Preoperative Evaluation

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Preoperative Evaluation

EVALUATION OF SURGICAL RISK

Ryan Schmicker, MD, and Sarah Agnum, MD, FACS

All surgical procedures are associated with a risk of perioperative morbidity and mortality. Appropriate preoperative medical evaluation should assess whether a patient has a higher than average risk of a surgical complication based on their current health status. The national health care professional evaluation is to systematically address the patient’s pre-existing medical conditions and identify unanticipated conditions, thereby treating potential complications before surgical intervention. Furthermore, knowledge of patients’ current conditions allows the surgeon to more effectively plan potential postoperative complications, thereby improving the informed-consent process. The risk assessment, although specific to the patient’s condition, must also take into account the surgical procedure to be performed and the type of anesthesia to be administered. Preoperative evaluations also provide medical advice that helps patients and their primary care physicians, anesthesiologists, and surgeons make the best treatment decisions regarding short-term and long-term clinical outcomes.

To properly evaluate surgical risk, a thorough patient history and physical examination are paramount, but only to assess the state of the patient’s pre-existing medical conditions, but also to identify unexpected disease processes. Laboratory tests should be ordered to supplement the initial evaluation, these most commonly include a complete blood count, electrocardiogram studies, blood glucose levels, serum albumin, and coagulation studies. Diagnostic testing can also be directed at specific circumstances, such as renal function studies in patients with risk factors for cardiovascular disease (CVD) and pulmonary function tests in a patient with chronic obstructive pulmonary disease (COPD). Once a patient has been fully evaluated, interventions can be initiated to minimize the risk of surgery and provide for a satisfactory outcome for the patient.

Cardiac Risk Assessment

Preoperative medical evaluation procedures are a major cause of morbidity and mortality in surgical patients, with one review reporting rates of perioperative myocardial infarction (MI) in 1.4% for all patients older than 60 years. The latest guidelines from the American College of Cardiology (ACC) and the American Heart Association (AHA) Task Force on Practice Guidelines, published in 2014, focus on the evaluation of patients undergoing surgery who are at risk for perioperative cardiac morbidity and/or mortality. These guidelines state that two types of procedures, those that are low risk (< 1% chance of major adverse cardiac event [MACE]) and those with elevated risk (≥ 5% chance of MACE). To determine the risk of MACE, the ACC/AHA guidelines advocate the use of one of a number of available risk prediction models. These include the Revised Cardiac Risk Index to predict major cardiac risk [see Table 1], the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) to predict factors associated with myocardial infarction and cardiac arrest (MICA) and ACS NSQIP Surgical Risk Calculator, which will be discussed later.

Preoperative Evaluation

According to the ACC/AHA guidelines, patient-specific clinical variables, exercise capacity, and surgery-specific risk factors, should be reviewed to determine the risk of cardiac events. The authors of this report have since updated the revised cardiac risk index to provide more accurate risk assessment.

A helpful and succinct history of the patient’s past and present symptoms, clinical course, and exercise capacity is the almost important in evaluating surgical risk.

Table 1: Revised Cardiac Risk Index to Predict Major Cardiac Risk Associated with Surgery

<table>
<thead>
<tr>
<th>No of Risk Factors</th>
<th>EMR (%)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>76.1 (1.0)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>10.0 (5.6)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.6 (1.3)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1.2 (0.6)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.4 (0.2)</td>
<td></td>
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</tbody>
</table>

Cardiac Risk Index

Some cardiac risk index values are calculated as follows: 1. High risk surgery (non-CV surgery, cerebrovascular). 2. (x) history of diabetes (x) positive family history, current need for oxygen therapy, hypoalbuminemia (x) or not on dialysis. 3. Congenital heart defect (documented history, or if the patient is an adult and the defect is not obvious). 4. Lower extremity peripheral arteriopathy. 5. Coronary artery disease (CVA/PA). 6. Dialysis (non-surgical vascular access ≥ 24 months). (95% CI) 0.05 (0.015, 0.023)

Practice Advisory for Preanesthesia Evaluation

An Updated Report by the American Society of Anesthesiologists Task Force on Preanesthesia Evaluation

PRACTICE ADVISORY

An update to the “Practice Advisory for Preanesthesia Evaluation” published by the American Society of Anesthesiologists (ASA) in 2001, describes an update to the guidelines for preanesthesia evaluation. The updated guidelines describe the evaluation of patients undergoing surgery undergoing sedation and local anesthetic surgery. The guidelines are intended to provide a framework for the preanesthesia evaluation process and are not intended to replace local anesthetic surgery. The guidelines are not intended to replace local anesthetic surgery. The guidelines are not intended to replace local anesthetic surgery. The guidelines are not intended to replace local anesthetic surgery. The guidelines are not intended to replace local anesthetic surgery. The guidelines are not intended to replace local anesthetic surgery. The guidelines are not intended to replace local anesthetic surgery. The guidelines are not intended to replace local anesthetic surgery. 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Preoperative Evaluation

• Evaluation of pertinent medical records
• Patient interview
• Physical Examination
  – Airway
  – Cardiovascular
  – Pulmonary
• Ideally occurs before the day of surgery for highly invasive surgical procedures or for patients with complex disease processes
Preoperative Testing

• Ideally:
  – Cheap
  – High positive and negative predictive values
  – Add to information obtained from clinical history and physical exam
  – Change or modify perioperative decision making to prevent perioperative complications
Preoperative Testing

• Should be ordered for specific indication only
• Results should clarify questions about preexisting medical condition or establish a relevant new diagnosis in patients with significant risk factors for specific conditions
• The more tests ordered, the more chance of a false-positive result
  – Wasted time
  – Wasted money
  – Risk for complications
Preoperative Testing

- In the medical population 50% of clinical diagnoses and nearly 50% of management decisions based on history alone
- Routine studies contribute to less than 1% of all diagnoses
- In the surgical world, routine preop screening rarely discovers abnormalities not predicted by history alone, and when detected, results are rarely actionable

Timing of Preoperative Testing

- Test results should be within 6 months of surgery, provided the patient’s medical history has not changed substantially in the interim.
- More recent test results may be desirable when the medical history has changed or when a test results may play a role in the selection of a specific anesthetic technique (e.g., regional anesthesia in the setting of anticoagulation therapy).

## UPHS PreOp Testing Guidelines

<table>
<thead>
<tr>
<th>UPHS Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No Testing</strong></td>
</tr>
<tr>
<td>NO testing in ASA 1 or 2 regardless of age having a low risk procedure.</td>
</tr>
<tr>
<td><strong>Duration of acceptability of tests</strong></td>
</tr>
<tr>
<td>SIX MONTHS before surgery if the patient’s medical history has not changed.</td>
</tr>
<tr>
<td><strong>Basic Metabolic Panel</strong></td>
</tr>
<tr>
<td>In patients having major surgery, taking diuretics, digoxin, potassium supplements,</td>
</tr>
<tr>
<td>with a history of CKD, or if IV contrast dye will be injected</td>
</tr>
<tr>
<td><strong>CBC</strong></td>
</tr>
<tr>
<td>Having major surgery, anemia history, or cirrhosis</td>
</tr>
<tr>
<td><strong>CXR</strong></td>
</tr>
<tr>
<td>Not Required</td>
</tr>
<tr>
<td><strong>EKG</strong></td>
</tr>
<tr>
<td>In patients with known Diabetes, CAD, CVD, arrhythmias, structural heart disease,</td>
</tr>
<tr>
<td>or peripheral arterial disease having elevated risk surgery. No age or BMI inclusion.</td>
</tr>
<tr>
<td><strong>Finger Stick (Glucose)</strong></td>
</tr>
<tr>
<td>All Diabetics the day of surgery</td>
</tr>
<tr>
<td><strong>Pregnancy</strong></td>
</tr>
<tr>
<td>Urine HCG for all females with potential of pregnancy</td>
</tr>
<tr>
<td><strong>PT/PTT/INR</strong></td>
</tr>
<tr>
<td>Any patient on anticoagulants, with a bleeding history, or cirrhosis</td>
</tr>
<tr>
<td><strong>T &amp; S</strong></td>
</tr>
<tr>
<td>If indicated</td>
</tr>
</tbody>
</table>
Complete Blood Count

• Clinically asymptomatic anemia has been shown to be present in about 1% of patients but surgically significant anemia in unselected patients is even more rare

• Should be considered if:
  – Highly invasive procedure/high risk of blood loss
  – Extremes of age
  – History of liver disease
  – History of anemia
  – History of bleeding diatheses

Coagulation Studies

• An unexpected coagulation defect leading to excessive surgical bleeding is extremely unlikely, provided a thorough history (both personal and family) and physical exam is performed

• Reasonable for patients with:
  – Bleeding diatheses (inherited or iatrogenic)
  – Renal dysfunction
  – Liver dysfunction
  – Undergoing highly invasive procedures
  – Regional anesthesia?

Regional/Neuroaxial Anesthesia and Antithrombotic Therapy

ASRA PRACTICE ADVISORY

Regional Anesthesia in the Patient Receiving Antithrombotic or Thrombolytic Therapy

American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (Third Edition)

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Abstract: The actual incidence of neurologic dysfunction resulting from hemoragic complications associated with neuroaxial blockade is unknown. Although the incidence cited in the literature is estimated to be less than 1 in 150,000 epidural and less than 1 in 220,000 spinal anesthetics, recent epidemiologic surveys suggest that the frequency is increasing and may be as high as 1 in 200 in some patient populations. Overall, the risk of clinically significant bleeding increase with age, associated abnormalities of the spinal cord or vertebral column, the presence of an underlying coagulopathy, difficulty during needle placement, and an indwelling neuroaxial catheter during sustained anticoagulation (particularly with standard heparin or low-molecular weight heparin). The need for prompt diagnostic intervention to optimize neurologic outcome is also consistently reported.

In response to these patient safety issues, the American Society of Regional Anesthesia and Pain Medicine (ASRA) convened its Third Consensus Conference on Regional Anesthesia and Anticoagulation. Practice guidelines or recommendations emanating from these reviews. However, the rarity of spinal hematoma defies a prospective randomized study, and there is no current laboratory model. As a result, the ASRA consensus statement represents the collective experience of recognized experts in the field of neuroaxial anesthesia and anticoagulation. These are based on case reports, clinical series, pharmacology, hematology, and risk factors for surgical bleeding. An understanding of the complexity of this issue is essential to patient management.
Serum Chemistries

- Significant electrolyte abnormalities noted on routine screening are extremely rare.
- Increased glucose in patients having noncardiac, nonvascular surgery are associated with increased perioperative cardiovascular mortality compared to normoglycemic patients.
- Patients without a known history of diabetes who had perioperative hyperglycemia experienced worse outcomes and higher mortality.

Serum Chemistries

• Consider if:
  – Known endocrine abnormalities
  – Renal dysfunction
  – Liver dysfunction
  – Use of certain medicine/therapies (diuretics, dialysis..)

Chest Radiograph

- Abnormalities on chest radiograph are incredibly common but rarely change perioperative outcome or management
- Exception is to evaluate possible acute processes (pneumonia, decompensated CHF)

Chest Radiograph

• ASA says consider for:
  – Smoking
  – Recent upper respiratory infection
  – COPD
  – Cardiac disease

• ACP suggests CXR may be helpful in patients >50yo who are undergoing AAA repair, upper abdominal, or thoracic surgery

• AHA adds BMI > 40 kg/m²

Pulmonary Function Testing

- Range from noninvasive passive or provocative screening tests (e.g., PFTs or spirometry) to invasive assessment of pulmonary function (e.g., ABG, split lung function, right heart catheterization)
- Incidence of pulmonary complications is higher in patients with preexisting lung disease
- Preoperative PFTs have not proven to be better predictors than clinical findings in predicting significant postoperative pulmonary complications after surgical procedures not involving lung resection

Risk Factors for Postoperative Pulmonary Complications

Patient factors:
• Advanced age
• ASA PS 2 or higher
• Functional dependence
• COPD
• Smoking
• CHF
• OSA
• PHTN

Surgical Factors:
• Surgery close to the diaphragm (thoracic and upper abdominal)
• Emergency surgery
• Prolonged duration
• Neurosurgery
• Head and neck surgery
• Vascular surgery
• General anesthesia

Pulmonary Function Testing

• Clinical characteristics to consider include:
  – type and invasiveness of the surgical procedure
  – interval from previous evaluation
  – treated or symptomatic reactive airway disease (asthma/COPD)
  – scoliosis with restrictive function
  – Neuromuscular disease (MG, severe MS, ALS)

• Outside of thoracic resection, very little utility of preoperative PFTs in predicting postoperative course

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American College of Surgeons, American Society of Anesthesiologists, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Anesthesiologists, and Society of Vascular Medicine

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**ACCAHA Representative, Society for Vascular Medicine Representative
Preoperative Cardiac Testing

• Range from noninvasive (e.g., echocardiogram) to invasive (e.g., cardiac catheterization) assessment of cardiac structure, function, and vascularity

• May be passive or provocative (e.g., stress testing)

• Clinical characteristics to consider include:
  – cardiovascular risk factors
  – type and invasiveness of surgery

Preop EKG

• *Is reasonable* for pts with known CAD or structural heart disease, except before low-risk surgery (Class IIb, LOE B)

• *May be considered* for asymptomatic patients, except for low risk surgery (Class IIb, LOE B)

• *Not useful* for asymptomatic pts undergoing low-risk surgery (Class III, LOE B)
Valvular heart disease

• Class I: Preoperative echo for patients with clinically suspected moderate or greater valvular regurgitation or stenosis if: (1) no prior echo w/in 1y; or (2) significant change in clinical status since last exam. (LOE C)

• Class I: Valve replacement or repair before noncardiac surgery for patients who meet standard criteria for valve replacement/repair (LOE C)

• Class IIa: Elevated-risk noncardiac surgery w/appropriate monitoring is reasonable in patients with: (1) asymptomatic severe AS; (2) asymptomatic severe MR; (3) asymptomatic severe AI with normal LVEF
Preop assessment of LV function

- *Is reasonable* for pts with dyspnea of unknown origin (Class IIa, LOE C)
- *Is reasonable* for pts with known CHF with worsening dyspnea or change in clinical status (Class IIa, LOE C)
- *May be considered* for reassessing LV function in clinically stable pts (Class IIb, LOE C)
- *Not recommended* as a routine preop test (Class III, LOE B)
Preop exercise stress testing

- *Reasonable to forego* in pts with elevated CV risk but excellent functional status (IIA, B)
- *May be reasonable to forego* in pts with elevated CV risk but moderate to good functional status (IIB, B)
- *Reasonable to perform* in pts with elevated CV risk & unknown or poor fn status if it will change mgmt (IIB, B/C)
- *May be considered* for pts undergoing elevated risk procedures (IIB, B)
- *Not useful* as a routine screening modality before low-risk noncardiac surgery (III, B)
Functional capacity > 4 METS

<table>
<thead>
<tr>
<th>No. of METs</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1 (baseline)</td>
<td>An oxygen uptake of 3.5 mL/kg/min, the typical resting oxygen uptake in a sitting position</td>
</tr>
<tr>
<td>1–3</td>
<td>Can take care of self, such as ambulate, eat, dress, or use the toilet</td>
</tr>
<tr>
<td>4</td>
<td>Can walk about two blocks, up a flight of steps, or carry groceries</td>
</tr>
<tr>
<td>5–10</td>
<td>Can do heavy work around the house (scrubbing floors or lifting or moving heavy furniture)</td>
</tr>
<tr>
<td>&gt; 10</td>
<td>Can participate in strenuous sports (swimming, football, basketball, tennis, and skiing)</td>
</tr>
</tbody>
</table>

MET = metabolic equivalent of tasks.
*An MET expresses the rate of energy consumption for given activities.
What about revascularization?
What about revascularization?

**CONCLUSIONS**

Coronary-artery revascularization before elective vascular surgery does not significantly alter the long-term outcome. On the basis of these data, a strategy of coronary-artery revascularization before elective vascular surgery among patients with stable cardiac symptoms cannot be recommended.

- Based largely on the CARP trial, ACC/AHA guidelines do not recommend revascularization for the general population
- Follow the recommendations found in routine clinical practice guidelines for revascularization (CABG/PCI)
- There are subsets of populations who benefit from preop revascularization – probably worth having cardiology and anesthesia weigh in on perioperative management
What if the patient has already undergone revascularization?
2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients With Coronary Artery Disease

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines


Developed in Collaboration With the American Association for Thoracic Surgery, American Society of Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Anesthesiologists, and Society of Thoracic Surgeons

Endorsed by Preventive Cardiovascular Nurses Association and Society for Vascular Surgery

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# Perioperative Management: Timing of Elective Noncardiac Surgery in Patients Treated With PCI and DAPT

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>B-NR</td>
<td>Elective noncardiac surgery should be delayed 30 days after BMS implantation and optimally 6 months after DES implantation.</td>
</tr>
<tr>
<td>I</td>
<td>C-EO</td>
<td>In patients treated with DAPT after coronary stent implantation who must undergo surgical procedures that mandate the discontinuation of P2Y$<em>{12}$ inhibitor therapy, it is recommended that aspirin be continued if possible and the P2Y$</em>{12}$ platelet receptor inhibitor be restarted as soon as possible after surgery.</td>
</tr>
<tr>
<td>IIa</td>
<td>C-EO</td>
<td>When noncardiac surgery is required in patients currently taking a P2Y$_{12}$ inhibitor, a consensus decision among treating clinicians as to the relative risks of surgery and discontinuation or continuation of antiplatelet therapy can be useful.</td>
</tr>
<tr>
<td>IIb</td>
<td>C-EO</td>
<td>Elective noncardiac surgery after DES implantation in patients for whom P2Y$_{12}$ inhibitor therapy will need to be discontinued may be considered after 3 months if the risk of further delay of surgery is greater than the expected risks of stent thrombosis.</td>
</tr>
<tr>
<td>III: Harm</td>
<td>B-NR</td>
<td>Elective noncardiac surgery should not be performed within 30 days after BMS implantation or within 3 months after DES implantation in patients in whom DAPT will need to be discontinued perioperatively.</td>
</tr>
</tbody>
</table>
Treatment Algorithm for the Timing of Elective Noncardiac Surgery in Patients With Coronary Stents
Conclusions

• A good history and physical exam will get you far
• Most extensive workups are unnecessary unless a change in clinical status
• Determining functional status answers a lot of questions
• We are happy to help answer any questions (but there is only so much we can do the evening before surgery)
Case #1

- 60yo man for Whipple
- PMH: pancreatic ca, HTN, T2DM, GERD
- PSH: appendectomy
- Allergies: NKFDA
- Meds: metoprolol, metformin, omeprazole
Case #1

• What other information do you want to know?

• What workup would you initiate?
Case #1

• Any further cardiac testing?
Case #2

- 66 yo man for open juxtarenal AAA repair
- PMH: AAA (6cm), CAD, HTN, DM, HLD, COPD
- PSH: laproscopic cholecystectomy, PCI
- Meds: aspirin, plavix, metoprolol, insulin, simvastatin, advair, albuterol
- Allergies: Morphine
Case #2

• What else do you want to know?

• What labs or testing do you want before going to surgery?
Case #2A

• What if the same patient came in through the emergency department with an increasingly pulsatile abdominal mass and worsening pain?

• Would this change your preoperative workup?
Case #2B

• What if the patient had severe pain, agitation, and hypotension?

• Now what workup would you need?
Case #3

- 72 yo man for transhiatal esophagectomy
- PMH: esophageal ca, CHF, CAD s/p MI, PVD, Hiatal hernia, GERD
- PSH: inguinal herniorrhaphy x2, T&A, PCI, AICD/PPM
- Meds: aspirin, plavix, carvedilol, ranitidine, furosemide, pravastatin
- Allergies: NKFDA
Case #3

• What else do you want to know?

• Do you need an echocardiogram?

• What about a stress test?

• Would you feel differently if a different surgery?
Case #4

- 72 yo man presenting for a right inguinal herniorrhaphy on an outpatient basis.
- PMH: none
- PSH: none
- Meds: none
- Allergies: none
Case #4

- What else do you want to know?
- What workup would you perform?
Case #4a

- Same patient and history
- On physical exam, you appreciate a 4/6 harsh systolic ejection murmur at the left upper sternal border
- Patient has never been told he has a murmur before
Case #4a

- Does this change your workup?

- Would you do the case if murmur only discovered on the morning of surgery?
Case #5

- 58 yo woman for laparoscopic cholecystectomy for symptomatic cholelithiasis
- PMH: Primary pulmonary hypertension
- PSH: none
- Medications: sildenafil
- Allergies: NKFDA
Case #5

• What other history do you want to know?

• What workup would you order?

• What is the implication of the primary pulmonary hypertension on your surgical and/or anesthetic plan?
Case #6

- 42 yo woman for breast biopsy for self-palpated lump.
- PMH: uterine fibroids, migraines, depression/anxiety
- PSH: none
- Meds: venlafaxine, alprazolam prn, motrin prn
- Allergies: bee stings
Case #6

• What else do you want to know?

• What workup would you order preoperatively?