Postoperative Delirium

Impact

- Increased mortality
- Increased length of stay
- Increased rate of discharge to long term care facilities
- Increased risk of major medical complications
  - MI
  - Pulmonary edema
  - Respiratory failure
  - Pneumonia
**Impact**

- Common cause of postoperative morbidity and mortality
- 50% of all surgeries in the US are done on people over age 65
- Depending on surgery, approximately 10% will develop delirium (3-50%)
- Highest risk in patients having hip fracture surgery and CABG

**Impact**

- Patients who developed delirium had 62% greater risk of mortality within 1 year after discharge and lived an average of 274 days vs 321 days for those without delirium (Leslie DL. Arch Int Med 2005)
- Total direct healthcare costs attributable to delirium about $143 billion annually (Leslie DL. JAGS 2011)

**Delirium**

- An acute change in mental status
- Inattention
- Fluctuating course
- Disorganized thinking

- Cognitive deficits
- Perceptual disturbances
- Psychomotor changes
- Altered sleep wake cycle
- Emotional disturbances
Delirium - Diagnosis

- History, including from informants
- Physical exam
- Appropriate (based on history and physical) laboratory and radiologic evaluation
- ACUTE cognitive change from baseline - a form of “brain failure”

Delirium - Diagnosis

- Hypo-active variant may be overlooked, but associated with poor outcomes

Wong et al. JAMA 2010;304(7):779-786

Emergence Delirium

- Occurs during the transition from anesthesia to wakefulness
- Characterized by agitation and hyperactivity
- Generally short-lived
Case 1

• A 76 year old woman undergoes a right L5 foraminotomy and L5-S1 fusion. Past history significant for “Mixed Connective Tissue Disease”. Medications preoperatively: Prednisone, Plaquinil, Celebrex, Nortriptyline, Coumadin and Ultram.

Case 1

• Postoperatively, she has some mild hypoxemia, thought to be due to narcotics.
• POD #0- no sleep
• AM rounds: easily startled, irritable, restless

What is the best way to determine if this patient has delirium?

1. Request a psychiatry evaluation
2. CAM (Confusion Assessment Method)
3. Folstein mini-mental status exam
4. MRI of her brain
5. MMPI
Case 2

- 66 year old woman with multiple medical problems is admitted for repair of a right hip fracture.
- Medical issues include:
  - Hypertension
  - Untreated OSA
  - Atrial fibrillation, history of RVR
  - CAD
  - CHF
  - History of previous perioperative DVT

- Medications: Lisinopril, digoxin
- BMI=46
- Unknown functional status
- Possible history of bipolar disorder, and bizarre behavior
- On admission, appeared to be oriented, answered most questions appropriately
- Normal vital signs, heart rate 60, atrial fibrillation
- Labs normal, except UA showed 20-50 WBC's

Which of the following puts her at increased risk for postoperative delirium?

1. Morbid obesity
2. Digoxin use
3. Multiple co-morbidities
4. Atrial fibrillation
5. Family history of Alzheimer's disease
Case 2

- The patient undergoes surgery without any intraoperative complications.
- She is extubated in the PACU.
- About 30 minutes after extubation, she becomes confused and combative, requiring multiple doses of haloperidol for agitation.

What is the most appropriate strategy to determine the cause of her delirium?

1. Administer a dose of Narcan
2. Obtain a CT of her head
3. Obtain an ABG
4. Obtain an EEG
5. Obtain a psychiatry consultation

Case 2

Since her episode of agitation in the PACU, she remained confused and combative.
- She was noted to be hypercapnic and was started on non-invasive ventilation, with normalization of her pCO₂.
- Urine culture grew E. coli, which was treated with ciprofloxacin
- Electrolytes, creatinine and ECG were all normal or unchanged
How should her agitation and combativeness be managed?

1. Reorient her frequently and use a sleep enhancement protocol
2. Start benzodiazepines and continue to titrate the dose until she is sedated
3. Use vest restraints and give haloperidol until she is sedated
4. Transfer her to the ICU
5. Start her on donepezil

Best Practices for Postoperative Delirium

* Postoperative Delirium in Older Adults: Best Practice Statement from the American Geriatrics Society

* This article is a supplement to the American Geriatrics Society's Clinical Practice Guidelines for Postoperative Delirium in Older Adults, presented at the American College of Surgeons 100th Annual Clinical Congress, San Francisco, CA, October 2014.
* The American Geriatrics Society Expert Panel on Postoperative Delirium in Older Adults

Best Practices- Diagnosis

* Document preoperative cognitive status in at-risk patients
* Use a validated diagnostic instrument
Risk Factors for Postoperative Delirium

- Age greater than 65 y
- Cognitive impairment
- Severe illness or comorbidity burden
- Hearing or vision impairment
- Current hip fracture
- Presence of infection
- Inadequately controlled pain
- Depression
- Alcohol use
- Sleep deprivation or disturbance
- Renal insufficiency
- Anemia
- Hypoxia or hypercarbia
- Poor nutrition
- Dehydration
- Electrolyte abnormalities (hyper- or hyponatremia)
- Poor functional status
- Immobilization or limited mobility
- Polypharmacy and use of psychotropic medications (benzodiazepines, anticholinergics, antihistamines, antipsychotics)
- Urinary retention or constipation
- Presence of urinary catheter


Best Practice- Risk Factors

- All surgical patients should have a preoperative assessment of delirium risk factors, including:
  - Age >65 (OR 3.03)
  - Chronic cognitive decline or dementia (OR 6.3)
  - Poor vision or hearing (OR 1.7)
  - Severe Illness (OR 3.49)
  - Presence of infection (OR 2.06)
  - Increased risk with 2 or more risk factors or in emergency situation

Best Practice- Intraoperative Measures

- Use of processed EEG monitors (BIS) of anesthetic depth.
- “Lighter” anesthesia may decrease risk of postoperative delirium
- Risks of “light” anesthesia
  - Intraoperative recall
  - Patient movement
  - Excess sympathetic stimulation leading to hypertension and tachycardia
Best Practices- Medication Management to Prevent Delirium

- Avoid medications that induce delirium postoperatively
- Anticholinergics, sedatives, meperidine—double risk of delirium
- Diphenhydramine- OR=2.3
- Benzodiazepines- OR=3.0
- Unless history of alcohol or benzodiazepine abuse
- Multiple medications (>5)

Best Practices- Pharmacologic Prevention of Postoperative Delirium

- Consider regional anesthetic to improve pain control
- Optimize postoperative pain control, with emphasis on use of non-opioids
- Lack of evidence for or against prophylactic use of antipsychotics
- No utility of initiating cholinesterase inhibitors

Best Practices- Nonpharmacologic Prevention and Treatment of Postoperative Delirium

- Formal education programs for health care professionals
- Multi-component intervention programs by an interdisciplinary team
- Prevent delirium
- Improve clinical outcomes
- No evidence for specialized hospital units
Nonpharmacologic Strategies

- Sensory enhancement: glasses, hearing aids
- Mobility enhancements
- Frequent orientation: clocks, calendars
- Pain control: minimize opioids
- Fluids, electrolytes, nutrition
- Sleep enhancement
- Medication simplification
- Pet therapy, aromatherapy

April 2015

Effectiveness of Multicomponent Nonpharmacological Delirium Interventions: A Meta-analysis

- JAMA Intern Med. 2015;175(4):512-520

Multicomponent non-pharmacological delirium prevention interventions are effective in reducing delirium incidence and preventing falls, with a trend toward decreasing length of stay and avoiding institutionalization. ... this meta-analysis supports the use of these interventions to advance acute care for older persons.
Best Practices - Pharmacologic Treatment of Postoperative Delirium

- Use antipsychotics at the lowest effective dose for the shortest duration to treat **severely agitated or distressed** patients, only if other methods have failed.
- **DO NOT USE** if patient is not agitated or threatening harm.
- **DO NOT USE** benzodiazepines except when specifically indicated.

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How should her agitation and combativeness be managed?

1. Reorient her frequently and use a sleep enhancement protocol.
2. Start benzodiazepines and continue to titrate the dose until she is sedated.
3. Use vest restraints and give haloperidol until she is sedated.
4. Transfer her to the ICU.
5. Start her on donepezil.

Take Home Points

- Postoperative delirium is a medical emergency.
- Development of postoperative delirium is associated with increased morbidity and mortality.
- The pathogenesis is unknown, but cholinergic deficiency is thought to play a role.
- CAM is the most reliable tool for diagnosing delirium.
Take Home Points

- Proactive strategies can be used for at-risk patients
- There are pharmacologic and non-pharmacologic interventions for management of delirium
- Delirium makes it difficult to obtain informed consent and to involve patients in their own care

Management of Anticoagulation in the Perioperative Setting

- 33 year old man with a history of recurrent right upper extremity DVT (Paget-Schroetter syndrome)
- No evidence of hypercoagulable state
- Last DVT 8 years ago
- Has chronic sinusitis, requiring surgery
- ENT surgeon asks for recommendations about his anticoagulation

The Case
Current Status- Oral Anticoagulation Therapy (OAC)

- 2.5 million patients on chronic anticoagulation therapy
- 10% will require surgical procedure
- Continue OAC- increased bleeding risk
- Withdrawal of OAC- marked increased risk of VTE and ATE

Peri-procedural Bridging

- Goal: ↓ risk of thromboembolism
- Multiple trials but poor quality of evidence to inform best practices
- Still no evidence based guidelines on “Should I bridge?”
- ACCP Guidelines- Evidence Grade 2C

Bridging algorithm for warfarin

- Effective procedure schedule
- ↓ risk of thromboembolism
- ↓ bleeding risk
- ↓ mortality

Pre-operative
- Place patient on low dose warfarin
- Increase dose to achieve INR 2-3
- Check INR 2 days before procedure
- Check creatinine and electrolytes
- Check warfarin levels 1 day before procedure
- Check INR one day before procedure

Post-operative
- Place patient on low dose warfarin
- Increase dose to achieve INR 2-3
- Check INR 2 days after procedure
- Check creatinine and electrolytes
- Check warfarin levels 1 day after procedure
- Check INR one day after procedure
Risk stratification for perioperative thromboembolism

- Patient risk should drive the need for conservative or aggressive peri-procedural management
- 3 most common reasons for OAC:
  - Mechanical heart valve
  - Non-valvular atrial fibrillation
  - VTE

What about the bleeding risk?

- BLEED-MAP
  - History of previous Bleeding
  - Mechanical heart valve
  - Active cancer
  - Low Platelets (<150,000)
  - Bleeding risk determines postoperative anti-thrombotic strategy

Clinical Consequences

- Fatality rates:
  - Mechanical heart valve thrombosis-15%
  - Embolic stroke (death or major disability)-70%
  - VTE-5-9%
  - Major bleeding-8-10%
Update: NEJM June 22, 2015

“Perioperative Bridging Anticoagulation in Patients with Atrial Fibrillation”

Conclusions

- Strategy of no bridging was noninferior to bridging for the prevention of arterial thromboembolism
- Bridging increased the risk of major and minor bleeding

Table 3. Study Outcomes.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>No Bridging (N = 918)</th>
<th>Bridging (N = 595)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>number of patients (percent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Primary</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arterial thromboembolism</td>
<td>4 (0.4)</td>
<td>3 (0.3)</td>
<td>0.01*</td>
</tr>
<tr>
<td>Stroke</td>
<td>2 (0.2)</td>
<td>3 (0.3)</td>
<td></td>
</tr>
<tr>
<td>Transient ischemic attack</td>
<td>2 (0.2)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Systemic embolism</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Major bleeding</td>
<td>12 (1.3)</td>
<td>29 (3.2)</td>
<td>0.005†</td>
</tr>
<tr>
<td><strong>Secondary</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>5 (0.5)</td>
<td>4 (0.4)</td>
<td>0.88†</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>7 (0.8)</td>
<td>14 (1.6)</td>
<td>0.10†</td>
</tr>
<tr>
<td>Deep-vein thrombosis</td>
<td>0</td>
<td>1 (0.1)</td>
<td>0.25†</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>0</td>
<td>1 (0.1)</td>
<td>0.25†</td>
</tr>
<tr>
<td>Minor bleeding</td>
<td>110 (12.0)</td>
<td>187 (20.9)</td>
<td>&lt;0.001†</td>
</tr>
</tbody>
</table>

* P value for noninferiority.
† P value for superiority.
Caveats

- Few patients with CHADS score 5-6
- Major surgical procedures with higher rates of arterial thromboembolism and bleeding were not represented
- Cannot be applied to patients with mechanical heart valves

Patients Who Do NOT Need Bridging (Evidence Grade 2C)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| Atrial fibrillation | CHADS 0-2  
No stroke or TIA           |
| VTE           | Single VTE > 12 moths ago  
No other risk factors  |
| MHV           | Aortic bileaflet  
No atrial fibrillation or other risks  |

Preoperative Bridging
### Risk Category

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Mechanical heart valve</th>
<th>Atrial fibrillation</th>
<th>VTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (&gt;10%/y ATE risk or &gt;10%/m VTE risk)</td>
<td>Any mechanical mitral valve</td>
<td>CHADS2 score 3-4</td>
<td>Recurrent (&gt;3 months) VTE</td>
</tr>
<tr>
<td></td>
<td>Caged ball or tilting disk in aortic or mitral position</td>
<td>Recurrent (3-6) months TIA</td>
<td>Severe thrombophilia</td>
</tr>
<tr>
<td>Intermediate risk (3-10%/y ATE or &gt;5%/m VTE)</td>
<td>Recent (&lt;6 months) stroke or TIA</td>
<td>RHEUMATIC valvular heart disease</td>
<td>APL or multiple thrombophilias</td>
</tr>
<tr>
<td></td>
<td>Recent (&lt;3 months) VTE</td>
<td>Bileaflet AVR w/ stroke risk factors</td>
<td>CHADS2 score 4-5, recent VTE</td>
</tr>
<tr>
<td>Low (&lt;4%/y ATE or &lt;2%/m risk VTE)</td>
<td>Bileaflet AVR w/o major risk factors for stroke</td>
<td>CHADS2 score 0-2 and no prior stroke</td>
<td>VTE &lt;12 months ago</td>
</tr>
</tbody>
</table>

### Postoperative Bridging

- **Thromboembolic risk**
  - High
  - Intermediate
  - Low: Category E

- **Bridging since adequate hemostasis**
  - Bridging
  - No bridging
  - No bridging
  - No bridging

### Peri-procedural Bridging in Patients with High Bleeding Risk

- **Warfarin when safe**
  - Oral bridging
  - Low-dose bridging (Prophylaxis dose)
  - Full-dose bridging

- **Assuming adequate postoperative hemostasis**
  - 12-24 hours post procedure
  - 48-72 hours post procedure
Target Specific Oral Anticoagulants (TSOAC)

- How long before surgery to stop depends on the bleeding risk of the procedure and the patient’s renal function
- Perioperative bridging is generally unnecessary for patients on TSOAC’s
- Routine coagulation assays do not reliably reflect degree of anticoagulation
- Rapid onset of action, should only be restarted postoperatively once hemostasis has been confirmed.

Bridging algorithm for dabigatran.

Aspirin

- Stop 7-10 days in advance of surgery for patients at low risk of cardiovascular events.
- Patients at high risk of cardiovascular events or patients receiving ASA for secondary prevention: continue ASA instead of stopping 7-10 days in advance (2C)
Stents

- Defer elective surgery for 6 weeks after bare metal stents and 6 months after drug-eluting stent. (1C)
- If surgery required within 6 weeks after BMS or 6 months after DES, continue dual antiplatelet therapy (2C)

Preoperative Cardiac Risk Assessment
60 year old man presents for preoperative assessment prior to a right total hip arthroplasty.

History of CAD
- 2006- chest pain with exertion, found to have 3-vessel CAD, CABG x 3
- 2010- recurrent chest pain, occluded native vessel, drug-eluting stent placed
- No further cardiac symptoms

Functional status: Walks on treadmill several times per week, for 30 minutes without symptoms
- Never smoker

History of:
- Type 2 diabetes
- Hypertension
- Hyperlipidemia
- GERD
- BPH
- PTSD
**Case**

- **Medications:**
  - Lantus insulin
  - Metformin
  - ASA 325 mg
  - Atorvastatin 40 mg
  - Metoprolol
  - Lisinopril 2.5 mg
  - Omeprazole
  - Multiple medications for PTSD

**Case**

- **Exam:**
  - BP 108/60, HR 68
  - Normal heart and lung exam

- **Labs:**
  - HgbA1c 6.2
  - Normal CBC, electrolytes and creatinine
  - ECG: Sinus rhythm with intra-ventricular conduction delay, unchanged since 2010

**What is this patient’s risk of major adverse cardiac events (MACE)?**

1. High
2. Low
3. Needs more tests
4. I don’t know
“A validated risk-prediction tool can be useful in predicting the risk of perioperative MACE in patients undergoing non-cardiac surgery.” (Class IIa recommendation, level of evidence B)
**Lee Revised Cardiac Risk Index**

- High risk surgery
- Vascular
- Open abdominal
- Thoracic
- CAD
- CHF
- Cerebrovascular disease
- Creatinine > 2
- Diabetes requiring insulin

<table>
<thead>
<tr>
<th>Points</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.4%</td>
</tr>
<tr>
<td>1</td>
<td>0.9%</td>
</tr>
<tr>
<td>2</td>
<td>6.6%</td>
</tr>
<tr>
<td>3+</td>
<td>11%</td>
</tr>
</tbody>
</table>

Lee et al. Circulation 1999, 100:1043-9

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**Perioperative Cardiac Risk Calculator**

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**Our patient’s RCRI score**

- 2
- CAD
- Diabetes on insulin
Gupta Cardiac Risk Calculator

- First new cardiac risk assessment since 1999
- Primary endpoint MI or cardiac arrest
- Huge cohort of 400,000 patients
- 180 different hospitals
- Wide range of procedures
- Gives a patient-specific risk in real time
- Surgery specific

Perioperative Cardiac Risk Calculator

<table>
<thead>
<tr>
<th>Year</th>
<th>Gupta</th>
<th>Lee RCRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort size</td>
<td>400,000</td>
<td>4315</td>
</tr>
<tr>
<td>C statistic</td>
<td>0.874</td>
<td>0.765</td>
</tr>
<tr>
<td>Surgery specific</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

Gupta et al. Circulation, 2011;124:382-8
5 factors contributed to risk of MI/CA

- Age
- Creatinine
- ASA class
- Procedure type
- Preoperative functional status
  - Dependent
  - Partially dependent
  - Independent

ASA Class

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Normal, healthy patient</td>
</tr>
<tr>
<td>Class II</td>
<td>Patient with mild systemic disease—a mild to moderate systemic disorder related to the condition to be treated or to some other, unrelated process</td>
</tr>
<tr>
<td>Class III</td>
<td>Patient with severe systemic disease that limits activity but is not incapacitating</td>
</tr>
<tr>
<td>Class IV</td>
<td>Patient with incapacitating systemic disease that is life threatening</td>
</tr>
<tr>
<td>Class V</td>
<td>Moribund patient not expected to survive 24 hr without an operation</td>
</tr>
</tbody>
</table>

Where Can I Find the Calculator?

- Qx Calculate
  - [http://www.qxmd.com](http://www.qxmd.com)
  - Free app for phone
- [http://www.surgicalriskcalculator.com](http://www.surgicalriskcalculator.com)
  - Free download for desktop
  - Request for password accepts anything
Bottom Line – Gupta Calculator

- More accurate than RCRI
- Surgery specific
- Point of care

- Fewer than 1% of patients develop MI/CA but 61% of these die within 30 days of surgery
- This may underestimate the cardiac risk, while the RCRI may overestimate the cardiac risk.

Our Patient
RCRI is not surgery specific and may overestimate risk of some procedures

Gupta risk calculator:
- ASA classification has poor inter-rater reliability
- Need to know their definitions of functional dependence
- Only looked at MI with large troponin bump and symptoms, and cardiac arrest, as endpoints
What testing does this patient need before his surgical procedure?

1. Echocardiogram
2. Exercise stress test
3. Pharmacologic vasodilator stress test
4. No further testing
5. Cardiology consult

ACC/AHA Guidelines

* “For patients with low risk of perioperative MACE, further testing is not recommended before the planned operation.” (Class III: No Benefit, level of evidence B)
Functional Capacity
Estimated Energy Requirements for Various Activities

1 MET
- Can you take care of yourself? Eat, dress, or use the toilet?
- Walk indoors around the house?

2 METs
- Walk a block or two on level ground at 2 to 3 mph or 3.2 to 4.8 km per h?

3 METs
- Do light work around the house like dusting or washing dishes?

4 METs
- Climb a flight of stairs or walk up a hill?
- Walk on level ground at 4 mph or 6.4 km per hr or run a short distance?
- Do heavy work around the house like scrubbing floors or lifting or moving heavy furniture?

10+ METs
- Participate in moderate recreational activities like golf, bowling, dancing?
- Participate in strenuous sports like swimming, singles tennis, football, basketball, or skiing?

Should this patient have postoperative surveillance monitoring of troponin?

1. Yes
2. No
3. Only if he develops symptoms
4. Ask his profession. If he is a lawyer or cardiologist, then yes.
1. Measurement of troponin levels is recommended in the setting of signs or symptoms suggestive of myocardial ischemia. (Level of evidence A)

2. Obtaining an ECG is recommended in the setting of signs or symptoms suggestive of myocardial ischemia, MI or arrhythmia. (Level of evidence B)

ACC/AHA Guidelines: Perioperative Surveillance

Class IIb

1. The usefulness of postoperative screening with troponin levels in patients at high risk for perioperative MI, but without signs or symptoms suggestive of myocardial ischemia or MI, is uncertain in the absence of established risks and benefits of a defined management strategy. (Level of evidence B)

ACC/AHA Guidelines: Perioperative Surveillance

Class IIb

2. The usefulness of postoperative screening with ECGs levels in patients at high risk for perioperative MI, but without signs or symptoms suggestive of myocardial ischemia or MI, is uncertain in the absence of established risks and benefits of a defined management strategy. (Level of evidence B)
Class III: No benefit
1. Routine postoperative screening with troponin levels in unselected patients without signs or symptoms suggestive of myocardial ischemia or MI is not useful for guiding perioperative management. (Level of evidence B)

Cohort of the POISE trial
- 8351 patients with increased cardiac risk from 190 hospitals in 23 countries
- All patients received ECG days 0, 1, 2, 3, 30
- All patients received cardiac biomarker of choice on days 0, 1, 2, 3

Background:
- 8351 patients enrolled from 190 hospitals in 23 countries
- All patients received ECG days 0, 1, 2, 3, 30
- All patients received cardiac biomarker of choice on days 0, 1, 2, 3
Routine Post-Op Troponin

- Strict definition of MI: elevated cardiac biomarker **AND** 1 or more of the following
- Typical ischemic symptoms
- New ischemic changes on ECG
- Coronary intervention
- New evidence of MI on cardiac imaging
- Autopsy diagnosis

Important Findings

- 5.0% of patients had MI
- Most (65.3%) were asymptomatic
- Most (74.1%) occurred within 48 hours of surgery
- Many (35.2%) were not discharged on ASA
- 30 day mortality 5.27 times higher in the MI group (11.6% vs 2.2%)

Routine Post-Op Troponin

Important Findings

- No difference in mortality if symptomatic MI or asymptomatic MI
**What Does That Mean?**
- We are missing at least 65% of all post-op MI’s
- These unidentified patients are at increased risk of death
- We are missing the opportunity to potentially intervene on the outcome

**So What’s The Downside?**
- No EBM regarding outcome interventions
- What to do with isolated elevated troponin without MI?
  - 415 patients with MI
  - 697 patients with isolated cardiac biomarker
  - Highest quartile had increased mortality

**Bottom Line**
- Check routine post-op troponin day 0, 1, 2, 3 if:
  - Cardiac risk greater than 6% **AND**
  - It would change my management
  - If troponin positive, look for MI
  - If just isolated troponin, no change in management
• American Geriatrics Society Expert Panel on Postoperative Delirium in Older Adults. Postoperative Delirium in Older Adults: Best Practice Statement from the American Geriatrics Society. J Am Coll Surg 2015; 220; 36–148.e1


References


References

Questions?

- Thank you
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