulbar blocks. The usual recommendation is to withhold five doses of warfarin before operation (if the international normalized ratio [INR] is 2 to 3) to allow the INR to decrease to within reference limits (see Table 13-16).[49] If the INR is greater than 3.0, warfarin should be withheld longer. If the INR is measured the day before surgery and is greater than 1.8, a small dose of vitamin K (1 to 5 mg orally or subcutaneously) can reverse anticoagulation.[50] Substitution with shorter-acting anticoagulants such as unfractionated or LMWH, referred to as bridging, is controversial (see Table 13-16). Bridging is usually reserved for patients who have had an acute arterial or venous thromboembolism within 1 month before surgery, if surgery cannot be postponed, for patients with certain mechanical heart valves, or for patients with high-risk hypercoagulable states.[50]

Type 1 diabetics have an absolute insulin deficiency and require insulin to prevent ketoacidosis even if they are not hyperglycemic. Type 2 diabetics are often insulin-resistant

Table 13-14 Preanesthesia Medication Instructions

Continue on Day of Surgery	Discontinue on Day of Surgery Unless Otherwise Indicated
Antidepressant, antianxiety, and psychiatric medications (including monoamine oxidase inhibitors*)	
Antihypertensives ■ Generally to be continued	Antihypertensives ■ Consider discontinuing angiotensin-converting enzyme inhibitors or angiotensin receptor blockers 12-24 hr before surgery if taken only for hypertension; especially with lengthy procedures, significant blood loss or fluid shifts, use of general anesthesia, multiple antihypertensive medications, well-controlled blood pressure; hypotension is particularly dangerous
Aspirin† ■ Patients with known vascular disease ■ Patients with drug-eluting stents for <12 months ■ Patients with bare metal stents for <1 month ■ Before cataract surgery (if no bulbar block) ■ Before vascular surgery ■ Taken for secondary prophylaxis	Aspirin† ■ Discontinue 5-7 days before surgery: • If risk of bleeding > risk of thrombosis • For surgeries with serious consequences from bleeding • Taken only for primary prophylaxis (no known vascular disease)

Table 13-14 Preanesthesia Medication Instructions—cont'd

Continue on Day of Surgery	Discontinue on Day of Surgery Unless Otherwise Indicated
Asthma medications	
Autoimmune medications ■ Methotrexate (if no risk of renal failure)	Autoimmune medications ■ Methotrexate (if risk of renal failure) ■ Entanercept (Enbrel), infliximab (Remicade), adalimumab (Humira): check with prescriber
Birth control pills	
Cardiac medications	
Clopidogrel (Plavix)* ■ Patients with drug-eluting stents for <12 months ■ Patients with bare metal stents for <1 month ■ Before cataract surgery (if no bulbar block)	Clopidogrel (Plavix)* ■ Patients not included in group recommended for continuation
COX-2 inhibitors	COX-2 inhibitors ■ If surgeon is concerned about bone healing
Diuretics ■ Triamterene, hydrochlorothiazide	Diuretics ■ Potent loop diuretics
Eye drops	
Estrogen compounds ■ When used for birth control or cancer therapy	Estrogen compounds ■ When used to control menopause symptoms or for osteoporosis
Gastrointestinal reflux medications	Gastrointestinal reflux medications (Tums)
	Herbals and nonvitamin supplements ■ 7-14 days before surgery
	Hypoglycemic agents, oral
Insulin ■ *Type 1 diabetes*: take ~ 1/3 of intermediate to long-acting (NPH, lente) ■ *Type 2 diabetes*: take up to ½ long-acting (NPH) or combination (70/30) preparations ■ Glargine (Lantus): decrease if dose is ≥1 unit/kg ■ With insulin pump delivery, continue lowest nighttime basal rate	Insulin ■ Regular insulin (*exception*: with insulin pump, continue lowest basal rate—generally nighttime dose) ■ Discontinue if blood sugar level <100
Narcotics for pain or addiction Seizure medications	Nonsteroidal anti-inflammatory drugs ■ 48 hr before day of surgery
Statins	Topical creams and ointments
Steroids (oral or inhaled)	Viagra or similar medications ■ Discontinue 24 hr before surgery
Thyroid medications	Vitamins, minerals, iron
Warfarin ■ Cataract surgery, no bulbar block	Warfarin‡ ■ Discontinue 5 days before surgery

*See text for details.
†Except when the risk or consequences of bleeding are severe (generally only with intracranial or posterior eye procedures).
‡Bridging may be necessary; see text for details.
COX-2, cyclooxygenase-2.

and prone to extreme hyperglycemia. Both type 1 and 2 diabetics should discontinue intermittent short-acting insulin. Patients with insulin pumps continue with their lowest basal rate, which is typically a nighttime rate. Type 1 diabetics take a small amount (usually 1/3 to 1/2) of their usual intermediate- to long-acting morning insulin (e.g., lente or NPH) the day of surgery to avoid ketoacidosis. Type 2 diabetics take none or up to half a dose of

Table 13-15 American College of Cardiology Foundation (ACCF)/American Heart Association (AHA) Perioperative Beta Blocker Recommendations

Class I

1. Beta blockers should be continued in patients undergoing surgery who are receiving beta blockers for treatment of conditions with ACCF/AHA Class I guideline indications for the drugs. *(Level of Evidence:* C)

Class IIa

1. Beta blockers titrated to heart rate and blood pressure are probably recommended for patients undergoing vascular surgery who are at high cardiac risk owing to coronary artery disease or the finding of cardiac ischemia on preoperative testing *(Level of Evidence:* B)
2. Beta blockers titrated to heart rate and blood pressure are reasonable for patients in whom preoperative assessment for vascular surgery identifies high cardiac risk, as defined by the presence of more than 1 clinical risk factor.* *(Level of Evidence:* C)
3. Beta blockers titrated to heart rate and blood pressure are reasonable for patients in whom preoperative assessment identifies coronary artery disease or high cardiac risk, as defined by the presence of more than 1 clinical risk factor,* who are undergoing intermediate-risk surgery *(Level of Evidence:* B)

Class IIb

1. The usefulness of beta blockers is uncertain for patients who are undergoing either intermediate-risk procedures or vascular surgery in whom preoperative assessment identifies a single clinical risk factor in the absence of coronary artery disease.* *(Level of Evidence:* C)
2. The usefulness of beta blockers is uncertain in patients undergoing vascular surgery with no clinical risk factors* who are not currently taking beta blockers. *(Level of Evidence:* B)

Class III

1. Beta blockers should not be given to patients undergoing surgery who have absolute contraindications to beta blockade. *(Level of Evidence:* C)
2. Routine administration of high-dose beta blockers in the absence of dose titration is not useful and may be harmful to patients not currently taking beta blockers who are undergoing noncardiac surgery *(Level of Evidence:* B)

*Clinical risk factors include history of ischemic heart disease, history of compensated or previous heart failure, history of cerebrovascular disease, diabetes mellitus, and renal insufficiency (defined in the Revised Cardiac Risk Index as preoperative serum creatinine concentration of >2 mg/dL.[40]

Table 13-16 Outpatient Periprocedural Bridging Protocol

Enoxaparin or Low-Molecular-Weight Heparin (LMWH)

Do not use enoxaparin if $CrCl_{est}$ < 40 mL/min, body weight > 150 kg, or patient has history of bleeding complications on enoxaparin, pork allergy, or heparin-induced thrombocytopenia.

Special consideration is needed for patients undergoing centroneuraxial anesthesia and for timing of catheter placement and removal. Enoxaparin dosing must be coordinated with the anesthesia service based on American Society of Regional Anesthesia (ASRA) guidelines.[49]

The first enoxaparin dose depends on how quickly the INR becomes subtherapeutic after cessation of warfarin. Obtain an INR determination before enoxaparin administration.

- *Day −7*: Last dose of warfarin is given if INR is 3.0-3.5. Repeat INR on day-5 and begin enoxaparin when INR is subtherapeutic.
- *Day −6*: Last dose of warfarin is given if INR is 2.5-3.0 Repeat INR on day-4 and begin enoxaparin when INR is subtherapeutic.
- *Day −5*: Last dose of warfarin is given if INR is 2.0-2.5. Repeat INR on day-4 and begin enoxaparin when INR is subtherapeutic.
- *Days −4, −3 and −2*: Continue enoxaparin—no warfarin.
- *Day −1*: Last dose of enoxaparin is given at 0700.
- *Day 0*: Day of surgery.

Alternative Management Using Administration of Oral Vitamin K

If enoxaparin is contraindicated (i.e., $CrCl_{est}$ < 40 mL/min, body weight > 150 kg, or patient has history of bleeding complications on enoxaparin, pork allergy, or heparin-induced thrombocytopenia), the following procedure using orally administered vitamin K is recommended:

- *Day −3*: Last dose of warfarin is given.
- *Day −2*: Hold warfarin and administer vitamin K in a single oral dose of 5 mg.
- *Day −1*: Obtain INR and repeat dose of vitamin K if INR ≥ 1.5.
- *Day 0*: Obtain STAT INR 1 hour before the scheduled arrival time for the procedure

$CrCl_{est}$, estimated rate of creatinine clearance; INR, international normalized ratio.

intermediate- to long-acting (e.g., lente or NPH) or a combination (70/30 preparations) insulin on the day of operation. Taking half the usual dose of intermediate-, long-acting, or combination insulin on the day of surgery improves perioperative glycemic levels compared to taking no insulin.[51] Ultra-long-acting insulin such as glargine insulin can be taken as scheduled.

Metformin does not need to be discontinued before the day of surgery and will not cause hypoglycemia during

fasting periods of 1 to 2 days. There is no risk of lactic acidosis with metformin in patients with a functioning liver and kidneys. Therefore, for patients who continue metformin, procedures are not canceled, but metformin is not administered postoperatively until the risk of lactic acidosis has passed. There are no data to support the recommendation to stop metformin 24 to 48 hours before surgery, which increases the risk of hyperglycemia.[52] Sulfonylurea drugs with very long half-lives (e.g., chlorpropamide) can cause hypoglycemia in fasting patients. Newer oral drugs (acarbose, pioglitazone) used as single-agent therapy do not cause hypoglycemia during fasting. However, to avoid confusion oral hypoglycemic drugs are generally withheld on the day of surgery. Patients taking steroids regularly take their usual dose on the day of surgery. Stress-associated adrenal insufficiency in some patients may require additional steroids perioperatively. A normal daily adrenal output of cortisol (30 mg) is equivalent to 5 to 7.5 mg of prednisone. The hypothalamic-pituitary axis (HPA) is not suppressed with less than 5 mg/day of prednisone or its equivalent. In patients taking 5 to 20 mg/day of prednisone or its equivalent for more than 3 weeks, the HPA may be suppressed. The HPA is suppressed with more than 20 mg/day of prednisone or its equivalent when taken for more than 3 weeks. The risk of adrenal insufficiency remains for up to 1 year after the cessation of high-dose steroids. During the stress of surgery, trauma, or infection an intact HPA will respond by increasing output of glucocorticoids. Supplementation with steroids depends on the amount of stress, duration and severity of the procedure, and the regular daily dose of steroid (Table 13-17). Infections, psychosis, poor wound healing, and hyperglycemia increase with high doses of perioperative steroids, which are rarely necessary.[53]

Herbals and supplements should be discontinued 7 to 14 days before surgery. The exception is valerian, a central nervous system depressant, which may cause a benzodiazepine-like withdrawal when discontinued; if possible, intake of valerian should be tapered before a planned anesthetic. Mandatory discontinuation of these medications, or cancellation of anesthesia when these medications have been continued, is not supported by available data. Herbal therapy alone is not a contraindication to neuraxial anesthesia. ASRA specifically advises against mandatory discontinuation of herbals or forgoing regional anesthesia in patients taking herbal drugs.[49]

Historically, monoamine oxidase inhibitors (MAOIs) were discontinued before surgery, but because of their long duration of action, they must be discontinued at least 3 weeks before surgery. Discontinuation of MAOIs may produce severe depression or result in suicide. The safest alternative is to continue MAOIs and adjust the anesthetic plan. Patients also continue any narcotic pain medications to prevent withdrawal symptoms and discomfort. Anxiolytics are continued as well. Drugs used to treat addiction such as methadone or nicotine-replacement therapies also are continued.[54] Inhalers and long-term medications for asthma or chronic obstructive pulmonary disease are continued on the day of surgery.[55]

Patients who are particularly anxious should be given pharmacologic premedication. Outpatients benefit from a prescription for a short course of benzodiazepines such as lorazepam to be taken in the days preceding surgery as well as on the day of operation. Opioids are useful in those patients experiencing preoperative pain, discomfort associated with placement of a regional

Table 13-17 Recommendations for Perioperative Glucocorticoid Coverage

Surgical Stress	Target Hydrocortisone Equivalent	Steroid Dosing				
				Postoperative		
		Preoperative	*Intraoperative*	*Immediately*	*Day 1*	*Day 2*
Minor (e.g., inguinal herniorrhaphy)	25 mg/day for 1 day	Usual daily dose of steroid	None†	None†	Usual daily dose*†	
Moderate (e.g., colon resection, total joint replacement, lower extremity revascularization)	50-75 mg/day for 1-2 days	Usual daily dose of steroid	50 mg† hydrocortisone	20 mg† hydrocortisone every 8 hr	20 mg† hydrocortisone every 8 hr	
Major (e.g., pancreatoduodenectomy, esophagectomy)	100-150 mg/day for 2-3 days	Usual daily dose of steroid	50 mg† hydrocortisone	50 mg† hydrocortisone every 8 hr	50 mg† hydrocortisone every 8 hr	50 mg† hydrocortisone every 8 hr

*If the postoperative course is uncomplicated, the patient can resume the usual steroid dose on postoperative day 1.
†If postoperative complications occur, continued glucocorticoid administration will be necessary commiserate with the level of stress.
Dosages from Salem M, Tainsh RE, Bromberg J, et al. Perioperative glucocorticoid coverage. A reassessment 42 years after emergence of a problem. Ann Surg 1994;219:416-425.

anesthetic, or insertion of invasive monitors before induction of anesthesia. Patients with a history of protracted severe PONV can be offered a prescription for a scopolamine patch to be placed 2 to 4 hours preoperatively. Patients with closed angle glaucoma should not be prescribed scopolamine. Patients at increased risk for pulmonary aspiration (parturients, nonfasting individuals, significant symptoms of esophageal reflux, anticipated difficult airway management) benefit from attempts to alter gastric contents. H_2 antagonists (ranitidine, famotidine), proton pump inhibitors (omeprazole), and antacids (sodium citrate) increase gastric fluid pH. Prokinetics (metoclopramide) stimulate gastric emptying. Table 13-18 outlines commonly used preoperative medications.

FASTING

Current guidelines (Table 13-19) for preoperative fasting for the adult patient recommend that "fasting from solids (and) nonhuman milk should exceed a period of 6 hours before procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia." Liberalization of preoperative fasting rules to include clear liquids up to 2 hours before anesthesia is acceptable for patients without conditions that may increase the risk of aspiration, such as an incompetent lower esophageal sphincter with reflux, hiatal hernia, diabetes mellitus, gastric motility disorders, intra-abdominal masses (including the gravid uterus), and bowel obstruction.[56]

Table 13-19 Guidelines for Food and Fluid Intake before Elective Surgery

Time Before Surgery	Food or Fluid Intake
Up to 8 hours	Food and fluids as desired
Up to 6 hours*	Light meal (e.g., toast and clear liquids†); infant formula; nonhuman milk
Up to 4 hours*	Breast milk
Up to 2 hours*	Clear liquids† only; no solids or foods containing fat in any form
During the 2 hours	No solids, no liquids

*This guideline applies only to patients who *are not* at risk for delayed gastric emptying. Patients with the following conditions *are* at risk for delayed gastric emptying: morbid obesity; diabetes mellitus; pregnancy; a history of gastroesophageal reflux; a surgery-limited stomach capacity; a potential difficult airway; opiate analgesic therapy.
†Clear liquids are water, carbonated beverages, sports drinks, coffee or tea (without milk). The following are *not* clear liquids: juice with pulp; milk; coffee or tea with milk; infant formula; any beverage with alcohol.
From Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: Application to healthy patients undergoing elective procedures: A report by the American Society of Anesthesiologists Task Force on Preoperative Fasting, Anesthesiology 90:896–905, 1999.

Table 13-18 Drugs for Pharmacologic Premedication before Anesthesia

Classification	Drug	Typical Adult Dose (mg)	Route of Administration
Benzodiazepines	Midazolam	1-2.5	IV
	Lorazepam	0.5-2	Oral, IV
Opioids	Hydromorphone	0.5-1	IV
	Fentanyl	25-100 μg	IV
Antihistamines	Diphenhydramine	12.5-50	Oral, IV
Antiemetics	Scopolamine	1.5	Topical
	Dexamethasone	4	IV
	Dolasetron	12.5	IV
	Ondansetron	4	IV
H_2 antagonists	Ranitidine	150	Oral
	Famotidine	20-40	IV, oral
Antacids	Nonparticulate sodium citrate	15-30 mL	Oral
Proton pump inhibitors	Omeprazole	20	Oral
	Pantoprazole	40	IV
Gastrointestinal stimulants	Metoclopramide*	10	Oral, IV

*Rare incidence of prolonged QT interval.
IV, Intravenous.

FORMULATION OF ANESTHESTIC PLAN, ASSESSMENT OF RISK, AND INFORMED CONSENT

The choice of anesthesia (general, regional or sedation), monitors, or specific anesthetic drugs rarely alters outcome or risk. However, impressions from clinical experience continue to influence beliefs and recommendations when devising a plan of anesthesia care. Factors to consider when formulating a planned anesthetic are shown in Table 13-20.

Risk assessment is useful to compare outcomes, control costs, allocate compensation, and assist in the difficult decision of canceling or recommending a procedure not be done when the risks are too high. Yet risk assessment, at its best, is hampered by individual patient variability. Risks have traditionally been attributed to the patient's co-morbid conditions, general health status, age, anesthetic technique, and the planned procedure (Fig. 13-8 and Tables 13-3, 13-9, and 13-21). Nevertheless, some assessment of risk is important in order to inform patients during the consent process (Table 13-22).

Table 13-20 Considerations That Influence the Choice of Anesthetic Technique

Coexisting diseases
Site of the surgery
Position of the patient during surgery
Risk of aspiration
Age of the patient
Patient cooperation
Anticipated ease of airway management
Coagulation status
Previous response to anesthesia
Preference of the patient

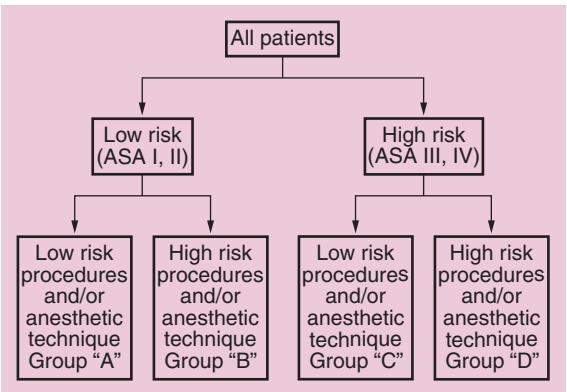


Figure 13-8 Example of a risk classification incorporating both patient co-morbidity and surgical severity. (From Pasternak LR: Risk assessment in ambulatory surgery: challenges and new trends. Can J Anaesth 51(S1):R1-R5, 2004.)

Table 13-21 Cardiac Risk* Stratification for Noncardiac Surgical Procedures

Risk Stratification	Example Procedures
Vascular (reported cardiac risk often more than 5%)	Aortic and other major vascular surgery Peripheral vascular surgery
Intermediate (reported cardiac risk generally 1% to 5%)	Intraperitoneal and intrathoracic surgery Carotid endarterectomy Head and neck surgery Orthopedic surgery Prostate surgery
Low† (reported cardiac risk generally less than1%)	Endoscopic procedures Superficial procedure Cataract surgery Breast surgery Ambulatory surgery

*Combined incidence of cardiac death and nonfatal myocardial infarction.
†These procedures generally do not require further preoperative cardiac testing.
From Fleisher LA, Beckman JA, Brown KA, et al: ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery, J Am Coll Cardiol 50:1707-1732, 2007.

Informed consent must be obtained for all nonemergency procedures and is a legal requirement in all jurisdictions of the United States. At a minimum, informed consent involves the indications for the treatment in terms a layperson can understand, and elucidation of alternatives. Many anesthesiologists perform preoperative evaluations, and obtain informed consent moments before a patient will undergo a major, potentially life-threatening or disfiguring procedure. This is often an awkward and unpleasant situation for the anesthesiologist, patient, and family. The effects of extensive disclosure are stressful at a time when patients and families may be ill-prepared to rationally consider the implications. An increase in preoperative anxiety may adversely affect postoperative outcomes because increased anxiety correlates with increased postoperative analgesic requirements and prolonged recovery and hospital stay. Anxiety impairs retention of information. However, anxiety is lower in patients seen by the anesthesiologist in advance of surgery compared to those receiving only premedication.

CONCLUSION

Preoperative preparation can decrease the risk of complications and improve outcomes during and after procedures requiring anesthesia. Innovation in preoperative preparation needs to continue if patients are to receive the best preoperative services. Identification and modification of risk require fundamentally good medicine; systems of care; clinical assessment; and experienced, knowledgeable, and dedicated health care providers.

Table 13-22 Commonly Disclosed Risks of Anesthesia

With General Anesthesia

Frequently Occurring, Minimal Impact

- Oral or dental damage
- Sore throat
- Hoarseness
- Postoperative nausea/vomiting
- Drowsiness/confusion
- Urinary retention

Infrequently Occurring, Severe

- Awareness
- Visual loss
- Aspiration
- Organ failure
- Malignant hyperthermia
- Drug reactions
- Failure to wake up/recover
- Death

With Regional Anesthesia

Frequently Occurring, Minimal Impact

- Prolonged numbness/weakness
- Post-dural puncture headache
- Failure of technique

Infrequently Occurring, Severe

- Bleeding
- Infection
- Nerve damage/paralysis
- Persistent numbness/weakness
- Seizures
- Coma
- Death

Adapted from O'Leary CE. American Society of Anesthesiologists Newsletter 2010;74:20-21.

QUESTIONS OF THE DAY

1. What components of the preanesthetic physical examination should be performed on every patient? What additional examination should be performed on a patient scheduled for a regional anesthetic?
2. A patient with recent percutaneous coronary intervention with a drug eluting stent requires surgery. How should elective surgery be managed with respect to cessation of antiplatelet therapy? How should urgent or emergent surgery be managed?
3. What are the risk factors for development of postoperative pulmonary complications? Is asthma a risk factor?
4. What routine preoperative tests should be ordered prior to low- or intermediate-risk surgery in ASA Physical Status 1 or 2 patients?
5. What factors determine whether angiotensin-converting enzyme inhibitors (ACEIs) or angiotensin receptor blockers (ARBs) should be stopped on the morning of surgery?
6. What anesthetic risks are commonly disclosed to patients prior to surgery?

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A BASIC STANDARDS FOR PREANESTHESIA CARE*

Committee of Origin: Standards and Practice Parameters (Approved by the House of Delegates on October 14, 1987, and last affirmed on October 20, 2010)

These standards apply to all patients who receive anesthesia care. In exceptional circumstances, these standards may be modified. When such is the case, the circumstances shall be documented in the patient's record.

An anesthesiologist shall be responsible for determining the medical status of the patient and developing a plan of anesthesia care.

The anesthesiologist, before the delivery of anesthesia care, is responsible for the following:

1. Reviewing the available medical record
2. Interviewing and performing a focused examination of the patient to:
   a. Discuss the medical history, including previous anesthetic experiences and medical therapy
   b. Assess aspects of the patient's physical condition that might affect decisions regarding perioperative risk and management
3. Ordering and reviewing pertinent available tests and consultations as necessary for the delivery of anesthesia care
4. Ordering appropriate preoperative medications
5. Ensuring that consent has been obtained for the anesthesia care
6. Documenting in the chart that the above has been performed

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