Assessment of Perioperative Cardiac Risk for Non-Cardiac Surgery

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Your Cardiology Consult
Avoid hypoxemia and hypotension!

Levels of Evidence

<table>
<thead>
<tr>
<th>Class</th>
<th>1</th>
<th>2a</th>
<th>2b</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefit</td>
<td>&gt;&gt;&gt; risk</td>
<td>&gt;&gt; risk</td>
<td>≥ risk</td>
<td>≤ risk</td>
</tr>
<tr>
<td>Recommend</td>
<td>“should”</td>
<td>“useful”</td>
<td>“may consider”</td>
<td>no benefit / harmful</td>
</tr>
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The Goal:
to avoid a Major Adverse Cardiac Event (MACE)

Major Adverse Cardiac Events
ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. JACC 2014; 64 (22)

- Myocardial infarction (MI)
- Pulmonary edema
- Complete heart block (CHB)
- Ventricular fibrillation (VF)
  - primary cardiac arrest

Active Cardiac Syndromes (1B)

- Unstable coronary syndromes, recent MI
- Acute decompensated heart failure (ADHF)
- Significant arrhythmias
  - symptomatic bradycardia, Mobitz II, CHB
  - SVT / AF > 100/min, ventricular arrhythmias
- Severe valvular disease
  - symptomatic aortic stenosis, mitral stenosis

Mobitz Type I and II (Second Degree Heart Block)

Mobitz Type I
(Mobitz Type II)

Is it ever obvious that I should just cancel the case?
OK, what if the patient does not meet these criteria?

Assessment of Cardiac Risk

(History, Examination, Resting ECG)

Revised Cardiac Risk Index (RCRI)
1. History of ischemic heart disease (IHD)
2. History of congestive heart failure (CHF)
3. History of cerebrovascular disease (CVA)
4. Insulin-dependent diabetes (IDDM)
5. Chronic kidney disease (CKD) (Scr >2 mg/dL)
6. Suprainguinal surgery
   - vascular, intraperitoneal or intrathoracic

Cardiac Risk of Non-Cardiac Surgery

<table>
<thead>
<tr>
<th>Risk</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>High &gt; 5%</td>
<td>Aortic, major, peripheral vascular surgery</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Abdominal / thoracic surgery, carotid endarterectomy, head &amp; neck, orthopedic, prostate surgery</td>
</tr>
<tr>
<td>Low &lt; 1%</td>
<td>Endoscopic, cataract, breast, superficial, ambulatory surgery</td>
</tr>
</tbody>
</table>

Risk Factors and Perioperative Complications

- High risk surgery
- IHD
- CHF
- CVA
- IDDM
- CKD

Newer Risk Assessment Tools
ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. JACC 2014;64 (22)
American College of Surgeons (ACS) NSQIP Database
www.riskcalculator.facs.org
www.surgicalriskcalculator.com

Enter Patient and Surgical Information

Preoperative Cardiac Risk Index

Risk calculator for patients undergoing noncardiac surgery

- Revised Cardiac Risk Index (RCRI)
- Risk calculator for patients undergoing noncardiac surgery

Enter Patient and Surgical Information

- Risk calculator for patients undergoing noncardiac surgery

Cardiac Preop CRASH 2-16 - March 2, 2016
Assessment of Functional Status and Diagnosis of Ischemic Heart Disease

Estimated Energy Requirements: Metabolic Equivalents (METS)

Estimated Energy Requirements: Metabolic Equivalents (METS)

Duke Activity Status Index (DASII)

Severity of Angina

A Caveat

Absence of Angina ("Silent Ischemia")

Defining Poor Exercise Tolerance

Can you ….

Cardiac Preop CRASH 2-16 - March 2, 2016
Electrocardiogram (ECG)
- Resting ECG: variable risk assessment
  - bradycardia, heart block, arrhythmias
  - previous MI
- Induction of myocardial ischemia: stress
  - increased myocardial O2 demand (VO2) in the face of fixed supply
  - exercise ECG: 33% false negative
  - single vessel CAD: 50% false negative

Limitations of Exercise ECG
- Left bundle branch block (LBBB)
- Ventricular pacing
- Pre-excitation syndromes (WPW)
- ST depression > 1 mm at rest
- Exercise restriction (e.g. PVD)

Stress Testing
- Increased myocardial O2 demand
  - exercise ECG
  - dobutamine stress echo
- Decreased myocardial O2 supply (coronary steal)
  - dipyridamole-thallium scan
  - adenosine-thallium scan

Dobutamine Stress Echo (DSE)
- Simple, reproducible, no radioactive tracer
  - high dose dobutamine + atropine + contrast
- Baseline ejection fraction (EF)
  - decreased EF during DSE:
    - diffuse disease
- New or worsened wall motion abnormality
  - risk increases with low threshold, extent of WMA
- Assess ischemic heart rate threshold

ACC/AHA Algorithm
ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. JACC 2014; 64 (22)

Cardiac Risk of Non-Cardiac Surgery
- Risk
  - High > 5%
    - Aortic, major peripheral vascular surgery
  - Intermediate (1-5%)
    - Abdominal / thoracic surgery, carotid endarterectomy, head & neck, orthopedic, prostate, surgery
  - Low < 1%
    - Endoscopic, cataract, breast, superficial, ambulatory surgery
Cardiac Evaluation and Care Algorithm

ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. JACC 2014;64 (22)

**Step 1**

Emergency Surgery?

If YES: Proceed to OR, with surveillance
If NO, go to Step 2

**Step 2**

Active Cardiac Syndromes?

- Unstable coronary syndromes
- Advanced decompensated heart failure
- Heart block or arrhythmias
- Symptomatic aortic or mitral stenosis

If YES: Evaluate and treat appropriately
If NO, go to Step 3

**Step 3**

Estimate Perioperative Risk

Revised Cardiac Risk Index (RCRI)
American College of Surgery (ACS) Risk Nomograms

If LOW: Proceed to surgery (Step 4)
If HIGH, go to Step 5

**Step 5**

≥ 4 METS without symptoms?

- Climb a flight of stairs
- Run a short distance
- Heavy housework, golf
- Swimming, singles tennis, skiing

If YES: Proceed to surgery
If no, or unknown, go to Step 6

**Step 6**

Will further testing impact decision-making or perioperative care?

If NO: Proceed to surgery or non-invasive treatment
If YES: Pharmacologic stress testing

**Step 7**

Pharmacologic Stress Test

If NORMAL: Proceed to surgery or non-invasive treatment
If ABNORMAL: Coronary revascularization

**Can We Decrease Risk Preoperatively?**

Guideline-Directed Medical Therapy (GDMT)

ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. JACC 2014;64 (22)

- Lifestyle modification
  - diet, exercise, weight loss
- Drug-based therapies
  - aspirin, statin, beta-blockade
- Device-based therapies
  - percutaneous coronary intervention (PCI)
**POISE: PeriOperative ISchema Evaluation Trial**

**Perioperative Beta Blockade**
ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. JACC 2014; 64 (22)

- Continue chronic beta blocker therapy
- RCRI $\geq$ 3: Initiate preoperative beta blockade
  - Do NOT start beta blockade $\leq$ 1 day prep
  - Ideal is 2-7 days before surgery
- RCRI $< 3$: Initiate postoperative beta blockade
- Utilize IV beta blockade as clinically indicated

**Poise-2 Trial**
Devereaux PJ et al, NEJM 2014; 370: 1494-1513

**What Does the Evidence Tell Us?**
One size does not fit all!

**Preoperative Coronary Revascularization**

** PCI and Timing of Surgery**
Kaluza et al. J Amer Coll Cardiol 2000; 35: 1288-94

** PCI and Timing of Surgery**
ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. JACC 2014; 64 (22)

- PCI: dual antiplatelet therapy (DAPT)
  - clopidogrel
  - aspirin
- If continued within 3-5 days preop
  - increased risk of surgical bleeding
- If held more than 3-5 days preop
  - increased risk of stent thrombosis
Summary (What You Should Know)

- MACE
- Active cardiac syndromes
- Revised Cardiac Risk Index
- Estimated energy requirements (METS)
- Non-invasive cardiac testing
- Cardiac risk of non-cardiac surgery
- ACC/AHA Cardiac Care Algorithm
- Implications of PCI
- POISE 1 and 2

Totsiens!