
2.1 Introduction

2.1.1 The Purpose of the Preoperative Assessment

- The preoperative assessment is designed to assess risks relevant to the perioperative period, including anesthesia, surgery and the recovery period.
- This process should not be expected to be a way to manage chronic health problems or new acute problems – these should be managed by the patient's primary care provider or referred to the appropriate specialist.
- The risk to the patient for surgery and anesthesia is a combination of their preoperative medical status (Table 2.1) and the intensity/invasiveness of their surgery.
- All testing and associated assessment and consultations are done on the basis of a reasonable expectation that the patient has a medical condition or risk factor and that its value will have an impact on perioperative management.

2.2 Preoperative Testing: When, Where, and Who?

- The preoperative assessment should be done prior to the day of surgery and the results made available for review by anesthesia directed staff prior to the morning of the day of surgery.
- The assessment may be done by primary care providers for individuals with table medical status and for whom major surgery is not anticipated. Others will require assessment by anesthesia staff or their extenders (Fig. 2.1).

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Table 2.1 American Society of Anesthesiologists classification

ASA status	Description	Example
P1	A normal, healthy patient	Healthy adult with no medical problems, no medications
P2	Patient with mild systemic disease	Well-controlled hypertension
P3	Patient with severe systemic disease	Angina pectoris without congestive heart failure, reactive airway disease regularly requiring inhalers
P4	Patient with severe systemic disease that is a constant threat to life	Severe congestive heart failure
P5	A moribund patient who is not expected to survive without the operation	Severe trauma, end stage terminally ill

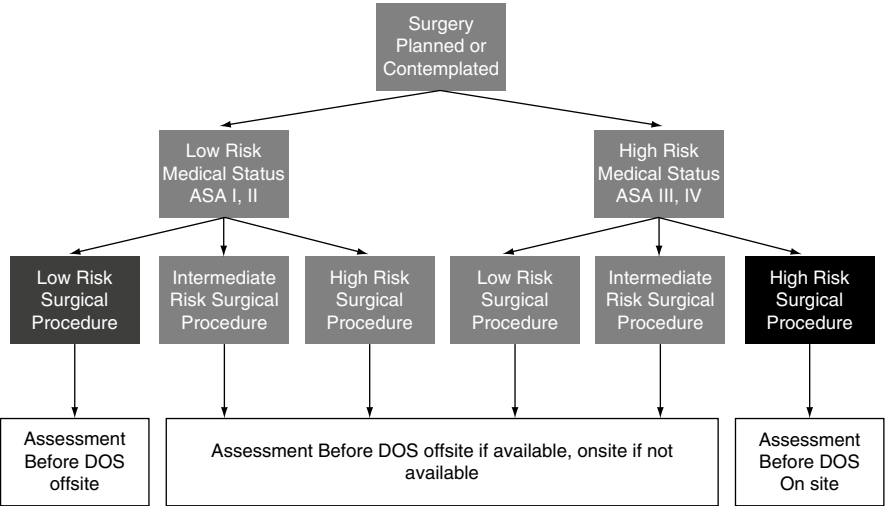


Fig. 2.1 Timing of the assessment

- Well-developed preoperative systems usually require only 25–33% of patients to actually visit the facility prior to the day of surgery; in other instances, information gathered by the preoperative system is sufficient to determine the relative risk for surgery.
- An assessment by non-anesthesia providers does not necessarily address all issues relevant for surgery and anesthesia. Anesthesia personnel may make a preliminary judgment on the basis of data provided by these sources.
- Absence of a system for preoperative assessment may result in delays of surgery, unnecessary cancellation and/or unnecessary testing to accommodate urgent needs.

2.3 Preoperative Testing

2.3.1 Guidelines

- Several standardized guidelines exist for determining the appropriateness of testing. These include the American Heart Association/American College of Cardiology guidelines as well as those of the American Society of Anesthesiology.
- The guidelines provide reasonable courses of action to pursue and should be balanced with an individual assessment.
- The group, institution, or system within which the perioperative system resides should have explicit guidelines for testing and process. This provides protection against the oft-feared and much-exaggerated concerns of medical liability.

2.3.2 The Value of Testing

- Testing is often done on the basis of custom or longstanding routine without rationale based on best available evidence or the patient's medical condition.
- Testing without specific indication has been shown not to have any positive effect on patient outcome. In one study the performance of 2,236 tests found that 1,828 did not have any indication, of which only 10 were abnormal and, of these, 4 with results of clinical significance. All four of these patients had their surgery without problem.¹ Another found that medical status and type of surgery were most predictive of the need for tests² while the most recent demonstrated no adverse events in a patient population undergoing ambulatory surgery without major medical risk factors who had no preoperative testing.³
- The ordering of large numbers of tests without indication increases the likelihood that a false positive test will lead to further, unnecessary testing and potential delays and cancellations.

2.4 Preoperative Tests

2.4.1 Physical Examination

- The extent of the physical examination should be guided by the nature of the medical issues associated with the patient and anticipated for surgery. Basic assessment of the airway and auscultation of cardiac and respiratory sounds are useful, but perhaps

secondary in importance to the obtaining of a history specific for issues to guide appropriate assessment.

- The preoperative assessment is not the optimal or appropriate time to engage in assessments not focused on perioperative care unless the provider is prepared to direct the patient to appropriate continuing care or consultation.
- New or unresolved issues should be referred to providers capable of providing continuing care after the perioperative period.
- The critical issue is whether the patient is as stable as reasonably possible or whether further assessment or management will minimize the risk associated with perioperative management.

2.4.2

Electrocardiogram (ECG)

- There is little evidence to support routine electrocardiograms on the basis of age >40, 50, or 60 alone, as is common in some recommendations.
- An abnormal ECG alone is not correlated with adverse outcomes. Studies have demonstrated that relying on ECGs alone is not predictive of adverse events.⁴
- The likelihood of an abnormal ECG is associated with age >65 and/or history of heart failure, angina, myocardial infarction, severe valvular disease or high cholesterol.⁵ It is likely prudent to add diabetes mellitus and chronic renal and hepatic disease to these indications.

2.4.3

Additional Cardiac Testing (See Chap. 20)

- Testing for cardiac patients having non-cardiac surgery is best done in association with the recommendations of the American Heart Association/American College of Cardiology Task Force.⁶
- The basis of the additional cardiac assessment is to determine whether the patient is as stable as reasonably possible for surgery.

2.4.4

Chest Radiograph

- Though one of the most common of tests, chest X-rays have been found to be of little value in patients without specific indication. Charpak and colleagues, reporting on the utility of routine chest X-rays on 1,101 patients, found that only 5% had an impact on perioperative management.⁷ In another review of 905 patients, 504 (22%) had risk factors of whom 22% had abnormalities, none of which were new or added to the clinical assessment of the patient.
- There is no indication for chest X-rays on the basis of age.
- X-rays should be obtained only in those cases where there is an acute or a chronic process that has changed within the past 6 months, or for planned thoracic surgery.

- The use of this information to guide management must be correlated with clinical information about the patient and a determination that the patient is as stable as reasonably possible for the planned procedure.

2.4.5

Hematocrit

- There is no indication for routine measuring the hematocrit in patients who do not have a medical history associated with anemia or a condition for which anemia may be a complication.
- Hematocrit should be measured in patients for whom significant blood loss is anticipated and/or who have a history consistent with cancer, kidney disease and liver disease, or signs of anemia on assessment.

2.4.6

White Blood Cell Count

- There is no evidence to support obtaining white cell counts in patients without an associated history of myeloproliferative disorder (e.g., solid tissue tumors, hematologic neoplasms, petechiae, purpura, splenomegaly or lymphadenopathy) and in those who are taking medications that might affect white blood status.
- Clinicians should not routinely obtain white blood cell counts before surgery.
- If an infection is suspected on the basis of symptoms and/or physical examination a white cell count may be obtained to assist in diagnosis. However, in these circumstances, it is better to defer elective surgery until the issue is resolved rather than trying to do an elective assessment on the day of surgery.

2.4.7

Platelet Count

- Obtain platelet counts in patients with a history of platelet abnormalities, symptoms or signs of impaired hemostasis on history and physical examination, myeloproliferative disorders, and in those receiving medications known to commonly alter platelet counts (e.g., chemotherapy, heparin).

2.4.8

Tests for Coagulation and Bleeding

- Tests for coagulation and bleeding should be reserved for those patients who are at risk on the basis of their medical history.
- These patients can be identified on the basis of medications and/or a history of liver disease, nutritional disorders or any history of bleeding tendency.

2.4.9

Prothrombin Time (PT)/International Normalized Ratio (INR)

- A potential rationale for obtaining a PT/INR before surgery would be to identify patients at risk for postoperative bleeding.
- The PT/INR is one of the least helpful tests in the preoperative armamentarium. In a recent review, it was the perfect unhelpful test.⁸ Abnormal results occurred in 0.3% of patients and, among a subset of studies that evaluated outcomes, abnormal test results did not affect management and were not associated with increased postoperative bleeding rates in any patients.
- Clinicians can predict most patients with an elevated PT/INR based on clinical evaluation. For example, patients with known chronic liver disease, malnutrition or a history of bleeding tendencies are more likely to have an abnormal PT/INR than are unselected patients.
- Also obtain a preoperative PT/INR for all patients who are taking warfarin to help guide warfarin management.

2.4.10

Partial Thromboplastin Time

- While an abnormal partial thromboplastin time (PTT) is more common than an abnormal PT/INR, the test is equally unhelpful.
- In one review, 6.5% of all PTT values were abnormal, but only 0.1% of all tests influenced management.⁸
- Do not use the PTT as a screening preoperative test.

2.4.11

Bleeding Time

- The bleeding time was commonly used in the past to assess perioperative bleeding risk, especially in patients taking aspirin or non-steroidal anti-inflammatory agents.
- However, a normal bleeding time does not predict a low risk for surgical hemorrhage, and an abnormal bleeding time does not increase the risk of hemorrhage.
- Do not routinely obtain a bleeding time before surgery.
- For a patient whose history and physical examination suggest impaired hemostasis and whose PT/INR, PTT and platelet count are normal, a bleeding time may be an appropriate part of a more thorough hemostasis evaluation that includes consultation with a coagulation specialist.

2.4.12

Electrolytes

- There is no indication for routine ordering of serum electrolytes.⁹
- Electrolytes should be ordered based on the presence of medical conditions for which electrolyte disturbances are common (e.g., cardiac disease, renal disease,

hepatic disorders, diabetes mellitus) or where medications may cause electrolyte imbalance (e.g., diuretics, digoxin, ACE, ARB).

- The nature of current testing procedures makes it more likely that it is more efficient and no more expensive to order an electrolyte panel versus isolated values.

2.4.13

Renal Function Tests

- In contrast to the limited value of many commonly ordered preoperative tests, serum creatinine has value in identifying patients at risk for perioperative cardiac complications.
- In the revised cardiac risk index, serum creatinine >2.0 mg/dL was one of the six independent risk factors for cardiac complications.¹¹ It predicted cardiac risk as well as established risk factors including coronary artery disease, congestive heart failure and high risk surgical procedure. Other studies have demonstrated the value of chronic renal insufficiency as a predictor for adverse outcomes after cardiac and vascular surgery.
- Renal insufficiency is often unsuspected by clinical evaluation. In a recent review, 2.6% of routine preoperative serum creatinine measurements were abnormal and influenced perioperative management.⁸
- Measure serum creatinine in patients more than 50 years old, in those with diabetes, hypertension, renal insufficiency, cardiovascular disease or undergoing major surgery, and in those who are taking medications that affect renal function.

2.4.14

Glucose

- Most abnormal preoperative serum glucose results are in those with known diabetes; the incidence of an unexpected abnormal blood glucose concentration that might influence perioperative management is 0.5%.⁸
- Do not obtain serum glucose as a screening preoperative test in unselected patients. Serum glucose measurement is appropriate to screen patients with risk factors for diabetes such as obesity, and to assess glucose control in patients known to have diabetes or symptoms suggestive of diabetes.

2.4.15

Liver Function Tests

- The most commonly obtained preoperative liver function tests are the serum transaminases. Alkaline phosphatase is not commonly obtained and should not be part of routine preoperative testing.
- Patients with hepatic cirrhosis have markedly increased perioperative morbidity and mortality. The risk is proportional to the severity of the cirrhosis, as measured by the Childs–Pugh classification.

- In contrast, no evidence suggests that asymptomatic liver function test abnormalities predict postoperative complications; the rate of unexpected abnormalities that influence management is 0.1%.⁸
- Clinicians should not obtain screening liver function tests on unselected patients as part of preoperative testing.

2.4.16

Albumin

- Serum albumin concentration is a robust laboratory predictor of postoperative morbidity and mortality.
- In a study of 54,215 veterans, low serum albumin was the single strongest predictor of 30-day postoperative mortality among patients undergoing major non-cardiac surgery.¹⁰ A linear relationship existed; the risk of mortality began to increase with serum albumin concentrations <3.5 g/dL. For patients with serum albumin concentrations <2.1 g/dL, the perioperative mortality rate was 28%. In other studies, low serum albumin concentrations have also predicted postoperative pulmonary complications.
- Although conditions such as recent severe blood loss and nephropathy can cause hypoalbuminemia, it is most often an indication of malnutrition. A few studies have shown a benefit of delaying surgery to allow time for vigorous nutrition to increase serum albumin, but most studies have not suggested benefit. Therefore, while a preoperative serum albumin concentration may have prognostic value, it usually does not affect patient management.
- Measure serum albumin concentration if it is likely to be low (e.g., in patients with liver disease, nephropathy, enteropathy, recent severe illness, blood loss or cachexia) and if the prognostic information is likely to affect the patient's care plan.

2.4.17

Urinalysis

- Urinalysis has been required in the past by state law for preoperative screening. This was on the basis of a belief that major abnormalities were present that could not be determined on the basis of a history. This was principally associated with detecting diabetes mellitus.
- One study³ found that in a study of 3,666 patients only 1.4% were abnormal and had an impact on care.
- In practice, there is no indication for routine urinalysis for preoperative assessment.
- Urinalysis should be reserved for patients with acute urinary tract symptoms or for whom surgeons may want a baseline prior to genitourinary and joint replacement surgery.

2.4.18

Pregnancy Testing

- Pregnancy testing is one of the most controversial areas of testing for elective surgical procedures.
- Complications associated with surgery and anesthesia for pregnant patients are principally associated with site of surgery (abdomen, perineal area) and type of anesthesia (general).

- Commercial testing kits are highly sensitive and, in cases where testing are to be done, are a reasonable first step to test for pregnancy.
- Patients who are menopausal or who have had surgery rendering pregnancy virtually impossible (hysterectomy, bilateral oophorectomy) need not be tested.
- Patients who are fertile should be tested on the basis of their history and advice that surgery may pose a risk to their pregnancy if they are pregnant.

2.5

Summary Recommendations

- Table 2.2 summarizes recommendations for the use of preoperative laboratory tests, and includes an estimate of the incidence of abnormalities that affect perioperative management and the positive and negative likelihood ratios for postoperative complications.

Table 2.2 Summary: preoperative laboratory testing

Test	Indication
Health patient <65	<ul style="list-style-type: none"> • No testing except as need for postoperative management
ECG	<ul style="list-style-type: none"> • Age > 65 • Presence of history of significant cardiovascular disease, hypertension • Thoracic/major vascular procedure
Chest X-ray	<ul style="list-style-type: none"> • None based on age • History of chronic pulmonary condition (e.g., asthma) that has changed within the past 6 months or which significant impair respiratory function • Thoracic procedure
Hematocrit	<ul style="list-style-type: none"> • History of anemia • Procedure with anticipated significant blood loss
CBC (Hct, WBC, platelet count)	<ul style="list-style-type: none"> • History of bleeding disorder, myeloproliferative disease, medications affecting blood formation • Procedure with anticipated significant blood loss
Glucose	<ul style="list-style-type: none"> • Diabetes mellitus or risk factors/symptoms (obesity, polyuria, polydipsia)
Serum electrolytes	<ul style="list-style-type: none"> • Diabetes mellitus and other endocrine disorders, renal disease, hepatic disorders • Medications affecting or affected by electrolytes, including those for cardiac disease, treatment for oncology
Liver function tests	<ul style="list-style-type: none"> • Cirrhosis or history of liver disease
Coagulation tests (PT/PTT)	<ul style="list-style-type: none"> • History of bleeding disorder, liver disease, or malnutrition • Patients on anticoagulants (warfarin, heparin)
Urinalysis	<ul style="list-style-type: none"> • Urologic procedure • History of recent/chronic urinary tract infection
Pregnancy test	<ul style="list-style-type: none"> • None in patient in whom menopausal or post-surgical procedure precluding pregnancy • Explicit patient history precluding risk for pregnancy

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Suggested Reading

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