

Case 9

A 45-year-old man is undergoing a preoperative evaluation for a laparoscopic cholecystectomy due to acute cholecystitis. He has a history of rheumatoid arthritis for 10 years. After the evaluation, the anesthesiologist determines that the patient is ASA status 3.

- What does ASA status 3 mean?
- What is the focus of the anesthesia evaluation of the arthritis?

ANSWERS TO CASE 9:

Preoperative Evaluation

Summary: A 45-year-old man is undergoing preoperative evaluation and is determined to be ASA 3. He had a prior MI 6 months ago.

- **Meaning of ASA 3:** Patients with systemic disease with functional limitations
- **Relevance of the arthritis:** The impact on the patient's functional capacity and mobility, as well as any potential difficulties with the airway that may occur

ANALYSIS

Objectives

1. Understand the goals of the pre-anesthetic evaluation.
2. Review the components of a basic preoperative examination.
3. Understand which tests are required prior to surgery and why.

Considerations

The preoperative evaluation is a vital step that must be completed prior to the administration of anesthesia. It is performed to reduce the patient's risk of morbidity and mortality when undergoing surgery, and to promote efficiency and reduce costs by minimizing delays and cancellations in the operating room on the day of surgery. (Please see Table 9–1.) In contrast to the history performed by a primary care provider during which chronic conditions are documented carefully, the anesthesia preoperative evaluation focuses on the current functional status of the patient and how their chronic diseases may limit the patient's functionality. For example, the relevance of this patient's arthritis to the anesthesiologist is mostly the impact on the patient's functional capacity and mobility, as well as any potential difficulties with the airway that may occur, as opposed to the long-term prognosis of a patient's chronic condition. It is also important to determine whether the arthritis impairs the patient's ability to open his mouth or extend his neck, both of which are important to ensure a successful intubation.

APPROACH TO

Preoperative Evaluation

When patients undergo surgery or any type of procedure that requires anesthesia, they are exposed to both the risk of surgery as well as the risk of anesthesia.

Table 9–1 THE GOALS OF PREOPERATIVE ASSESSMENT

1. To obtain a history of the patient’s medical condition and relevant anesthesia history, and to complete a physical examination targeting the airway and relevant systems such as the cardiopulmonary status of the patient.
2. To recommend further testing or consultation as needed to optimize the patient for the anesthesia and surgery.
3. To obtain informed consent from the patient or health care proxy.
4. To allay anxiety and educate patients and their families about anesthesia.
5. To implement risk reduction strategies as appropriate.

During the course of the preoperative evaluation, the anesthesiologist must accurately assess the risk to the patient and formulate a safe and appropriate anesthetic plan. The attendant anesthetic risks must be balanced against the potential benefit the patient will derive from the procedure. For example, in fragile individuals with multiple comorbidities, the risk of general anesthesia involving airway manipulation and hemodynamic fluctuations may be significant. In this situation, the anesthesiologist must use the preoperative evaluation to assess the patient’s underlying condition and recommend further testing or interventions, and optimizing the patient’s medical condition prior to the operation.

History and Physical Examination

The preoperative evaluation begins with a thorough history and physical examination. The history should include a brief description of the type and extent of the surgery planned as well as the urgency of the situation. Other relevant aspects of the surgery include the indication for surgery and the history of the current condition. An elective surgery may present significantly different challenges compared to an emergency procedure, when there may be little time to optimize the patient’s condition. For example, in an elderly patient with abdominal pain and vomiting, it will be important to assess the patient’s current hydration, including how long the patient has been ill. This history may influence recommendations for additional laboratory testing and the anesthetic plan. In contrast, the orthopedic history of the healthy young male scheduled for an elective knee arthroscopy, or anterior cruciate ligament (ACL) repair is unlikely to warrant additional testing.

In all patients, current and past medical problems should be listed along with an indication of severity, treatment, and stability of these conditions. This is particularly relevant for cardiopulmonary diseases such as congestive heart failure, and for chronic obstructive pulmonary diseases (COPD) that are associated with an increased postoperative risk for complications.

An accurate medication history is an important part of the preoperative evaluation and all medications need to be carefully documented. This includes prescription medications, over-the-counter medications, and herbs, and vitamins and supplements. When patients, especially the elderly, are on multiple medications, they should be instructed to bring all medications or a detailed list with them to the preoperative visit to help ensure documentation of these medications.

A list of allergies including the response and severity of the allergic reaction should also be described. Previous surgeries and anesthetic experiences are important and can be useful in helping understand how a patient may respond to their upcoming surgery. The use of tobacco, alcohol, and illicit drugs are part of the routine evaluation, as are questions about a patient's family history of adverse reactions to anesthesia such as malignant hyperthermia or pseudocholinesterase deficiency. A review of systems may uncover symptoms that may suggest previously undiagnosed conditions and positive findings may warrant the anesthesiologist to modify the anesthetic plan. For example, if the patient has symptoms consistent with gastroesophageal reflux disease, the anesthetic plan should include a rapid sequence induction.

The preoperative evaluation is also an opportunity to evaluate the patient's physiologic reserve. It is particularly important to assess the functional capacity of the patient since this might determine whether the patient will need further cardio-respiratory evaluation prior to surgery. In every patient, past anesthetic records should be reviewed if available, and ordered if unavailable and likely to affect formation of the anesthetic plan. This is especially important if the patient has a history of a difficult airway or is a poor historian.

At a minimum, the patient's physical examination should include vital signs, height and weight, an airway examination, and auscultation of the heart and lungs. For the anesthesiologist, the airway examination is a vital component of the examination, for failure to secure an airway during the procedure may result in catastrophic consequences. The components of an airway examination include determining the Mallampati classification of the oral cavity (please see Case 10), the degree of neck flexion, head extension, thyromental distance, and dental status. Other factors such as body habitus and heavy facial hair may also affect the anesthesiologist's ability to mask and intubate the patient. If a difficult intubation is anticipated, the option of an awake fiberoptic intubation should be discussed with the patient. If applicable, other methods of anesthesia besides general anesthesia should also be considered at this time.

Preoperative Testing

After a thorough history and physical examination has been performed, the anesthesiologist will determine whether or not laboratory testing is needed. Depending on the surgical procedure and the health status of the patient, a history and physical examination may be sufficient. For example, a healthy

patient undergoing a noninvasive surgical procedure such as a hernia repair or knee arthroscopy is unlikely to need any further workup.

Diagnostic tests can aid in the risk assessment for anesthesia and surgery, guide interventions to optimize medical conditions, and provide baseline results for perioperative management. However, screening tests can yield false positive results that may result in further morbidity in patients without a medical indication due to an unnecessary follow up. Pre-anesthetic testing should only be performed when indicated by the patient’s underlying medical condition. Indications for common tests are described in Table 9–2.

Table 9–2 PREOPERATIVE TESTING

Hematocrit (Hct)	Hct should be ordered if there is likelihood of unexpected or symptomatic anemia, or significant blood loss is anticipated. If significant blood loss is possible, a type and screen or crossmatch is also indicated.
Coagulation studies (PT, PTT, INR)	Coagulation studies should be ordered if patient’s history suggests a coagulation disorder (such as hemophilia, von Willebrand disease), liver disease, malnutrition or malabsorption, or if the patient is on anticoagulants.
Chemistries (electrolytes, BUN, creatinine, glucose)	Chemistries should be ordered if patient has known kidney disease, has risk factors for renal dysfunction (eg, age >55, diabetes, vascular disease, lupus), is on diuretics, or will be exposed to radiographic dye. Liver function tests are generally not required, although a low albumin has been associated with increased morbidity and mortality in ill patients, and may be requested to establish a baseline.
ECG	An electrocardiogram is one of the only tests that may be ordered based on both the medical history and age. In general the incidence of cardiac disease rises steadily with age and baseline. ECGs are often ordered for males over 45 years and females 55 years in age. An ECG should also be ordered for patients with cardiac disease or symptoms of cardiac disease.
Chest x-ray (CXR)	Routine screening chest x-rays are not recommended before surgery. A CXR is only indicated in patients who have clinical evidence of active pulmonary disease (eg, pneumonia, pulmonary edema, a mediastinal mass) or are undergoing an intrathoracic procedure.

Cardiac Assessment in Non-Cardiac Surgery

Cardiac complications are the most significant adverse events in the perioperative period. The preoperative evaluation should be used to identify patients with modifiable conditions or those at a high risk for perioperative cardiac events. The guidelines for cardiac evaluation before non-cardiac surgery by the American College of Cardiology and American Heart Association (ACC/AHA) are the national standards of care and are organized in a step-wise approach.

STEP 1. Determine the urgency of the proposed surgery. If the patient needs emergent surgery, the focus is on perioperative surveillance and risk reduction measures such as serial ECGs, cardiac enzymes, adequate pain control, and beta blockers to control heart rate.

STEP 2. Determine if the patient has an active cardiac condition such as an acute MI, unstable or severe angina, decompensated heart failure, severe valvular disease, or significant arrhythmias (eg, ventricular tachycardia and rapid atrial fibrillation). For these patients, surgery should be postponed except for life-saving emergencies.

STEP 3. Determine the severity of the proposed surgery. The ACC/AHA categorizes surgical procedures into three categories: low-, intermediate-, and high risk. Low-risk surgeries include endoscopic procedures, breast and superficial surgeries, and most ambulatory procedures. Intermediate-risk surgeries include most orthopedic and intraperitoneal surgeries. High-risk surgeries include aortic or vascular surgeries. Patients with no active cardiac conditions who need low-risk surgery do not need further cardiac testing.

STEP 4. Assess the patient's functional capacity. A common way to assess a patient's functional status is by estimating a patient's exercise tolerance in metabolic equivalents or METs. Asymptomatic patients who have a functional status greater than 4 METs, which is roughly equivalent to walking up two flights of stairs, can proceed with surgery without any additional cardiac workup.

In patients with poor or indeterminate functional capacity who are scheduled for vascular, intermediate, or high-risk procedures, five clinical predictors: ischemic heart disease, heart failure, cerebrovascular disease, diabetes and renal insufficiency are important comorbidities. The number of clinical predictors determines the recommendations for cardiac testing. Patients with no clinical predictors may proceed to surgery. Patients with three or more of the clinical predictors would most likely benefit from further cardiac testing. Other risk factors for coronary artery disease such as smoking, hypercholesterolemia, age, and hypertension have not been shown to predict perioperative cardiac morbidity.

If the patient has a pacemaker or automatic implantable cardioverter defibrillator (AICD), a consult with the device manufacturer, cardiologist, or electrophysiology service may be desirable. Patients with pacemakers and AICDs

are at risk for adverse events for unexpected activation and/or firing due to electric interference from devices such as electrocautery during surgery.

NPO Status

To avoid the risk of pulmonary aspiration, patients should receive NPO instructions prior to the surgery. The ASA task force on preoperative fasting currently recommends a fasting of solids and nonhuman milk to exceed 6 hours prior to any procedure requiring general anesthesia, regional anesthesia, or sedation/analgesia. Fasting rules have been liberalized at most centers to allow clear liquids (water, carbonated beverages, sports drinks, coffee or tea without milk) up to 2 hours before surgery in patients who are not at risk of delayed gastric emptying. To avoid confusion, patients should receive a written copy of all instructions. Some institutions may adhere to stricter guidelines such as NPO after midnight except for sips of clear liquids when taking medications, or allowing clear liquids up to 4 hours before surgery for surgery scheduled late in the day.

For pediatric patients, clear liquids may be taken up to 2 hours before surgery. Breast milk is allowed until 4 hours before surgery; formula or nonhuman milk should be held for 6 hours preoperatively.

Preoperative Medications

During the preoperative evaluation, the patient's current medication regimen should be reviewed, and any potential interactions of these medications with drugs administered in the perioperative period must be considered. Depending on the nature of the procedure and the patient's comorbidities, some medications may have beneficial effects on the surgery and some may have detrimental effects. Some of the commonly encountered medications are:

1. Cardiac and antihypertensive medications: In general, all antihypertensive medications should be continued through the morning of surgery. Stopping beta blockers or alpha-2 agonists (clonidine) may result in rebound hypertension. Angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers have been associated with prolonged and resistant hypotension after induction of anesthesia. Currently, whether or not these drugs should be held prior to surgery is controversial within the anesthesiology community, and practice varies widely. Diuretics can be held on the morning of surgery provided they have not been prescribed for congestive failure. Patients with cardiovascular disease taking statin drugs, beta blockers, digoxin, antiarrhythmics, and antiplatelet agents should continue taking these medications because discontinuation can have detrimental effects.
2. Aspirin, antiplatelet agents such as clopidogrel, low-molecular-weight heparin, and warfarin: The decision to discontinue these medications, in general, depends on the surgeon's preference and the type of surgery. Anticoagulation

or antiplatelet therapy may limit the choice of anesthetic to general or sedation, as a spinal or epidural is relatively contraindicated.

Whenever a decision is made to hold these agents, it is important to carefully weigh the risks and potential benefits, and to involve the patient's cardiologist or primary care physicians. There may be an increased risk of vascular events if chronic aspirin or antiplatelet medications are stopped perioperatively. In general, for high-risk patients such as those with cardiac or vascular disease, renal insufficiency, and diabetes, aspirin should not be stopped for procedures with minimal bleeding such as cataract surgery or endoscopies. If there is concern over significant blood loss such as may occur in intracranial surgery, stopping aspirin for 3 to 4 days prior to surgery should be sufficient.

For patients with recently placed coronary stents (< 1 year), aspirin and clopidogrel should not be stopped unless absolutely contraindicated, and then, only with the coordination of the patient's cardiologist. Premature discontinuation of antiplatelet therapy may result in stent thrombosis, MI, and/or death. If a patient can stop warfarin safely, it should be held for at least four doses to allow the INR (international normalized ratio) to normalize (< 1.5). If the INR remains elevated on the day of surgery, fresh frozen plasma (FFP) and vitamin K can be given to reverse anticoagulation. Low-molecular-weight heparin should be held for at least 12 to 24 hours before surgery or neuraxial anesthesia to minimize the risk of surgical bleeding and epidural or spinal hematomas.

3. Antiseizure, antipsychotics, narcotics, and medications for asthma and heartburn should be continued on the day of surgery.
4. Herbs and non-vitamin supplements should be stopped 1 week prior to surgery since they may interact with perioperative medications and some may cause increased risk of bleeding.

ASA Status

After the patient has been fully evaluated, the anesthesiologist assigns a physical status to the patient based on his or her medical condition. The American Society of Anesthesiologist (ASA) Physical Status Classification System ranks patients for risk of adverse events during a surgical procedure. (See Table 9–3) This assignment is based on the physical condition of the patient, and is independent of the surgical procedure. The grading system ranks patients from ASA 1, denoting a normal and healthy patient, to ASA 5, signifying a moribund patient who is not expected to survive without the operation. Intraoperative adverse events are encountered more frequently in patients with a poor physical status, greater or equal to ASA 3, especially in emergency situations. Some examples of patients that have a poor physical status who are at high risk for anesthesia and surgery include patients with active heart disease (CHF, aortic stenosis), chronic renal disease, end-stage liver disease, and patients scheduled for surgery who are already in the intensive care unit.

Table 9–3 ASA PHYSICAL STATUS CLASSIFICATION

ASA 1	Normal healthy patient
ASA 2	Patients with mild systemic disease with no functional limitations
ASA 3	Patients with systemic disease with functional limitations
ASA 4	Patients with severe systemic disease that is a constant threat to life
ASA 5	Moribund patients who are not expected to survive without intervention.
"E"	The suffix "E" is attached to the ASA classification for all emergent procedures, that is, ASA 3E

Informed Consent

Most patients are anxious and apprehensive before surgery. The preoperative visit is an opportunity for the patient to discuss the anesthetic plan and express his or her concerns before the surgery. In order to obtain informed consent, the patient should receive a fair and reasonable account of the proposed procedures and the inherent risks. Risks that are reasonably likely to occur with the anesthetic should be mentioned, for example, nausea/vomiting, sore throat with a general anesthetic, or subdural puncture headache following placement of a spinal or epidural. The discussion should be informative and reassuring, answering all the patient's questions. This discussion should also be documented appropriately in the medical chart.

In summary, the preoperative evaluation consists of a history, physical examination, relevant laboratory tests, and consultations which allow the anesthesiologist to assess the patient's physical status and optimize his or her medical condition preoperatively. Using this information, an appropriate anesthetic plan is formed by the anesthesiologist, the patient is educated about anesthesia, and informed consent is obtained. Successful preoperative assessment and management of the patient in the preoperative period may result in decreased perioperative morbidity and mortality, as well as an improved efficiency in the operating room.

Comprehension Questions

- 9.1. The hospital has asked its anesthesia department to reduce the resources utilized in the pre-op clinic. To comply, the department agrees to reduce the number of patients by agreeing that the anesthesiologists will evaluate which patient(s) in the pre-op holding area on the morning of surgery?
- A. An ASA II patient undergoing a thoracotomy for lymphoma.
 - B. An ASA II patient undergoing a hemipelvectomy for tumor resection.
 - C. An ASA III patient undergoing a carpal tunnel release.
 - D. An ASA IV patient undergoing a laparoscopic cholecystectomy.
- 9.2. Which of the following are the benefits of preoperative testing?
- A. Inducing anxiety by informing the patient about his or her risks of surgery
 - B. Allowing for the generation of additional revenue from routine laboratory tests
 - C. Increasing cancellations on the day of surgery
 - D. Reducing the ordering of unnecessary laboratory tests

ANSWERS

- 9.1. **C.** Healthy patients undergoing minor or even moderately complex surgical procedures may, in general, be evaluated by the anesthesiologist on the morning of surgery (unless the institution has a policy to the contrary). Healthy patients undergoing a complex or high-risk surgical procedure (A, B) need to be evaluated prior to the morning of surgery, to be certain that their condition is optimized.
- Patients with moderate or significant comorbidities (ASA III or IV) and who are undergoing minor low-risk surgical procedures may be evaluated on the morning of surgery if their medical condition is stable (C). Patients with significant comorbidities who are undergoing a complex or high-risk surgical procedure need to be evaluated prior to the morning of surgery.
- 9.2. **D.** Preoperative evaluation allays a patient's anxiety, and allows for the optimization of his or her medical condition prior to surgery. Since the lab tests in the preoperative clinic are usually prescribed by protocol, the preoperative clinic actually reduces the ordering of unnecessary tests prior to surgery. The preoperative evaluation of complex patients or patients undergoing complex or high-risk procedures has been shown to reduce cancellations on the day of surgery.

Clinical Pearls

- The preoperative evaluation is a vital step as the information provided can reduce the patient's perioperative risk, as well as promote operating room efficiency by minimizing delays and cancellations on the day of surgery. Also, the preoperative evaluation is a valuable means to ease a patient's preoperative anxiety.
- Preoperative laboratory studies can aid in risk assessment, and guide optimization of medical treatment as well as provide baseline values that guide intraoperative treatments. Only appropriate laboratory studies should be ordered, based on the patient's medical condition and type of surgery.
- The ACC/AHA guidelines on preoperative cardiac evaluation consider the type of surgery as well as the patient's active cardiac conditions and functional capacity to assess a patient's cardiac risk for surgery and need for additional testing.

REFERENCES

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