Preoperative Cardiac Evaluation: The New Guidelines

Hugo Quinny Cheng, MD
Division of Hospital Medicine
University of California, San Francisco

Disclosures

• No financial relationships with pharmaceutical industry
• No discussion of unapproved medications
• Non-FDA approved indications for medications to be presented
Preoperative Evaluation Guidelines


1. How do you assess risk for cardiac complications?
2. What should be done with (drug-eluting) stents?
3. What medications can reduce the risk of cardiac complications?

Class 1 Should do it
2a Reasonable to do it
2b Not unreasonable to do it
3 Don’t do it. No, really, just don’t
A 70-y.o. man with progressive weakness due to cervical myelopathy will have spinal decompression & fusion. He has insulin-requiring diabetes and a remote CVA. He uses a walker, needs help with some ADLs.

Medications include aspirin, statin, ACE-inhibitor

Labs noted for Cr = 1.6

70-y.o. with IDDM and remote stroke undergoing cervical spine surgery for weakness. Cr = 1.6

How would you estimate this patient’s risk for cardiac complications?

1. Over 10%
2. Between 5-10%
3. Between 1-5%
4. What? Do I look like a Ouija board?
70-y.o. with IDDM and remote stroke undergoing cervical spine surgery for weakness. Cr = 1.6

Should this patient receive a stress test?

1. Yes
2. No

Revised Cardiac Risk Index

Predictors:
- Ischemic heart disease
- Congestive heart failure
- Diabetes requiring insulin
- Creatinine > 2 mg/dL
- Stroke or TIA
- “High Risk” operation (intraperitoneal, intrathoracic, or suprainguinal vascular)

<table>
<thead>
<tr>
<th># of RCRI</th>
<th>Complications</th>
<th>All</th>
<th>Serious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictors</td>
<td></td>
<td>0.5%</td>
<td>0.4%</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>1.3%</td>
<td>1%</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>4%</td>
<td>2.4%</td>
</tr>
<tr>
<td>≥ 3</td>
<td></td>
<td>9%</td>
<td>5.4%</td>
</tr>
</tbody>
</table>

All: MI, cardiac arrest, complete heart block, *pulmonary edema*

Serious: MI & cardiac arrest

New Cardiac Risk Prediction Tool

Derived from National Surgical Quality Improvement Program (NSQIP) database:
• > 400 K patients in derivation & validation cohorts
• Wide range of operations
• “Complication” = 30-day incidence of MI & cardiac arrest

<table>
<thead>
<tr>
<th>Independent Predictors</th>
<th>1. Type of surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Age</td>
</tr>
<tr>
<td></td>
<td>3. Serum creatinine &gt; 1.5 mg/dL</td>
</tr>
<tr>
<td></td>
<td>4. Functional status (dependency for ADLs)</td>
</tr>
<tr>
<td></td>
<td>5. American Society of Anesth (ASA) class</td>
</tr>
</tbody>
</table>


ASA Class (a brief digression)

American Society of Anesthesiologists Physical Classification
1. Healthy, normal
2. Mild systemic disease
3. Severe systemic disease
4. Severe systemic disease that is a constant threat to life
5. Moribund patient not expected to survive without surgery
70-y.o. with h/o remote MI, stroke, IDDM undergoing cervical spine surgery. Needs help with some ADLs.

**Age** 70
**Creat** > 1.5
**ASA Class** 3
**Dependency:** Partial
**Procedure:** Spine

By clicking on the “Submit” button below, you acknowledge that you have read, understand, and agree to be bound by the terms of the GoMD Online Calculator End Agreement.

**Estimate risk of perioperative myocardial infarction or cardiac arrest.**

| Age | 70 |
| Creatinine | <1.5 mg/dL / 133 µmol/L |
| ASA Class | ASA 3 |

ASA 1 = Normal healthy patient
ASA 2 = Patients with mild systemic disease
ASA 3 = Patients with severe systemic disease
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 the operation

**Preoperative Function:** Partially Dependent
**Procedure:** Spine

www.qxmd.com/calculate-online/cardiology/gupta-perioperative-cardiac-risk
70-y.o. with h/o remote MI, stroke, IDDM undergoing cervical spine surgery. Needs help with some ADLs.

Age 70
Creat > 1.5
ASA Class 3

Dependency: Partial
Procedure: Spine

Estimated risk of perioperative MI or cardiac arrest = **1.3%**

www.qxmd.com/calculate-online/cardiology/gupta-perioperative-cardiac-risk

---

### 2014 ACC/AHA Guideline

**Low Clinical Risk?**
- (< 1% or RCRI = 0 or 1)
  - yes: Go to OR
  - no: Functional Capacity?
    - ≥ 4 METs: Go to OR
    - < 4 METs or ?
      - no: Will stress test result change management?
        - yes: Obtain pharmacologic stress test
        - no: Go to OR or consider alternative approach
    - 2a if > 10 METs
    - 2b if 4-10 METs
70-y.o. with **DES placed 8 months ago** for stable angina, IDDM and remote stroke undergoing cervical spine surgery for progressive weakness.

**When should he have surgery?**

1. Operate now, he can’t wait
2. Wait 12 months after stent placement
3. How about never? Is never good for you?

---

**Surgical Outcomes After Stenting**

**Question:** How do stent type and time until surgery affect risk of cardiac complications?

**Study Design:** Retrospective cohort analysis
- Over 25,000 pts who had noncardiac surgery between 6 weeks & 2 years after BMS or DES placement
- Looked at effect of time since stenting and type of stent on major cardiac complications (MI, all-cause mortality, revascularization)

Time Since Stent Placement

Time of surgery after PCI didn’t matter after first 6 months

2014 ACC/AHA Guidelines for PCI

- Highest thrombosis risk in first 4-6 weeks (BMS or DES)
- Optimal delay in elective surgery after PCI: (Class 1)
  - Balloon angioplasty: 14 days
  - Bare metal stent: 30 days
  - Drug eluting stent: 12 months
- 6 months delay after DES may be acceptable if risk of further delay outweighs risk of thrombosis (Class 2b)

Guidelines for DES

<table>
<thead>
<tr>
<th>Guideline</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC / AHA</td>
<td>Wait 12 months before elective surgery…but maybe 6 months is ok if delay is harmful</td>
</tr>
<tr>
<td>ACCP</td>
<td>• Wait 6 months before surgery • If &lt; 6 months, continue dual therapy</td>
</tr>
<tr>
<td>ESC</td>
<td>• Wait 12 months before surgery • 6 month delay OK for new-generation DES</td>
</tr>
</tbody>
</table>

Perioperative β-blockers

70-y.o. man will have spinal decompression & fusion. Has stable angina, IDDM, and a remote CVA. He uses a walker, needs help with some ADLs.

Would you start a beta-blocker?

1. Yes, it prevents postop MI
2. Maybe, I’m worried about risks
3. No, I’ve stopped doing this
**POISE: Biggest β-blocker Trial**

**Patients:** 8351 pts with s/f major noncardiac surgery  
- CAD, CHF, CVA/TIA, CKD, DM, or high-risk surgery  
- Not already taking β-blocker

<table>
<thead>
<tr>
<th>Time</th>
<th>Dose 1</th>
<th>Dose 2</th>
<th>Dose 3 &amp; Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-4 h</td>
<td>Metoprolol XL 100 mg</td>
<td>Metoprolol XL 100 mg</td>
<td>Metoprolol XL 200 mg</td>
</tr>
<tr>
<td>0-6 h</td>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 h</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Outcome:** 30-day cardiac mortality, nonfatal arrest or MI

Devereaux PJ. Lancet. 2008; 371:1839-1847

---

**POISE: Results**

Metoprolol XL:  
Reduced cardiac events (mostly nonfatal MI)  
**but**  
Increased risk of stroke & total mortality

Devereaux PJ. Lancet. 2008; 371:1839-1847
Patients: 1066 pts at elevated risk of postoperative cardiac complications, undergoing elective non-CV surgery

Treatment: Bisoprolol 2.5 mg daily started at randomization
- dose titrated in hospital by 1.25 - 2.5 mg daily
- maximum 10 mg daily
- target heart rate = 50-70 with SBP >100

Drug started median 34 days prior to surgery

Outcome: 30-day cardiovascular mortality or nonfatal MI


**DECREASE-IV Results**

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Bisoprolol</th>
<th>Hazard Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-Day MI or Cardiac Mortality</td>
<td>6%</td>
<td>2%</td>
<td>0.34</td>
</tr>
</tbody>
</table>

Investigation of possible breaches of academic integrity

Findings regarding DECREASE IV:
- Data & documentation missing
- Inclusion criteria violated
- Outcomes not assessed by claimed protocol
- Cannot vouch for conclusions from this trial

ACC/AHA guideline committee excluded DECREASE study when making recommendations

---

2014 ACC / AHA Guideline for β-blockers

Strong recommendation to continue if… (1)
- Already using β-blocker to treat angina, HTN, arrhythmia

May be reasonable to consider initiation if… (2b)
- High clinical risk (e.g., RCRI score ≥ 3)
- Ischemia seen on preoperative stress test

Uncertain benefit to preoperative initiation if…
- Compelling long-term indication for treatment

Avoid initiation… (3)
- On day of surgery
Stress from surgery

Clonidine

Sympathetic tone

Catecholamines

Beta-blocker

Increased HR & BP

Statin

Plaque rupture

Aspirin

Myocardial ischemia / infarction

Strategies to Prevent Postoperative MI

Beyond Beta-Blockers

For a patient at elevated risk for perioperative cardiac complications, what other drug would you start to reduce this risk?

1. Aspirin
2. Clonidine
3. Statin
4. Nothing…you’ve made me scared & cynical
POISE 2: Clonidine & Aspirin

10,010 patients having noncardiac surgery (2010-13):

- All patients had cardiovascular disease, multiple atherogenic risk factors, or were undergoing high-risk operation
- Randomized to Aspirin, Clonidine, both, or neither (2 x 2 design)
- Primary outcome: Death or MI within 30 days of surgery

Devereaux, PJ et al. NEJM 2014;370:1494-03
Devereaux, PJ et al. NEJM 2014;370:1504-13

POISE 2: Clonidine Study

Before surgery:
- Encouraged to hold usual HTN meds until seen by anesthesiologist
- Study drug given 2-4 hours prior to surgery
- Clonidine 0.2 mg po x 1 & 0.2 mg/day patch or placebo

After surgery:
- Patch removed 72 hours after surgery or at discretion of attending for hypotension or bradycardia

Devereaux, PJ et al. NEJM 2014;370:1504-13
## POISE 2: Clonidine Results

<table>
<thead>
<tr>
<th></th>
<th>Clonidine</th>
<th>Placebo</th>
<th>Hazard Ratio</th>
<th>NNT or NNH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death or MI</td>
<td>7.3%</td>
<td>6.8%</td>
<td>1.08 (NS)</td>
<td></td>
</tr>
<tr>
<td>Non-fatal MI</td>
<td>6.6%</td>
<td>5.9%</td>
<td>1.11 (NS)</td>
<td></td>
</tr>
<tr>
<td>Hypotension</td>
<td>48%</td>
<td>37%</td>
<td>1.32 (p &lt; 0.001)</td>
<td>NNH = 11</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>12%</td>
<td>8.1%</td>
<td>1.49 (p &lt; 0.001)</td>
<td>NNH = 26</td>
</tr>
</tbody>
</table>

Devereaux, PJ et al. NEJM 2014;370:1504-13

## 2014 ACC / AHA Guidelines for Alpha-2 Agonists (Clonidine)

**Class III (no benefit)**

Alpha-2 agonists for prevention of cardiac events are **not recommended** in patients who are undergoing noncardiac surgery
POISE 2: Aspirin Study

Before surgery:
- Stratified into 2 groups: new ASA users (initiation) or chronic ASA users (continuation)
- Continuation group stopped ASA ≥ 3 days prior to OR
- Aspirin 200 mg (or placebo) given right before surgery

After surgery:
- Aspirin or placebo given daily postop x 30 days (initiation) or for 7 days followed by home regimen (continuation)
- Study drug stopped if major or life-threatening bleed

Devereaux, PJ et al. NEJM 2014; 370:1494-03

## POISE 2: Aspirin Results

<table>
<thead>
<tr>
<th></th>
<th>Aspirin</th>
<th>Placebo</th>
<th>Hazard Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death or MI</td>
<td>7.0%</td>
<td>7.1%</td>
<td>0.99 (NS)</td>
</tr>
<tr>
<td>Non-fatal MI</td>
<td>6.2%</td>
<td>6.3%</td>
<td>0.98 (NS)</td>
</tr>
<tr>
<td>Major Bleeding</td>
<td>4.6%</td>
<td>3.8%</td>
<td>1.23 (p = 0.04)</td>
</tr>
</tbody>
</table>

- Surgical site (78%) & GI tract (9%) most common sites
- Outcomes similar for initiation & continuation groups

Devereaux, PJ et al. NEJM 2014; 370:1494-03
2014 ACC / AHA Guidelines for Aspirin

For patients with stents: (Class 1)
- Continue DAPT for first 4-6 weeks after BMS or DES implantation, unless bleeding risk outweighs benefits
- If P2Y12-inhibitor must be stopped, continue ASA if possible

For patients without stents:
- May be reasonable to continue ASA in elective surgery if benefits outweigh risks from bleeding (Class 2b)
- Initiation of ASA does not benefit patients undergoing elective noncardiac surgery (Class 3)

Trial of Statins in Vascular Surgery

497 statin naive patients s/f vascular surgery

Fluvastatin XL 80 mg/day
- Started > 1 month preop
- Continued > 1 mo postop

Placebo

Patients followed for 30 days after surgery

Endpoint: cardiac death or nonfatal MI

Schouten et al. NEJM, 2009; 361:980-9
Trial of Statins in Vascular Surgery

Reduced nonfatal MI

No difference in rates of LFT or CPK elevation


2014 ACC / AHA Guideline for Statins

Definitely continue if… (Class I)
- Patient is already taking statins chronically

Reasonable to initiate if… (Class 2a)
- Patient is having vascular surgery

Consider initiating if… (Class 2b)
- Patient has elevated clinical risk and is undergoing a moderate or high risk operation
Preoperative Cardiac Evaluation

- Use a prediction tool to evaluate cardiac risk; focus on clinically relevant endpoints
- Think about what you’ll do with stress test result before ordering one
- Waiting 12 months to go to OR after DES is standard, but 6 months may be adequate
- Emphasize good general medical care; little if any role for medications (or invasive intervention) solely for prophylaxis

Thank You!

quinny.cheng@ucsf.edu