Preoperative Cardiac Evaluation
Prior to Noncardiac Surgery

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Overview

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• Introduction
• Procedure risk categorization
• Preoperative estimation of cardiac risk
• Stepwise approach to preoperative evaluation
• Preoperative cardiac testing
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## Abbreviations

- **ACC**: American College of Cardiology  
- **AHA**: American Heart Association  
- **ASA**: American Society of Anesthesiologists  
- **NICE**: National Institute for Health and Care Excellence  
- **MACE**: Major adverse cardiac event(s)

## Abbreviations (cont.)

- **RCRI**: Revised Cardiac Risk Index  
- **ACS NSQIP**: American College of Surgeons National Surgical Quality Improvement Program  
- **ACS**: Acute coronary syndrome  
- **PCI**: Percutaneous coronary intervention  
- **DAPT**: Duel antiplatelet therapy
### Learning Objectives

1. List patient characteristics that increase risk of perioperative MACE.

2. Categorize procedures into high-risk or non-high risk.

3. Estimate individual patients’ cardiac risk using the RCRI.

4. Estimate individual patients’ cardiac risk using the ACS NSQIP online risk calculator.

(continuation)

### Learning Objectives (cont.)

5. Discuss optimal timing of elective noncardiac surgery after ACS or PCI.
Preoperative Cardiac Evaluation

Introduction

- > 50 million surgeries in the US annually
- 1.4 – 3.9% of surgeries in the US are complicated by a major perioperative cardiac event
- Cardiac complications are the most common cause of postoperative morbidity and mortality
- Two major determinants of surgical outcomes:
  - Procedure type
  - Patient characteristics

Preoperative Cardiac Evaluation

Procedure risk

2014 ACC/AHA Guidelines divide procedures into only two categories:

- Low:
  - Procedure wherein the combined surgical and patient characteristics predict a risk of MACE < 1%
  - e.g. cataract surgery, endoscopy
- Elevated:
  - Procedure wherein the combined surgical and patient characteristics predict a risk of MACE ≥ 1%
  - e.g. open and vascular procedures
Preoperative Cardiac Evaluation

Preoperative cardiac risk estimation

ACC/AHA recommends use of one of the following cardiac risk estimation tools:

• Revised Cardiac Risk Index (RCRI)
• ACS NSQPI Surgical Risk Calculator

Revised Cardiac Risk Index

Two or more of the following risk factors make a patient “high risk.”

- High-risk surgery (intraperitoneal, intrathoracic, or supra-inguinal vascular procedures)
- History of ischemic heart disease
- History of congestive heart failure
- History of cerebrovascular disease
- Preoperative treatment with insulin
- Preoperative serum creatinine >2.0 mg/dL
Preoperative Cardiac Evaluation

Preoperative risk estimation (cont.)

ACS NSQPI Surgical Risk Calculator:

- 22 questions (about patient (including ASA class) and planned procedure)
- Online: http://riskcalculator.facs.org/

ASA Classification:

1: Healthy patient
2: Mild systemic disease
3: Severe systemic disease
4: Severe systemic disease / constant threat to life
5: Moribund / not expected to survive surgery
**Enter Patient and Surgical Information**

### Procedure
47805 - Cholecystectomy, with cholangiography

Begin by entering the procedure name or CPT code. One or more procedures will appear below the procedure box. You will need to click on the desired procedure to properly select it. You may also search using two words or two partial words by placing a "w" in between, for example: "cholecystectomy + cholangiography"

### Are there other potential appropriate treatment options?
- [ ] Other Surgical Options
- [ ] Other Non-operative options
- [ ] None

Please enter as much of the following information as you can to receive the best risk estimates. A rough estimate will still be generated if you cannot provide all of the information below.

**Age Group**
- Under 55 years

**Sex**
- Female

**Functional Status**
- Independent

**Emergency Case**
- No

**Diarhoea**
- Oral

**Hypertension requiring medication**
- Yes

**Congestive heart failure in 30 days prior to surgery**
- No

**Dyspnea**
- With moderate exertion

**ASA Class**
- Severe systemic disease

- No

**Anesthesia within 30 days prior to surgery**
- No

**Systemic infection within 48 hours prior to surgery**
- None

**Ventilator dependent**
- No

**Disseminated cancer**
- No

**Current smoker within 1 year**
- Yes

**History of severe COPD**
- No

**Dialysis**
- No

**Acute renal failure**
- No

**BMI calculation**
- Height: 62 in 157 cm
- Weight: 172 lbs 78 kg
**Surgical Risk Calculator**

**Outcomes**

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<td>0.5%</td>
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<td>1.7%</td>
<td>1.8%</td>
<td>1.9%</td>
<td>2.0%</td>
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**How to Interpret the Graph Above**

- **Your Risk**: The individual patient's risk for developing a complication is calculated based on their specific health history and the type of surgery they are undergoing.

- **Average Patient Risk**: The average risk for developing a complication among a group of patients undergoing the same type of surgery.

- **Your % Risk**: The percentage risk for developing a complication for the patient-specific risk.

**Definitions**

- **Serious Complication**: Includes complications such as infection, heart attack, or kidney failure.

- **Less Serious Complication**: Includes complications such as pain, swelling, or slow healing.

- **Risk Factors**: Includes factors such as age, type of surgery, and pre-existing conditions.

- **Prognosis**: Indicates the likelihood of recovery and potential complications.

**Disclaimer**: The ACS Surgical Risk Calculator estimates the chance of an unfavorable outcome (such as a complication or death) after surgery. The risk is estimated based on the patient's medical history and the type of surgery performed. The estimates are not guarantees and may not be accurate for all patients. The calculator provides an estimate based on the average risk for patients with similar risk factors. Patients should discuss their specific risk factors with their healthcare provider before making any decisions about surgery.
Preoperative Cardiac Evaluation

Stepwise preoperative evaluation

Once the patient’s perioperative risk for MACE has been estimated using one of the preceding methods, this information can be used in one of the following algorithms:
Preoperative evaluation algorithm

**Conditions requiring specialist evaluation:**
- Moderate or greater valvular stenosis/regurgitation
- Cardiac implantable electronic device
- Pulmonary hypertension
- Congenital heart disease
- Severe systemic disease

**Complete RCR or ACS NSQIP cardiac risk calculator.**
High cardiac risk? (RCRI >1 or ACS NSQIP >1%)?

- **Yes**
  - Consult Cardiology or specialist for evaluation

- **No**
  - Assess functional status.

**Assess functional status.**
Can patient complete >4 METS?
- Sexual relations
- Climbing a flight of stairs
- Moderate recreational activities (golf, bowling, dancing)
- Yard work (raking leaves, weeding, pushing power mower)
- Throwing a baseball or football
- Walking up a hill
- Doubles tennis

- **Yes**
  - Optimize preventive care:
    - Hypertension per ACC/AHA guidelines
    - Cholesterol per ACC/AHA guidelines
    - Sleep apnea history or STOP-Bang >3
    - Smoking cessation

- **No**
  - Consider Cardiology consultation for pharmacologic stress testing

**Optimize preventive care:**
- Hypertension per ACC/AHA guidelines
- Cholesterol per ACC/AHA guidelines
- Sleep apnea history or STOP-Bang >3
- Smoking cessation

**Recommend perioperative medication management.**
- Review ACS NSQIP risk estimates with patient.

**Refer to surgery**
STOP-Bang screening tool for obstructive sleep apnea

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<td>T</td>
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<tr>
<td>O</td>
<td>Observed apnea</td>
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<tr>
<td>P</td>
<td>High blood pressure</td>
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<tr>
<td>B</td>
<td>Body mass index &gt;35 kg/m²</td>
</tr>
<tr>
<td>A</td>
<td>Age &gt;50 years</td>
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<tr>
<td>N</td>
<td>Neck circumference &gt;40 cm</td>
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<tr>
<td>G</td>
<td>Male gender</td>
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</table>

Scoring: 0-3 Low risk  
4+ High risk

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**CENTRAL ILLUSTRATION** Stepwise Perioperative Cardiac Risk When Considering Noncardiac Surgery

- Patient
- Needs emergency noncardiac surgery
- Needs elective noncardiac surgery
- Exhibits evidence of acute coronary syndrome
- No evidence of ongoing ACS
- Perioperative risk for MACCE = 1%
- Perioperative risk for MACCE > 3%
  - Functional capacity: Unknown
  - Functional capacity: Poor
  - Functional capacity: Moderate - Good
  - Functional capacity: Excellent

- Proceed to surgery
- Proceed to ACS evaluation
- Consider non-invasive testing if results would change management
- Proceed to surgery
- Proceed to surgery
- Proceed to surgery

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Preoperative Cardiac Evaluation

Preoperative cardiac testing

ACC/AHA recommends against using the following cardiac tests in the following situations (class III):

• 12-lead EKG
  - Routine preoperative EKG is not useful for asymptomatic patients undergoing low risk procedures.

• Assessment of left ventricular (LV) function
  - Routine preoperative evaluation of LV function is not recommended.

(cont.)

Preoperative Cardiac Evaluation

Preoperative cardiac testing (cont.)

ACC/AHA recommends against using the following cardiac tests in the following situations (class III):

• Exercise or pharmacologic stress testing
  - Routine stress testing is not useful for patients at low perioperative risk for MACE
  - Routine stress testing is not useful for patients undergoing low-risk procedures

• Preoperative coronary angiography
  - Routine preoperative coronary angiography is not recommended
Preoperative Cardiac Evaluation

**Procedure timing**

Elective noncardiac surgery should be delayed following:

- **ACS**
  - 2014 ACC/AHA Guidelines: minimum 60 day interval between ACS and elective noncardiac surgery.

- **PCI**
  - Recommended time delay depends on presence and type of stent implanted.

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Supplemental Figure 1: Guideline Recommendations On Timing of Non-cardiac Surgery Post-PCI

- Post-PCI patients referred for elective NCS

  - BMS
    - NCS<30d
    - NCS≥30d
  - DES
    - NCS<3m
    - NCS=3-6m
    - NCS>6m

PCI: percutaneous coronary intervention; NCS: non-cardiac surgery and procedures; BMS: bare-metal stents; DES: drug-eluting stents; d: days; m: months. Figure adapted from 2016 ACC/AHA Guideline Focused Update on Duration of Dual Antithrombotic Therapy in Patients With Coronary Artery Disease. Green color box indicates class III guideline recommendation or harm, yellow indicates IIIb and green indicates class I recommendation.
Preoperative Cardiac Evaluation

Summary

• Estimation of patients’ cardiac risk is a key component of preoperative evaluation prior to elective noncardiac surgery.

• Patients undergoing low-risk procedures usually do not require preoperative cardiac testing.

• Patients at low-risk for MACE (as determined by the RCRI or the ACS NSQIP Surgical Risk Calculator) may proceed with surgery without further cardiac testing.

• Elective noncardiac surgery should be delayed following ACS and/or PCI.

Preoperative Cardiac Evaluation

References


(cont.)


(continues)
