Preoperative Evaluation and Preparation

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Preoperative evaluation and optimization of patients are important components of anesthesia practice. The task of gathering information and properly preparing for these cases can be challenging. At a minimum, the guidelines of the ASA indicate that a preanesthesia visit should include the following[1]:

- An interview with the patient or guardian to review medical, anesthesia and medication history
- An appropriate physical examination
- Review of diagnostic data (laboratory, electrocardiogram, radiographs, consultations)
- Assignment of an ASA physical status score (ASA-PS).
- A formulation and discussion of anesthesia plans with the patient or a responsible adult

Many anesthesiologists rely on screening batteries of tests to evaluate 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 injury because they prompt further testing to evaluate abnormal results, or lead to unnecessary interventions, delay of surgery, anxiety, and inappropriate therapies. Studies showing that elimination of "routine" testing does not increase risk required preoperative clinical evaluation of patients.[2, 3] Complete and thorough histories assist in planning appropriate and safe anesthesia care, and are more accurate and cost-effective than screening laboratory tests for establishing diagnoses.[4]

Table 1 lists the important components of the anesthesia history. The form can be completed in person (paper or electronic version), via the Internet, a telephone interview or by staff. Cardiovascular (CV), pulmonary, or neurologic symptoms are noted. Equally important as identifying the presence of disease is establishing its severity, stability, current or recent exacerbations, treatment of the condition, or planned interventions. An inability to perform average levels of exercise (4-5 metabolic equivalents by walking 4 blocks or 2 flts of stairs) identifies patients at risk of perioperative complications.[5] Better fitness improves cardiorespiratory reserve, and decreases morbidity. Conversely an inability to exercise may be a result of cardiopulmonary disease. A personal or family history of adverse events related to anesthesia is important.

Table 1. Patient History

Patient's Name _____ Age____ Sex _____ Date of Surgery_____
Proposed operation _____ Primary care doctor (PCP)/phone #_____
Cardiologist/phone #_____ Other physicians/phone #s_____

1. Please list ALL operations (and approximate dates)
   _____
2. Please list any allergies to medications, latex, food or other (and your reactions to them)
   _____
3. Circle TESTS that you have completed, and bring reports for your visit.

a. EKG-Date: Location:	d. BLOOD WORK-Date: Location:
b. STRESS TEST-Date: Location:	e. SLEEP STUDY-Date: Location:
c. ECHO/ultrasound of heart-Date: Location:	f. Other: Date: Location:

4. List ALL meds you have taken in the last month (over-the-counter drugs, inhalers, supplements)

Name of Drug Dose and how often	Name of Drug Dose and how often
a.	d.
b.	e.
c.	f.

(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 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, MI, abnormal ECG, skipped beats, murmur, palpitations, heart failure)	☐	☐
8. Do you have diabetes?.....	☐	☐
9. Do you have high blood pressure?.....	☐	☐
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?	☐	☐
12. Have you or anyone in your family had serious bleeding problems? (circle all that apply)…. (Prolonged bleeding from nosebleed, gums, tooth extractions, or surgery)	☐	☐
13. Have you had any problems with your blood ? (circle all that apply)…… (anemia, leukemia/lymphomas, 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)?.....		
Frequent heartburn, hernia, stomach ulcer	☐	☐
Back, Neck or Jaws (TMJ, rheumatoid arthritis, disc herniation)?.....	☐	☐
Thyroid gland (under active or overactive)?.....	☐	☐
15. Have you ever had: (circle all that apply)		
Seizures or epilepsy?.....	☐	☐
Stroke, facial, leg or arm weakness, difficulty speaking?.....	☐	☐
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: _____	☐	☐
18. Have you ever had problems with anesthesia or surgery? (circle all that apply) (Nausea, vomiting malignant hyperthermia (in blood relatives or self), or problems during placement of a breathing tube)	☐	☐
19. Do you have any chipped or loose teeth, dentures, caps, bridgework, braces, problems opening your mouth, swallowing or choking? (circle all that apply)	☐	☐
20. Do your physical abilities limit your daily activities?.....	☐	☐
21. Do you snore?.....	☐	☐

22. Please list any medical illnesses not noted above:

_____

22. Additional comments or questions for the physician's assistant or anesthesiologist?

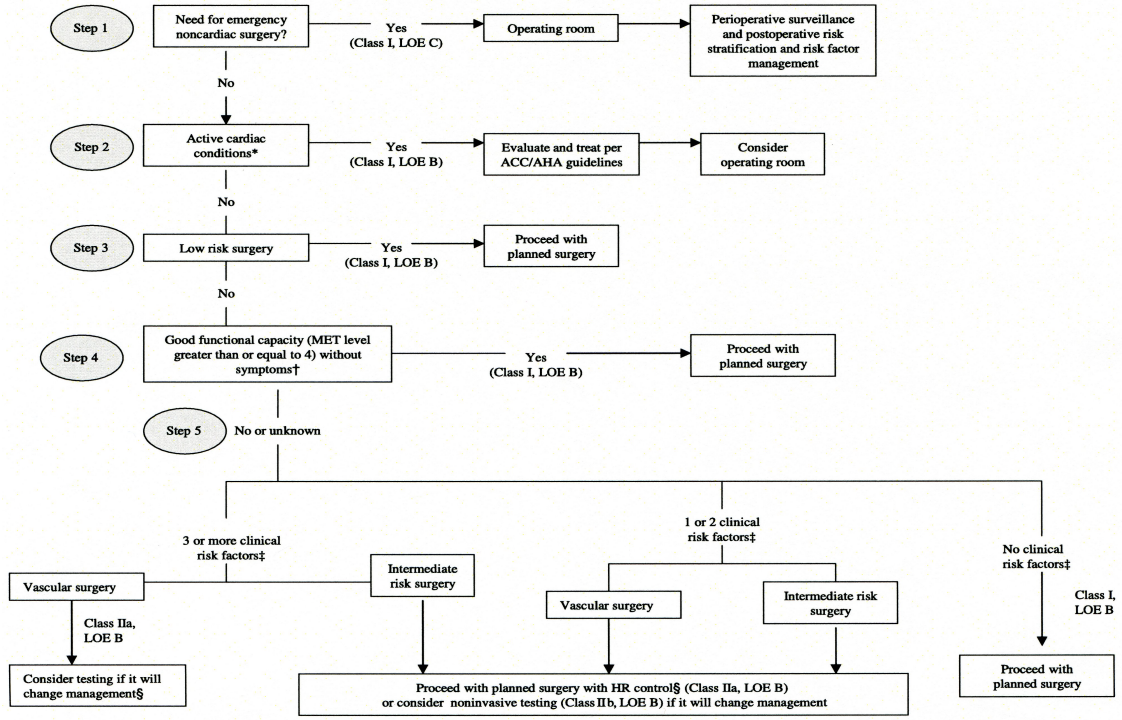
_____

At a minimum, the preanesthetic examination includes the airway, heart and lungs, vital signs, oxygen saturation, height, and weight. Examination of the airway is always necessary. Auscultation of the heart and inspection of the pulses, peripheral veins and extremities for edema are important diagnostically and in development of care plans. The pulmonary examination includes auscultation for wheezing and decreased or abnormal sounds. Cyanosis, clubbing and the effort of breathing are noted. For patients with deficits or disease or those undergoing 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 important conditions that are likely to impact the 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. The basis of cardiac assessment is the history, and the physical examination. Review of records and previous studies especially stress tests and catheterization results is necessary. Often a phone call to the primary physician or cardiologist will yield important information and obviate the need for further testing or consultation.

The ACC/AHA guidelines for CV evaluation for non-cardiac surgery have decreased recommendations for testing or revascularization.[5] The guidelines have an algorithm to be followed in stepwise fashion, stopping at the first point that applies to the patient (Fig 1). For emergency surgery, the focus is perioperative surveillance (e.g., serial ECGs, enzymes, monitoring) and risk reduction (e.g., beta blockers, statins, pain management). Active cardiac conditions (e.g. an acute MI, unstable or severe angina, decompensated heart failure (HF), severe valvular disease, or significant arrhythmias) warrant postponement for all except life-saving emergency procedures. Step 3 considers the surgical risk and patients without active cardiac conditions having low-risk surgery need no further cardiac testing. For higher risk surgery, Step 4 assesses functional capacity, defined by metabolic equivalents. 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 HF, cerebrovascular disease, diabetes, and renal insufficiency) from the Revised Cardiac Risk Index (RCRI) determines the likely benefit of further cardiac testing. Patients with no RCRI predictors proceed to surgery. Consider further testing for those with >3 RCRI predictors but only if results will alter management. Traditional risk factors for CAD such as smoking, hypertension (HTN), age, male gender, hypercholesterolemia, and family history do not predict perioperative risk.

Figure 1. ACC/AHA Algorithm for Cardiac Evaluation for Noncardiac Surgery[5]



The benefits versus the risk of coronary revascularization before noncardiac surgery are controversial. The only randomized prospective study of preoperative revascularization vs. medical management failed to show an outcome difference.[6] Noncardiac surgery soon after revascularization has high rates of morbidity and mortality.[7-9] Patients who have had a percutaneous coronary intervention (PCI), especially with a drug-eluting stent (DES) require months, if not a lifetime of antiplatelets to prevent restenosis or thromboses.[8, 10] The type of stent, DES or bare metal (BMS), must be identified and managed in collaboration with a cardiologist. A scientific advisory offers recommendations for managing patients with coronary stents.[10] Antiplatelets should not be stopped without consultation with a cardiologist familiar with stents and an in-depth discussion with the patient of the risks.[10] Elective procedures that require stopping dual antiplatelet therapy should be delayed during the high-risk period (12 m for DES; 4-6 wks for BMS). Aspirin is continued throughout the perioperative period, and clopidogrel restarted

as soon as possible. Evidence shows a low risk of bleeding complications with continued aspirin during most procedures.[11] Premature discontinuation of dual antiplatelet therapy can cause catastrophic stent thrombosis, MI, or death. Invasive procedures increase the risk of stent thrombosis which has a high mortality.[8-10] Stent thrombosis is best treated with PCI, which can be safely performed perioperatively if needed.[12] High risk patients may best be managed in facilities with immediate access to interventional cardiology.[8]

Heart failure increases perioperative adverse events. Patients with compensated HF have a 5-7% risk of cardiac complications; those with decompensated HF have a 20-30% incidence. HF may be due to systolic dysfunction (decreased EF from abnormal contractility), diastolic dysfunction (elevated filling pressures with abnormal relaxation but normal contractility and EF) or a combination. Diastolic HF accounts for half of cases but there is little science to guide perioperative care. HTN can cause diastolic dysfunction, and LVH on an ECG raises suspicion of HTN and diastolic dysfunction. Ischemic heart disease is a common cause of systolic dysfunction (50-75% of cases). Weight gain, shortness of breath, fatigue, orthopnea, paroxysmal nocturnal dyspnea, nocturnal cough, peripheral edema, hospitalizations and recent changes in management are significant. Elective surgery is best deferred for patients with decompensated HF.[5] Measurement of EF and diastolic function with echocardiography may be helpful. Patients with class IV HF (symptoms at rest) need evaluation by a cardiologist before general anesthesia. Minor procedures with sedation may proceed as long as the condition is stable.

Cardiac murmurs can be clinically unimportant or caused by significant valvular abnormalities. Functional murmurs from turbulent flow across the aortic or pulmonic outflow tracts occur with high outflow states (hyperthyroidism, pregnancy, anemia). Elderly patients, those with risk factors for CAD, rheumatic fever, volume overload, pulmonary disease, cardiomegaly, or an abnormal ECG are likely to have valvular pathology. Echocardiography is beneficial, especially if more than sedation is planned. Diastolic murmurs are always pathologic and require evaluation. Regurgitant disease is tolerated perioperatively better than stenosis. Aortic stenosis (AS) is the most common valvular lesion in the U.S. (2-4% of adults >65 yr); severe AS is associated with a high risk of perioperative complications. Aortic sclerosis, present in 25% of people 65-74 yr and 50% of those >84 yr, causes a systolic ejection murmur similar to that of AS, but has no hemodynamic compromise.[13] Patients with severe AS should not have anesthesia (unless emergency and life-saving) without a cardiology evaluation.[14] Antibiotic prophylaxis to prevent infective endocarditis is no longer recommended for patients with valvular abnormalities except for patients with heart transplants.[15]

Pacemakers and implantable cardioverter-defibrillators (ICDs) can be affected by electrical/magnetic interference. Consultation with the manufacturer or cardiologist may be needed. Patients usually have a card with important designations and phone numbers. Patients with ICDs invariably have HF, ischemic or valvular disease, cardiomyopathies, or potentially lethal arrhythmias. Special features such as rate adaptive mechanisms in some pacemakers are disabled or the device reprogrammed to asynchronous pacing to prevent interference.[16] Some monitors, ventilators, vibrations, or chest prepping fool the sensors into increasing pacing, leading to ischemia or inappropriate treatment. Shock functions are disabled before procedures if interference or unexpected movement is undesirable.[16] During intracranial, spinal, or ocular procedures, an unexpected discharge with movement can be catastrophic. Central line placement can trigger cardioversion. ICDs are deactivated only after arrival to a facility with monitoring and external defibrillation devices. Many devices are complex and reliance on a magnet to disable them, except in emergencies, is not recommended. Some devices ignore magnet placement. Magnets can permanently disable certain therapies. A magnet may suspend anti-shock therapies in some ICDs only while it is in place. Magnets do not affect the pacing function of an ICD. If a pacemaker or ICD is reprogrammed, or if a magnet is used, the device needs 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, HF, renal insufficiency, and cerebrovascular disease are common in hypertensive patients. However, there is little evidence of an association between preoperative blood pressure (BP) <180/110 mmHg and perioperative cardiac risk. It is generally recommended that elective surgery be delayed for patients with severe HTN (DBP >115 mmHg; SBP >200 mmHg) until BP is < 180/110 mmHg. If severe end-organ damage is present the goal is to normalize BP as much as possible before surgery.[17] Effective lowering of risk requires weeks of therapy for regression of vascular changes, and too rapid or extreme lowering of BP may increase cerebral and coronary ischemia. Studies suggest that intraoperative hypotension is far more dangerous than HTN.[17] For BP <180/110 mmHg there is no evidence to justify cancellation of surgery, although if time allows preoperative interventions are appropriate.

Pulmonary disease increases non-pulmonary and pulmonary perioperative complications (PPC). PPC occur frequently, and increase costs, morbidity and mortality. Predictors of PPCs are advanced age, HF, COPD, smoking, general health status (including impaired sensorium and functional dependency), and obstructive sleep apnea (OSA).[18, 19] Well-controlled asthma does not increase PPC.[20] Patients with poorly controlled asthma, (e.g., wheezing at the time of anesthesia induction), have a higher risk.[20] COPD increases PPC, and the more severe the COPD, the greater the risk, but there is no prohibitive degree of severity that precludes surgery. Surprisingly the risk with COPD is less than that with HF, advanced age, and poor general health. Preoperative steroids and inhaled beta-agonists markedly decrease the incidence of bronchospasm with intubation, and may shorten hospital and ICU stays.[20, 21] Recovery time, pain, and reduction in lung volumes are less after laparoscopic procedures, but it is unclear whether this lowers PPC rates.[18] PPC risk is lower for percutaneous interventions; in a study of endovascular versus open AAA repair, PPC rates were 3% and 16%, respectively.[18] General anesthesia carries greater risk than peripheral nerve blocks. Two large meta-analyses, and retrospective and randomized trials, suggest that PPC rates are lower with spinal or epidural anesthesia and/or postoperative epidural analgesia.[18, 21] Routine PFTs, CXR, or ABGs do not predict PPC risk, and offer little more than clinical evaluation.[21] Maximizing airflow in obstructive disease, treating infections and HF, and lung expansion maneuvers including cough, deep breathing, incentive spirometry, PEEP, and CPAP reduce PPC rates.

Obstructive sleep apnea is caused by intermittent airway obstruction, and affects up to 9% of women and 24% of men.[22] Snoring, daytime sleepiness, HTN, obesity, and a family history of OSA are risk factors for OSA.[22] A large neck circumference (>40 cm in anyone) predicts a greater chance of OSA.[23] Patients with OSA have increased rates of diabetes, HTN, AF, bradyarrhythmias, ventricular ectopy, stroke, HF, pulmonary HTN, dilated cardiomyopathy, and CAD.[24] Mask ventilation, direct laryngoscopy, intubation, and FOI are more difficult in patients with OSA. Airway obstruction, hypoxemia, atelectasis, ischemia, pneumonia, and prolonged hospitalizations occur in patients with OSA.[19] Patients need to bring CPAP devices on the day of their procedures. The ASA has published recommendations for the perioperative care of patients with OSA, including a scoring system to predict perioperative risk.[25]

Renal disease is associated with HTN, CV disease, volume overload, electrolyte disturbances, metabolic acidosis, need for modification of anesthetic drugs, and is a risk factor for CAD. In elective procedures, it is recommended that dialysis be performed within 24 hr, but not immediately before, because of acute volume depletion and electrolyte alterations. It may not be necessary to correct chronic hyperkalemia if K <6 mEq/dL and within a range of a given patient's established levels. Radiocontrast media 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 <60 $ml/kg^{-1}/min^{-1}$ alkalinizing renal tubular fluid with sodium bicarbonate or simple hydration may reduce injury.

Diabetic patients are at risk for multi-organ dysfunction, renal insufficiency, strokes, peripheral neuropathies, and CV disease is prevalent. Tight glucose control in stroke, critically ill or CABG individuals may improve outcomes, but is controversial.[26] It has yet to be proven that tight control in the immediate perioperative period for noncardiac surgery confers benefit, or simply increases hypoglycemia. Chronically poor control increases co-morbidities (e.g., vascular disease, HF, infections) and likely increases the risk of surgery. It is unlikely that simply targeting perioperative glucose will have a substantial impact on outcomes. No data exist that supports cancellation of procedures for any level of elevation of blood glucose, or even treatment of such. DKA and hypoglycemia (glucose <50 g/dL) are the only conditions that absolutely warrant perioperative intervention. Preoperative goals of glucose control are to prevent hypoglycemia during fasting and extreme hyperglycemia and ketosis.

Extreme obesity is defined by a BMI ≥40 and these patients may have OSA, HF, diabetes, HTN, pulmonary HTN, a difficult airway, decreased arterial oxygenation, and increased gastric volume. Special equipment is needed such as BP cuffs, airway management devices, procedure tables and gurneys to support excessive weight.

Anemia is common preoperatively, is a marker of increased perioperative mortality, and a predictor of short and long-term outcomes in the general population.[27] Preoperative anemia is the strongest predictor of the need for transfusions which increase morbidity and mortality.[27] If patients have a hemoglobin >6 g/dL, are asymptomatic, and have no CAD, the minimal physiologic perturbations with a well-conducted anesthetic and a low-risk procedure are unlikely to pose enough risk to warrant transfusion. Elective surgeries are postponed pending determination of the cause of the anemia.

Extremes of age increase the risk of surgery and anesthesia. Patients >85 yr with a history of hospital admission within the previous 6 m have a high risk of postoperative admission after ambulatory surgery.[28] Age increases the risk of pulmonary complications. [18]

Diagnostic testing and the benefits of disease-indicated testing versus "routine" preoperative tests have been studied, and few abnormalities detected by nonspecific testing result in changes in management and rarely have such changes benefited patients.[29, 30] On average, 1 in 2,000 preoperative tests result in patient harm from pursuit of abnormalities.[4] It has been suggested that not following up on an abnormal result is a greater medico-legal risk than not identifying the abnormality to begin with. Testing is indicated to confirm findings suggested by the history and physical examination, and then only if results will change management. Simply finding abnormalities, unless there are safe, effective treatments that lower risk, do not change outcomes. Recommended testing is in Table 3.

In a pilot study by Chung involving over 1000 patients undergoing ambulatory surgery no increase in adverse perioperative events occurred in patients who had no preoperative testing.[2] There was no increase in OR delays or cancellations, or differences in outcome from lack of testing. Similarly, Schein et al showed that routine medical testing in patients having cataract surgery who were evaluated preoperatively by primary care physicians did not offer benefit.[3] The specificity of an ECG abnormality in predicting postoperative cardiac adverse events is only 26%, and a normal ECG does not exclude cardiac disease.[30] An ECG should not be done simply because of age. Recommendations for age-based testing were derived from the high number of ECG abnormalities found on elderly patients. A prospective observational study in patients ≥50 yr having noncardiac surgery found abnormalities in 45% of the preoperative ECGs, and bundle branch blocks were associated with postoperative MI and death but had no added predictive value over clinical risk factors.[31] The Centers for Medicare and Medicaid Services do not reimburse for "preoperative" or age-based ECGs.[32] The ASA Preoperative Evaluation Practice Advisory recognized that ECGs did not improve prediction beyond risk factors identified by patient history.[1] CXR have not been shown to predict PPCs.[18]

Healthy patients of any age and patients with known, stable, chronic diseases undergoing low-intermediate risk procedures are unlikely to benefit from any "routine" tests with the exception of procedures involving injection of contrast dye (a creatinine is indicated). A test should be ordered only if the results will impact the decision to proceed with the planned procedure or alter the care plans. Discovering abnormalities in blood tests or on ECGs and CXR does not impact outcomes for the vast majority of patients receiving anesthesia. Eliciting a history of increased dyspnea on exertion, new onset chest pain, or syncope, and providing patients with appropriate preoperative medication instructions are of greater benefit than ordering ECGs or blood tests.

According to the ASA Preoperative Evaluation Practice Advisory the literature *"... is insufficient to inform patients or physicians whether anesthesia causes harmful effects on early pregnancy,"* and pregnancy testing may be offered to women if the test result would alter patient management.[1] 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 child-bearing age undergo a urine pregnancy test on the day of surgery (DOS). It has been suggested that if a mandatory testing policy is utilized that patients be informed that consent to surgery or anesthesia includes consent for pregnancy testing.

Table 3. Preoperative Testing Guidelines [a, b,]

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 on DOS
Diabetes	Glucose level on DOS
Active cardiac condition (decompensated HF, arrhythmia, CP, murmur)	Electrocardiogram

[a] A careful history and local practice determine whether a pregnancy test is indicated.
[b] There is no absolute level of potassium or glucose that precludes surgery and anesthesia. The benefits of the procedure must be balanced against the risk of proceeding in a patient with abnormal results.

Medication instructions that advise patients to continue or discontinue drugs will likely improve outcomes more than testing will. The patient's co-morbidities and the nature of the procedure are considered when managing preoperative meds. Continuing meds may be beneficial or detrimental, and in some cases stopping them suddenly has a negative effect. Several drug classes and emerging controversies deserve special mention.

Generally, cardiac meds and anti-hypertensive agents are continued preoperatively. Selectively continuing or discontinuing drugs depends on the volume and hemodynamic status of the patient, the degree of cardiac

dysfunction, the adequacy of BP control, and the anticipated anesthetic and volume challenges. Continuing all meds for patients with severe disease is likely best. A suggested approach is to continue ACEI and ARBs and alter the anesthetic plan, especially induction dosages and drugs and have vasopressin available to prevent or mitigate significant hypotension.[33] The potential for refractory hypotension is balanced against the positive therapeutics of continuing these agents on a case by case basis.

Aspirin (ASA) is commonly used to lower risk of vascular disease, diabetes, renal insufficiency or advanced age. Traditionally ASA has been withdrawn in the perioperative period because of concern of increased bleeding. However, this practice has come under scrutiny. A meta-analysis involving almost 50,000 patients undergoing a variety of noncardiac surgeries (30% on perioperative ASA) found that ASA increased bleeding complications by a factor of 1.5, but not the severity of complications except in patients undergoing intracranial surgery and possibly transurethral resection of the prostate.[11] When surgeons are blinded to ASA administration they can not identify patients taking or not taking ASA based on bleeding.[12] There is an increased risk of vascular events when ASA is stopped in patients who take it regularly.[34] A rebound hypercoagulable state may result.[35] Acute coronary syndromes occurred 8.5 $\pm$ 3.6 days and acute cerebral events 14.3 $\pm$ 11.3 d after ASA cessation, the typical duration of cessation before surgery. Events were twice as common in patients who had stopped ASA in the previous 3 wk than in those who had not.[11] Stopping aspirin for 3-4 days should be sufficient, if ASA is stopped at all, and dosing should be resumed as soon as possible. New platelets formed after ASA (half-life of ~15 min) is stopped will not be affected. Normally functioning platelets >50,000/mm^3 are adequate to control surgical bleeding. A review article recommends discontinuing ASA if taken only for primary prevention (no history of stents, strokes, MI).[34] Continuing ASA, if taken for secondary prevention (history of stents, vascular disease), is recommended except for procedures with a risk of bleeding in closed spaces (e.g., intracranial). Neuraxial or peripheral anesthesia is safe for patients taking ASA.[36] The risk of spinal hematoma with clopidogrel is unknown. Based on labeling and guidelines of ASRA, clopidogrel is discontinued 7 days before planned neuraxial blockade.[36]

Type 1 diabetics have an absolute insulin deficiency and require insulin to prevent DKA even if they are not hyperglycemic. Type 2 diabetics are often insulin-resistant and prone to extreme hyperglycemia. Both Type 1 and 2 diabetics should discontinue short-acting insulins, except for patients with insulin pumps who continue their lowest basal rates. Type 1 diabetics need to take a small amount (usually 1/3-1/2) of their usual AM dose of intermediate to long-acting insulin (e.g., lente or NPH) the DOS to avoid DKA. Type 2 diabetics should take none or up to ½ dose of intermediate to long-acting insulin (e.g., lente or NPH) or a combination (e.g., 70/30) insulin on the day of the procedure. Glargine (e.g., Lantus) insulin can be taken as scheduled. Metformin does not need to be discontinued *before* the DOS. Metformin will not cause hypoglycemia during fasting periods of 1-2 days, and there is no risk of lactic acidosis with metformin except in cases of renal or hepatic failure. Procedures should not be cancelled if patients continue metformin. There is no data to support stopping metformin 24-48 hr before surgery, which increases the risk of hyperglycemia. Sulfonylurea agents with long half-lifes (e.g., chlorpropamide) can cause hypoglycemia in fasting patients. Newer oral agents (acarbose, pioglitazone) used as single-agent therapy do not cause hypoglycemia during fasting. To avoid confusion oral hypoglycemic agents are generally held the DOS.

Conclusion

Preparation to lower the risk of complications and improve outcomes during and after procedures requiring anesthesia is the most important goal. Traditionally surgical risk has been considered more important than the anesthetic risk. Identification and modification of risk requires fundamentally good medicine, systems of care, clinical assessment and experienced, knowledgeable and dedicated health care providers. Anesthesiologists must continue to innovate to provide patients with the best preoperative services.

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