Clinical Controversies in Perioperative Medicine

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

Cardiac Evaluation: New Guidelines

A 70-y.o. man with progressive weakness due to cervical myelopathy will have spinal decompression & fusion.
Drug-eluting stent placed 8 months ago for stable angina.
He also has insulin-requiring diabetes and a remote CVA.
He uses a walker, needs help with some ADLs.

1. How do you assess his risk for cardiac complications?
2. How long should surgery be delayed due to the stent?
3. Which drugs can reduce his risk of cardiac complications?
70-y.o. with DES placed 8 months ago, IDDM and remote stroke undergoing cervical spine surgery for weakness.

*How would you estimate this patient’s cardiac risk?*

1. I use the Revised Cardiac Risk Index (RCRI), so ~ 10%
2. I use the RCRI, so ~ 5%
3. I use the “NSQIP” prediction tool, so ~ 1%
4. My gut says he’s “high risk”

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**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>
</tr>
</thead>
<tbody>
<tr>
<td>Predictors</td>
<td>All</td>
</tr>
<tr>
<td>0</td>
<td>0.5%</td>
</tr>
<tr>
<td>1</td>
<td>1.3%</td>
</tr>
<tr>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>≥ 3</td>
<td>9%</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

| Independent Predictors | 1. Type of surgery | 2. Age | 3. Serum creatinine > 1.5 mg/dL | 4. Functional status (dependency for ADLs) | 5. American Society of Anesth (ASA) class |


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.

<table>
<thead>
<tr>
<th>Estimate risk of perioperative myocardial infarction or cardiac arrest.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td><strong>Creatinine</strong></td>
</tr>
<tr>
<td><strong>ASA Class</strong></td>
</tr>
<tr>
<td><strong>Preoperative Function</strong></td>
</tr>
<tr>
<td><strong>Procedure</strong></td>
</tr>
</tbody>
</table>

www.qxmd.com/calculate-online/cardiology/gupta-perioperative-cardiac-risk
70-y.o. with h/o remote MI, stroke, IDDM undergoing cervical spine surgery for progressive weakness.

Estimated risk of perioperative myocardial infarction or cardiac arrest: 0.72%

Other findings:
- Excellent performance (AUC = 0.88)

Caveats:
- Didn’t look at all possible variables (e.g., TTE, stress test)

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

### Which Prediction Tool is Better?

<table>
<thead>
<tr>
<th>Tool</th>
<th>Sample size</th>
<th># of hospitals</th>
<th>Currency of data</th>
<th>Screen for MI?</th>
<th>Changes to Practice &amp; Guideline?</th>
</tr>
</thead>
</table>
| RCRI    | ~4000       | 1              | '89 – '94        | CK-MB, ECG       | New ACC/AHA guideline endorses RCRI & NSQIP
|         |             |                |                  |                  | Elevated risk = RCRI ≥ 2 or NSQIP > 1%
|         |             |                |                  |                  | Personal practice: use NSQIP when quantifying risk                                            |
| NSQIP   | ~400,000    | > 200          | '07 – '08        | No               |                                                                                                 |

www.qxmd.com/calculate-online/cardiology/gupta-perioperative-cardiac-risk
70-y.o. with DES placed 8 months ago, IDDM and remote stroke undergoing cervical spine surgery for weakness.

*When should he have surgery?*

1. Operate now, he can’t wait
2. Operate now only if he can continue antiplatelet therapy
3. Wait until 12 months after stent placement

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**Perioperative Cardiac Complications in Patients with Coronary Stents**

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
- Identify risk factors for cardiac complications (all-cause mortality, MI, revascularization)

Effect of Stent Type & Time After Implantation

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

![Graph showing complications over time between PCI and surgery for BMS and DES stents.]


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&lt;br&gt;• If &lt; 6 months, continue dual therapy</td>
</tr>
<tr>
<td>ESC</td>
<td>• Wait 12 months before surgery&lt;br&gt;• 6 month delay OK for new-generation DES</td>
</tr>
</tbody>
</table>
Perioperative $\beta$-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, he should be on one anyway
2. Maybe, I’m worried about the risks
3. No, I’ve stopped doing this entirely

POISE: Biggest $\beta$-blocker Trial

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

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

Devereaux P.J. Lancet. 2008; 371:1839-1847
**POISE: Results**

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

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

**DECREASE-IV**

**Patients:** 1066 pts with estimated 1-6% 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>Treatment</th>
<th>30-Day Postoperative MI or Cardiac Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bisoprolol</td>
<td>2%</td>
</tr>
<tr>
<td>Control</td>
<td>6%</td>
</tr>
<tr>
<td>Hazard Ratio</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

Conclusion of investigation:
- Cannot vouch for reliability of findings or validity of conclusions from this trial
2014 ACC / AHA Guideline for β-blockers

Definite indication to continue if… (I = helps)
- Already using β-blocker to treat angina, HTN, arrhythmia

Reasonable to consider initiation if… (IIb = maybe)
- 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… (III = harms)
- On day of surgery

Beyond Beta-Blockers

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

1. Nothing else
2. Clonidine
3. Aspirin
4. Statin
Strategies to Prevent Postoperative MI

- Stress from surgery
  - Clonidine
- Increased HR & BP
  - Beta-blocker
- Plaque rupture
  - Statin
- Sympathetic tone
  - Catecholamines
- Myocardial ischemia / infarction

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
- Troponin checked daily on postoperative days 0 - 3

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>
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<tr>
<th></th>
<th>Aspirin</th>
<th>Placebo</th>
<th>Hazard Ratio</th>
</tr>
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<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:**
- 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
- Initiation of ASA does not benefit patients undergoing elective noncardiac 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:
1° Endpoint: myocardial ischemia (ECG or ↑ troponin)
2° 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

Schouten et al. NEJM, 2009; 361:980-9
2014 ACC / AHA Guideline for Statins

Definitely continue if… (I = helps)
  • Patient is already taking statins chronically

Reasonable to initiate if… (IIa = likely helps)
  • Patient is having vascular surgery

Consider initiating if… (IIb = might help)
  • 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

• While waiting 12 months to go to OR after DES is standard, 6 months may be adequate

• Emphasize good general medical care; little if any role for medications solely for perioperative prophylaxis
Thank You!

quinny@medicine.ucsf.edu