Michael Maniaci, M.D.
Assistant Professor of Medicine

Maniaci.michael@mayo.edu
Updates in Perioperative Medicine
A case-based approach

2nd Annual Inpatient Medicine for NPs & Pas: Hospital Care from Admission to Discharge

Wednesday-Saturday, October 19-22, 2016
Sawgrass Marriott Hotel • Ponte Vedra Beach, Florida
Disclosures

• Financial disclosures
  • None

• Off label usage for medications
  • Heparin for bridging therapy
Objectives

• Define the current guidelines on cardiac risk in non-cardiac surgery
• Identify the usefulness of cardiac markers in perioperative care
• Understand the role of perioperative pulmonary assessment
• Identify the current guidelines in perioperative medication management
• Review current guidelines for stress-dose steroid use
• Review the current literature on the use and discontinuation of DAPT and NOACs in the perioperative period
The case

- A 68 year old gentleman present to the ED after a fall
  - Past Medical History:
    - HTN, Hyperlipidemia, IDDM, PVD, tobacco use, COPD
    - Stage 3 CKD due to HTN + IDDM (creatinine 2.5 baseline)
    - TIA 4 years ago
    - Baseline can walk up 2 fights of stairs without trouble
    - No reports of angina or DOE and is quite active
  - The patient is admitted by orthopedics for hip replacement
  - Surgery is scheduled in 8 hours, your team asked to “clear”
• Your are reviewing the case with the Orthopedics team and they ask you if Cardiology should be consulted to consider coronary evaluation prior to going to surgery. You respond:

A. Yes, this patient has significant cardiac risk factors and should be evaluated with a coronary angiogram

B. Yes, as coronary revascularization in non-symptomatic patients prior to urgent surgery has been proven effective

C. No, this patient has minimal risk factors so no further workup is needed

D. No, although this patient has an elevated risk of postoperative cardiac events, he has good functional status and the surgery is one that should not be delayed (urgent)

E. Yes, lets call them out of spite, they always dump on us
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2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation (non-cardiac surgery)

If MI is present:
Wait 60 days regardless of revascularization

Risk stratification options

• Revised Cardiac Risk Index (RCRI)
• National Surgical Quality Improvement Program (NSQIP)
• The NSQIP-derived myocardial infarction and cardiac arrest calculator (Gupta Calculator)
RCRI

REVISED CARDIAC RISK INDEX

**Independent Predictors of Post Operative cardiac complications**
1. Intrathoracic, intraperitoneal, or infrainguinal vascular surgery
2. History of ischemic heart disease
3. History of congestive heart failure
4. Insulin treatment for diabetes mellitus
5. Serum creatinine level > 2mg/dL
6. History of cerebrovascular disease

<table>
<thead>
<tr>
<th>Scoring (no. of predictors present)</th>
<th>Risk of major cardiac complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.4%</td>
</tr>
<tr>
<td>One</td>
<td>0.9%</td>
</tr>
<tr>
<td>Two</td>
<td>7.0%</td>
</tr>
<tr>
<td>More than two</td>
<td>11%</td>
</tr>
</tbody>
</table>

Adapted from Lee T et al. Derivation and prospective evaluation of a simple index for prediction of cardiac risk of major noncardiac surgery. Circulation. 199;100:1043-1049
Gupta calculator

Estimate risk of perioperative myocardial infarction or cardiac arrest.

Age

Creatinine
<1.5 mg/dL / 133 µmol/L

ASA Class
ASA 1
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
Totally Independent

Procedure
Anorectal

Submit
2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation (non-cardiac surgery)

Adapted from Fleisher LA et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation. J Am Coll Cardiol. 2014;64(22):e77-e137
How the heck to I figure out METS?

DUKE ACTIVITY STATUS INDEX

1. Can you take care of yourself (eating, dressing, bathing or using the toilet)?
   Yes: 2.75  No: 0
2. Can you walk indoors, such as around your house?
   Yes: 1.75  No: 0
3. Can you walk a block or two on level ground?
   Yes: 2.75  No: 0
4. Can you climb a flight of stairs or walk up a hill?
   Yes: 5.50  No: 0
5. Can you run a short distance?
   Yes: 8.00  No: 0
6. Can you do light work around the house, such as dusting or washing dishes?
   Yes: 2.70  No: 0
7. Can you do moderate work around the house, such as vacuuming, sweeping floors or carrying in groceries?
   Yes: 3.50  No: 0
8. Can you do heavy work around the house, such as scrubbing floors or lifting and moving heavy furniture?
   Yes: 8.00  No: 0
9. Can you do yard work, such as raking leaves, weeding or pushing a power mower?
   Yes: 4.50  No: 0
10. Can you have sexual relations?
    Yes: 5.25  No: 0
11. Can you participate in moderate recreational activities, such as golf, bowling, dancing, doubles tennis or throwing a baseball or football?
    Yes: 6.00  No: 0
12. Can you participate in strenuous sports, such as swimming, singles tennis, football, basketball or skiing?
    Yes: 7.50  No: 0

1. Add up DASI scores
2. VO2peak = (0.43xDASI) + 9.6
3. VO2peak / 3.5 = METS

Online calculators available:
- www.iheartmyheart.com
2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation (non-cardiac surgery)

Key points

• Don’t delay emergent surgeries for preoperative cardiac assessment
• There are risk calculators out there; use them!
• Low risk (<1%) vs high risk (>1%)
• Good functional status goes to surgery (> 4 METs)
• Only order stress testing if it would impact decision making or perioperative care
• The orthopedic resident remembers a recent lecture about cardiac markers then asks you if preoperative and postoperative troponins should be checked. You respond:

A. No, this guy has no symptoms, why would we check this?

B. Just check a preoperative troponin. That’s the one with good data on prognostic value

C. Just check a postoperative troponin. That’s the one with good data on prognostic value

D. Yes, check both a preoperative and postoperative troponin as both have been proven to have well proven prognostic implications in non-cardiac surgery

E. I’m a hospitalist, you’re a surgeon, lets not play this game of wits…
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Background

- Cohort of the POISE trial (8351 patients)
- 415 patients suffered perioperative MI (5%)
- 74% occurred within 48 hours after surgery
- 30 day mortality was 5.27x (11.6% vs 2.2%)
- 65% of these MI’s were asymptomatic
So what do we do?

- VISION trial (2012) and the VISION cohort (2014)
- ~15,000 patients had postoperative troponins checked
- Primary outcome was 30-day mortality
- Those with elevated troponin T levels of > 0.03ng/mL had a significant (10-fold) increase in 30-day mortality
- Mortality increase irregardless of symptoms
- 84% did not experience symptoms

Botto et al. Myocardial injury after noncardiac surgery. Anesthesiology. 2014 Mar;120(3):564-78
So what? Can we even doing anything postoperatively and would it even help?

- 667 major vascular surgery patients
- 66 patients had troponin elevation > 0.15ng/mL
- 43 were given “intensive therapy”
  - Antiplatelet therapy
  - Beta-blockers
  - Statin
  - ACE inhibitor
- Elevated troponin levels who did not receive treatment intensification:
  - Less likely to survive 1 year without experiencing a major cardiac event than those who did receive treatment intensification (HR, 2.80 [CI, 1.05 to 24.20])

For those who like pictures:

Figure 4. Major cardiac event-free survival of the 3 groups of patients: perioperative myocardial infarction with intensification (PMI with IT), perioperative MI without intensification (PMI without IT) and no perioperative MI. Patients not receiving treatment intensification were at higher risk for a major cardiac event (hazard ratio, 2.80; 95% confidence interval 1.05–24.2; P = 0.04) compared with patients who did receive treatment intensification. When patients with an elevated postoperative troponin received intensive postoperative therapy their life expectancy was similar to those who did not have a postoperative elevation (P = 0.45).

Key points

- Preoperative troponins on asymptomatic patients do not seem to be helpful
- The majority of postoperative MIs are asymptomatic
- The patients have high mortality rates
- Post operative troponins in high risk patients may help screen and catch this asymptomatic MIs
- Emerging data that intervention may benefit
- Recommend to check in high risk patients
You run into the orthopedic resident at lunch. He tells you that he is impressed with your cardiac risk assessment and asks about pulmonary risk assessment as the patient does have COPD. You respond:

A. There is no valid way of calculating pulmonary risk
B. Yes, there is a new prediction tool that can help us
C. The patient has COPD so the risk is high no matter what
D. Obstructive sleep apnea is the only process found to increase the pulmonary risk of non-cardiac surgery
E. Sounds like something you should look up after you’re done with lunch
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PERISCOPE Trial

- 5,099 surgical patients in 63 European hospitals
- Risk scoring:
  - Low risk
    - < 26 points
    - 3.39% PPC
  - Intermediate risk
    - 26-44 points
    - 12.98% PPC
  - High risk
    - > 45 points
    - 38.01% PPC

Key points

• This is the first major pulmonary risk index that has been validated

• Postoperative Pulmonary Complications (PPCs) include respiratory failure, pulmonary infection, pleural effusion, atelectasis, pneumothorax, bronchospasm, and aspiration pneumonitis

• These rate were increased as the score rose
• As you try to walk away from the lunch encounter, the orthopedic resident states that the patient has a RCRI of 3 (IDDM, Cr > 2, TIA Hx) and should be started immediately on a pre-operative beta blocker. You respond:

A. No, surgery is in a few hours and we don’t have time to titrate properly
B. No, perioperative beta blockade has not been proven to reduce postoperative MI and mortality
C. Yes, the patient is at high risk and beta blockade should be started regardless of surgical timeframe
D. Yes, but only in the form of an IV esmolol drip titrated to a HR 60-70bpm as the POISE trial showed this to be optimum
E. Beta blocker, schmada blocker, please just let me eat my lunch
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Perioperative Beta Blockade in Noncardiac Surgery: 2014 ACC/AHA Guidelines

- A review of 17 studies (16 RCT with 12,043 patients + 1 cohort with 348 patients)
- All trial but 1 initiated beta blockade within 24 hours or less prior to surgery
- Beta blockade decreased nonfatal MI (RR 0.69)
- Increase in:
  - Nonfatal stroke (RR 1.76)
  - Hypotension (RR 1.47)
  - Bradycardia (RR 2.61)
  - All-cause mortality rate in all but 1 trial (RR 1.30)

Key points

• Starting beta blockade within 1 day of noncardiac surgery was associated with fewer nonfatal MIs

• This was at a cost of increased hypotension, bradycardia, stroke and death

• Large doses of beta blockers used in these trial

• If starting a beta-blocker preoperatively, it should be done > 2 days prior to surgery

• Long term beta blockade should be continued
• The floor nurse reports that the last preoperative blood pressure check showed a SBP of 150. The patient has already taking his daily BP meds and is not on ASA at home. The mentions that a Google search told her that starting ASA and giving oral clonidine help reduce post-operative mortality and improve outcomes. You respond:

A. Great idea, we know lower blood pressure and aspirin are great for essential HTN, so preoperative protection with them is wise

B. Yes start them now, even if the benefit is minimal there are no contraindications in this time period

C. No, do not start them. Although these medications pose no harm to our patient there is no evidence that they will help in this

D. No, do not start them. Not only has preoperative initiation not been proven to improve outcomes, they have also shown to cause harm

E. Don’t confuse your Google search with my medical education
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POISE-2 Cohort looking at Aspirin

- > 10,000 noncardiac surgery patients
- Looked at both ASA continuation and initiation
- Primary outcome was death or nonfatal MI
- No difference between ASA and placebo (7% vs 7.1%)
- No differences in rates of MI, VTE, or stroke
- Major bleeding rates higher (4.6% vs 3.8%)

POISE-2 Cohort looking at Clonidine

• > 10,000 noncardiac surgery patients
• Looked at both ASA continuation and initiation
• Primary outcome was death or nonfatal MI
• No difference between clonidine and placebo in the outcome of death or MI (7.3% vs 6.8%)
• Clinically significant hypotension, bradycardia, and nonfatal cardiac arrest was seen in the clonidine arm
• No difference in stroke rates
Key points

• Aspirin started before surgery and continued perioperatively did not decrease the rate of death or MI but did increase the risk of major bleeding

• Clonidine did not decrease the rate of death or MI but did increase the risk of bradycardia and hypotension

• Risk vs benefits of holding ASA must be made on an individual basis

• Clonidine should not be started in the perioperative period but patients already on it should not stop its use abruptly
As you are trying to digest your meal, the anesthesia team calls and asks to hold the patient’s captopril the day of surgery. The orthopedic resident pops up besides you and asks you if there is a universal guideline for this request. You respond:

A. We always continue ACE Inhibitors in the perioperative setting unless the patient has acute kidney injury
B. We always stop ACE Inhibitors in the perioperative setting due to the certainty of hypotension during surgery
C. There are no universal guidelines, we must judge each case on patient risk factors and recent studies show that you can safely hold ACE inhibitors for a short time if necessary without harm to the patient
D. In patients undergoing surgery, ACE inhibitor use was not associated with in-hospital complications or increased 30-day mortality
E. Man, both C and D sound good…can I pick both?
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Background: Which meds do we usually hold?

- **Diuretics**
  - Usually held on the morning of surgery because of the potential for hypovolemia and electrolyte depletion

- **ACE Inhibitors and ARBs**
  - Intensify the hypotensive effects of anesthesia induction.
  - Angiotensin II cannot compensate for venous pooling of blood, resulting in diminished cardiac output and arterial hypotension.
So should we hold them?

- Cleveland Clinic study of 18,000 patients
- There was more incidence of intraoperative hypotension
- Did not find an association between use of ACE inhibitors and intraoperative or postoperative upper-airway complications
- ACE inhibitor use was not associated with in-hospital complications or increased 30-day mortality

So we should always give them?

- Recent look at 526 patients receiving ambulatory surgery
- ½ continued theirs ACE, the other ½ discontinued it
- Primary outcome was hypertension at the time of surgery
- No significant difference found in preoperative SBP
- No unplanned hospital admissions or adverse clinical outcomes seen in either group

Twersky RS et al. The risk of hypertension after preoperative discontinuation of ACE inhibitors or ARBs in ambulatory and same day admission patients. Anesth Analg. 2014;118:938-944
Key points

• There are no universally accepted guidelines

• You must judge each case on patient risk factors

• Recent studies show that you can safely hold ACE inhibitors for a short time if necessary without harm to the patient

• In patients undergoing surgery, ACE inhibitor use was not associated with in-hospital complications or increased 30-day mortality
• You get called by the floor nurse that the patient’s family is inquiring about eliminating non-necessary oral meds in the preoperative period. He asks if he should hold the patient’s simvastatin. You respond:

A. Sure, there is no postoperative benefit with statins
B. Heck no, preoperative statin use is associated with lower cardiovascular events, all-cause mortality, myocardial injury, and stroke occurrence
C. Yes stop it, preoperative statin use is associated with high rates of postoperative hepatitis
D. Both A and C are true
E. Families are like fudge…mostly sweet with a few nuts
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Another look at the VISION study

- Matched 2845 statin users with 4492 controls
- The preoperative use of statins was associated with a lower risk of:
  - All-cause mortality (RR 0.58)
  - Cardiovascular mortality (RR 0.42)
  - Myocardial injury after noncardiac surgery (RR 0.86)
- No significant differences in the risk of MI or stroke

Berwanger O. et al. Association between pre-operative statin use and major cardiovascular complications among the patients undergoing non-cardiac surgery: the VISION study. Eur Heart J. 2015 Sep 1. pii: ehv456
Key points

• Statins continue to be the magic drug
• Patients on statins requiring noncardiac surgery should continue them
• Consider placing patients with multiple cardiac risk factors on statin therapy (trials in progress)
• The orthopedic resident later informs you that he discovered that our patient takes prednisone 5mg daily for resolving PMR. He has set up a 48 hour stress dose steroid bolus and taper, and he wants you to sign off on the orders. You respond:

A. Sounds good to me, all patients on steroids are at high risk for postoperative adrenal crisis

B. All patients on steroids require a cosyntropin stimulation test prior to the decision being made

C. Recent studies show that most patients do not require stress dose steroids in the perioperative setting unless unexplained hypotension is seen

D. Continuing his home dose of prednisone will probably be sufficient

E. Both C and D are true
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D. Continuing his home dose of prednisone will probably be sufficient
E. Both C and D are true
Background

• Cortisone was developed in 1949

• In 1952 Fraser et al described a 34-year old gentleman with RA who had hemodynamic collapse during a hip arthroplasty

• The patient had used cortisone for 8 months and had stopped it 2 days prior to surgery: the first case of exogenous steroid induced adrenal insufficiency

• Even though this was over 60 years ago, little progress has been made on recommendations

A recent review – Key Points

• Studies include a retrospective review, small cohorts, two small prospective trials, one primate trial, and several other systemic reviews

• Compiling this evidence, patients on long term exogenous steroids likely do not require high-dose perioperative steroids

• Maintenance dosing should be continued

• Consider secondary adrenal insufficiency if the patients experiences unexplained hypotension

• Three minutes prior to your shift ending, you get a call from the Orthopedic resident. He just admitted a patient with a history of atrial fibrillation on rivaroxaban who needs an urgent surgery (within 72 hours). He asks you what to do with the anticoagulation. You respond:

A. Hold rivaroxaban for 5 days, then we’ll talk
B. Just hold rivaroxaban for 48 hours, then you’re fine
C. Stop rivaroxaban today, start bridging with enoxaparin tonight, and you will be fine in 48 hours
D. How long we hold the medication and whether we bridge really all depend on multiple patient factors
E. Tell him he has the wrong number, leave the hospital as quickly and quietly as possible
• Three minutes prior to your shift ending, you get a call from the Orthopedic resident. He just admitted a patient with a history of atrial fibrillation on rivaroxaban who needs a wrist surgery. He asks you what to do with the anticoagulation. You respond:

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First question: When to stop?

<table>
<thead>
<tr>
<th>Preoperative interruption</th>
<th>Dabigatran</th>
<th>Rivaroxaban - Apixaban</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low Bleeding Risk</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CrCl ≥ 80 mL/min</td>
<td>≥ 24h</td>
<td>≥ 24h</td>
</tr>
<tr>
<td>CrCl 50-80 mL/min</td>
<td>≥ 36h</td>
<td>≥ 48h</td>
</tr>
<tr>
<td>CrCl 30-50 mL/min</td>
<td>≥ 48h</td>
<td>≥ 48-72h</td>
</tr>
<tr>
<td>CrCl 15-30 mL/min</td>
<td>NA</td>
<td>≥ 72-96h</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>≥ 96h</td>
</tr>
<tr>
<td></td>
<td>≥ 24h</td>
<td>≥ 72-96h</td>
</tr>
<tr>
<td></td>
<td>≥ 36</td>
<td>≥ 96h</td>
</tr>
</tbody>
</table>

Drug interaction - (e.g. Aspirin, Anti-Platelet Agents, Amicdarone, Phenotiazin)

=> add 12h
Mayo Clinic Proposed Classification of Procedure-Related Bleeding Risk

• High Risk Procedures
  • Neurosurgery – intracranial or spinal surgery
  • Neuraxial or deep plexus peripheral block
  • Urological – TURP, cystectomy, prostate
  • Kidney, liver or spleen surgery; kidney biopsy
  • Cardiovascular surgery
  • Intestinal surgery, bowel resection
  • Colon polypectomy
  • Cancer surgery
  • Reconstructive plastic surgery
  • Any other major operation (duration > 45 min)
**First question: When to stop?**

<table>
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<tr>
<td><strong>High Bleeding Risk</strong></td>
<td>≥ 48h-72h</td>
<td>≥ 48h</td>
</tr>
</tbody>
</table>

| CrCl ≥ 80 mL/min           | ≥ 24h      | ≥ 48h                   |
| CrCl 50-80 mL/min          | ≥ 36h      | ≥ 72-96h                |
| CrCl 30-50 mL/min          | ≥ 48h      | ≥ 96h                   |
| CrCl 15-30 mL/min          | NA         | ≥ 36                    |

Drug interaction - (e.g. Aspirin, Anti-Platelet Agents, Amicardone, Phenotiazin)

=> add 12h
What if it is an emergency?

**Emergency procedure**

1. Acceptable delay before surgery?
2. NOACs plasma concentration:
   1. $< 30 \text{ ng/mL} \rightarrow \textbf{Surgery}$
   2. $30 - 400 \text{ ng/mL} \rightarrow \textbf{Postpone} - \text{Repeat every 12h until } < 30 \text{ ng/mL}$
   3. $> 400 \text{ ng/mL} \rightarrow \text{Overdose associated with high risk life-threatening bleeding}$
      (dabigatran = hemodialysis)

**Bleeding management**

1. Monitoring: hemodynamic, blood loss
2. Coagulation assays (standard lab. test, point-of-care monitoring)

2. Standard resuscitation:
   1. Fluid therapy
   2. Tranexamic acid 1 g
   3. Red Blood Cells (RBCs) transfusion
   4. Massive Transfusion Protocol: Fresh Frozen Plasma/Platelet concentrates/ RBCs

3. 1. 4-factor PCCs 25-50 U/kg
    2. FEIBA® 30-50 U/kg (Max 200 U/kg) in case of life-threatening bleeding

Faraoni, D et al. Updates in the perioperative and emergency management of non-vitamin K antagonist oral anticoagulants. Critical Care 2015; 19:203
What do I do afterwards?

- **Low Bleeding Risk**
  - NOACs: 6-8h

- **High Bleeding Risk**
  - **Low TE risk**
    - NOACs: 48-72h
  - **High TE risk**
    - LMWH: 6-8h
    - NOACs: 48-72h

Faraoni, D et al. Updates in the perioperative and emergency management of non-vitamin K antagonist oral anticoagulants. Critical Care 2015; 19:203
Second question: To bridge or not to bridge? 2012 ACCP Antithrombotic Guidelines

<table>
<thead>
<tr>
<th>TE Risk Level</th>
<th>Characteristics</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk</td>
<td>• CHADS 0 – 2 (no history of stroke or TIA)</td>
<td>No bridge</td>
</tr>
<tr>
<td>&lt; 5%</td>
<td>• Single VTE event &gt; 12 months ago and no additional risk factors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Aortic bileaflet MHV without AFib or any other additional risk factors</td>
<td></td>
</tr>
<tr>
<td>Intermediate</td>
<td>• CHADS 3 or 4</td>
<td>Bridge</td>
</tr>
<tr>
<td>risk 5-10%</td>
<td>• VTE event within past 3 to 12 months</td>
<td></td>
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<tr>
<td></td>
<td>• “Nonsevere” thrombophilia (Factor V Leiden OR prothrombin gene heterozygote)</td>
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<tr>
<td></td>
<td>• Recurrent VTE</td>
<td></td>
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<tr>
<td></td>
<td>• Active cancer (treated in last 6 months or palliative)</td>
<td></td>
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<tr>
<td></td>
<td>• Aortic bileaflet MHV AND any one of the following:</td>
<td></td>
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<tr>
<td></td>
<td>• Atrial fibrillation, Prior stroke or TIA, HTN, DM, Age &gt; 75 yrs</td>
<td></td>
</tr>
<tr>
<td>High risk</td>
<td>• CHADS score 5 or 6</td>
<td>Bridge</td>
</tr>
<tr>
<td>&gt; 10%</td>
<td>• Recent (within 3 months) stroke or TIA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Rheumatic valvular heart disease</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Recent (within 3 months) VTE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• “Severe” Thrombophilia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Any mitral MHV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Caged-ball or tilting disk aortic MHV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Recent (within 6 months) stroke or TIA</td>
<td></td>
</tr>
</tbody>
</table>

Recent literature has questioned practice

• **ORBIT-AF (7372 patients, 2803 interruptions)**\(^1\)
  - Bleeding events were more common in bridged than non-bridged patients (5.0% versus 1.3%; adjusted OR, 3.84; \(P<0.0001\)).
  - The incidence of MI, stroke, systemic embolism, major bleeding, hospitalization, or death within 30 days was also significantly higher in patients receiving bridging (13% versus 6.3%; adjusted OR, 1.94; \(P=0.0001\)).

• **Kaiser Permanente Colorado (1178 patients)**\(^2\)
  - Bridged group had increased bleeding: 15 patients (2.7%) and 2 patients (0.2%), respectively (hazard ratio, 17.2; 95% CI, 3.9-75.1)
  - There was no significant difference in the rate of recurrent VTE between groups (0 vs 3; \(P = .56\)).


Strong data emerging for atrial fibrillation

- Randomized, double blinded, placebo controlled
  - 1884 patients, 950 - no bridging, 934 - bridged
  - Majority of patients CHADS$_2$ < 5
  - The incidence of arterial thromboembolism:
    - 0.4% in the no-bridging group
    - 0.3% in the bridging group
  - The incidence of major bleeding was:
    - 1.3% in the no-bridging group
    - 3.2% in the bridging group
    - RR 0.41; 95% CI, 0.20 to 0.78
    - P=0.005 for superiority

Revised Antithrombotic Guidelines based on current literature

<table>
<thead>
<tr>
<th>TE Risk Level</th>
<th>Characteristics</th>
<th>Recommendation</th>
</tr>
</thead>
</table>
| Low risk < 5% | • CHADS 0 – 2 (no history of stroke or TIA)  
• Single VTE event > 12 months ago and no additional risk factors  
• Aortic bileaflet MHV without AFib or any other additional risk factors | No bridge |
| Intermediate risk 5-10% | • CHADS 3 or 4  
• VTE event within past 3 to 12 months  
• "Nonsevere" thrombophilia (Factor V Leiden OR prothrombin gene heterozygote)  
• Recurrent VTE  
• Active cancer (treated in last 6 months or palliative)  
• Aortic bileaflet MHV AND any one of the following:  
  • Atrial fibrillation, Prior stroke or TIA, HTN, DM, Age > 75 yrs | Case-by-case basis  
  • No bridge  
  • Prophylactic  
  • Full |
| High risk > 10% | • CHADS score 5 or 6  
• Recent (within 3 months) stroke or TIA  
• Rheumatic valvular heart disease  
• Recent (within 3 months) VTE  
• "Severe" Thrombophilia  
• Any mitral MHV  
• Caged-ball or tilting disk aortic MHV  
• Recent (within 6 months) stroke or TIA | Bridge |


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As you are driving home, you get the urgent page form the Orthopedic resident; that patient had a DES placed 5 months ago. Can the patient have surgery, and if so, can aspirin and clopidogrel be held? You respond:

A. What was I thinking answering my pager after I left?
B. Sorry, you gotta wait at least 6 months after DES for a procedure, and you can’t hold ASA/clopidogrel
C. He can go to the urgent procedure, but the ASA and clopidogrel must be continued as stent thrombosis risk is very high until after 12 months of treatment
D. It has been > 3 months after DES placement; he can go to surgery and we can hold DAPT and substitute 81mg ASA
E. Is that a cop pulling me over for texting while driving?
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D. It has been > 3 months after DES placement; he can go to surgery and we can hold DAPT and substitute 81mg ASA
E. Is that a cop pulling me over for texting while driving?
When is the right time?

• Angioplasty only (no stent)
  • > 14 days\(^1\)

• Bare Metal Stent (BMS)
  • > 30 days\(^1\)

• Drug Eluting Stent (DES)
  • OLD: optimal > 1y, but can proceed > 6months if benefit of surgery > risk stent thrombosis
  • NEW: new generation DES thrombotic risk is low and peaks at 3 months\(^2\)

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\(^1\) Fleisher LA et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation. J Am Coll Cardiol. 2014;64(22)e77-e137

2016 ACC/AHA Guidelines

Key points

• Newer generation DES afford us some leeway in the timing of our surgical procedures
  • DAPT can be held 3 months after DES placement if bleeding risk is high

• Ideally, if DAPT can be continued through a surgery prior to 6 months, then do so

• Still recommended to continue ASA 81mg through surgery
Thank You!! Contact me anytime with questions!

Michael J. Maniaci, M.D.
Chair, Division of Hospital Internal Medicine
Associate Medical Director, Mayo Clinic Multidisciplinary Simulation Center in Florida
Mayo Building & Hospital 1-500N
Jacksonville, FL 32224
Email maniaci.michael@mayo.edu
Office Phone (904)-956-0081
Questions & Discussion