DISCLOSURES

• No financial or corporate disclosure
• Any brand names mentioned are for example only, not an endorsement of a specific product
OBJECTIVES

1) Review the goals of medical evaluation in the pre-operative setting

2) Examine the cardiac pre-operative assessment

3) Briefly review the management of anti-coagulation in the pre-operative setting

4) Briefly discuss the implications of accurate documentation for facility reimbursement
LECTURE OBJECTIVES

Overview of pre-operative evaluation

Cardiac risk stratification

Pre-operative anti-coagulation management
PRE-OPERATIVE MEDICAL EVALUATION – WHY?

• Improve patient safety and outcomes by reducing peri- and post-operative risk

• Appropriate risk stratification based on a thorough history and physical with appropriate, guided diagnostic testing

• Cost control through evidence based or guideline driven testing

• Improvement of patient flow through the medical experience
MULTI-SPECIALTY APPROACH

- Patient-centric model of medical care in 2018 requires provider coordination and cooperation
- One physician ultimately must be responsible for a patient’s care, but responsibility for individual issues should be based on each practitioners’ skill set and scope
- Communication is key to a safer patient experience! Surgeons, anesthesiologists, and internists should be in constant communication throughout a patient’s medical experience.
THERE IS NO SUCH THING AS “CLEARING” A PATIENT…

• An Internist should never “clear” a patient
• Instead, we risk stratify
• Each specialty should focus on its own area – Internists should not be recommending what type of anesthesia should be used, surgical approach, etc.
• “This patient is medically optimized to proceed to OR without further testing or interventions for X procedure”
TIMING

• Within 30 days of the procedure, but not so close that testing might delay the procedure (OR schedules are tight!)
• Enough time out to hold anticoagulation or anti-platelet agents if needed (anywhere from 3-7 days)
• Enough time to get any pre-operative testing done and follow-up on results
• Obviously, in hospitalized or emergent cases, do the best you can with what time you have.
PRE-OPERATIVE EVALUATION

• Thorough, complete History and Physical
• Problem list of diagnoses with severity
• Recommended tests
• Specific comments on:
  • Oral medication administration
  • Specific prophylaxis to minimize complications
  • Anticoagulation recommendations
  • Specific recommendations (dose and route of which beta blocker, not just “would use beta-blocker”)
DOCUMENTATION IS KEY!

• The better you document your thought process, the better other care providers will be able to understand your plan

• In an era of copy and pasted electronic medical records, a well written, concise summary is golden

• Documentation is a key element in reducing malpractice claims – sometimes, bad outcomes occur despite your best preparation; documentation shows your best preparation occurred
DON’T JUST FOCUS ON THE HEART!

Too often, pre-operative evaluations are “cardiac clearance”.

Lung disease, diabetes, bleeding disorders, delirium risk, renal issues, aspiration risk, and many, many others deserve mention.
LECTURE OBJECTIVES

Overview of pre-operative evaluation

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Pre-operative anti-coagulation management
PRE-OPERATIVE CARDIAC RISK ASSESSMENT

• Peri-operative Myocardial Infarction and Coronary Artery Disease are significant sources of morbidity and mortality

• Goal of evaluation is to quantify risk through a history and physical, make appropriate referrals for diagnostics and testing, and help direct appropriate peri-operative care
TWO TYPES OF RISK

• Procedure specific risk

• Patient specific risk
PROCEDURAL RISK OF CARDIAC DEATH OR NON-FATAL MYOCARDIAL INFARCTION

- High risk (5%+) – emergent major operation, aortic/major vascular, peripheral vascular, prolonged surgery with major blood loss/fluid shifts
INTERMEDIATE RISK

• 1-5%

• Carotid endarterectomy, ENT surgery, Intraperitoneal, Non-cardiac Intrathoracic, Orthopedic, Prostate
LOW RISK

- <1% Risk
- Endoscopy, superficial procedures, cataract surgery, breast surgery
PATIENT SPECIFIC CARDIAC RISK – 2014 ACC/AHA (A BRIEF 105 PAGE READ)

• Take a full history and physical
• Functional capacity evaluation – helps determine metabolic efficiency – can be limited by peripheral vascular disease or osteoarthritis
OLDER RISK ASSESSMENT TOOLS

- Goldman risk index (which evolved into RCRI)
- Detsky modified risk index
- Eagle criteria
- Fleisher-Eagle criteria (Fleisher is the chair of the ACC committee currently reviewing guidelines)
CURRENT MODELS

• RCRI score is still used by the ACC – well established, well validated model with external validation

• Gupta Cardiac Calculator/National Surgical Quality Improvement Program database (NSQIP) – up and coming, some studies show it may be a better predictor, but there is no external validation yet

• Both are likely good models, RCRI is still more widely used, still recommended by ACC
REVISED CARDIAC RISK INDEX (RCRI)

• Replaced old “intermediate” risk factors

• They are:
  • History of ischemic heart disease (includes angina) or prior MI based on pathologic Q wave on resting 12 lead EKG
  • History of heart failure, prior or currently compensated
  • History of cerebrovascular disease (includes TIA)
  • Diabetes mellitus requiring insulin
  • Renal insufficiency (pre-op creatinine >2.0 mg/dL)
  • The surgical risk itself (don’t forget to include this as a “point”!)
MAJOR PREDICTORS

• Recent MI – the closer to 6 months out, the lower the risk. Within 3 months carries the highest risk of recurrent ischemia
• Recent PCI – drug eluting stents need advanced antiplatelet agents!
• Decompensated heart failure
• Class III/IV angina (Canadian Cardiovascular Society scoring)
• Severe Aortic stenosis or severe Mitral Regurgitation
• High grade atrioventricular block, sustained v.tach, nsvt with underlying heart dz, and SVT with uncontrolled ventricular rate

• All of these should be obvious signs that the patient is sick anyway!
MINOR PREDICTORS

- No longer considered to be “validated” as risk factors – instead, they should increase clinical suspicion of underlying heart disease
  - Age >70
  - EKG with LVH, LBBB, non-specific ST/T changes
  - Atrial fibrillation (though this does increase complication risk, just not obvious increase in risk of fatal MI/ventricular arrhythmia)
  - Uncontrolled systemic hypertension
USING RCRI, CARDIAC RISK CAN BE ASSESSED

- No risk factors — 0.4 percent (95% CI 0.1-0.8 percent)
- One risk factor — 1.0 percent (95% CI 0.5-1.4 percent)
- Two risk factors — 2.4 percent (95% CI 1.3-3.5 percent)
- Three or more risk factors — 5.4 percent (95% CI 2.8-7.9 percent)

- Risk assesses cardiac death, non-fatal MI, and non-fatal cardiac arrest
STEPWISE APPROACH TO CARDIAC RISK ASSESSMENT – STEP 1 – EMERGENCY?

• Is the case emergent?

• Yes – go straight to OR, close post-op monitoring

• No – step 2
STEP 2 – MAJOR CARDIAC RISK FACTORS

• Active Major risk factors?

  • Yes – eval and treat as indicated, consider OR when stable

  • No – proceed to step 3
STEP 3 – SURGICAL RISK

• Assess surgical risk

• Low risk – proceed to OR, no further work-up indicated

• Moderate or High risk – step 4
STEP 4 – FUNCTIONAL CAPACITY

• Functional capacity evaluation

• Mets ≥4 – proceed with planned surgery

• Mets < 4 or unobtainable – step 5
**FUNCTIONAL CAPACITY – IN METABOLIC EQUIVALENTS**

- 1 MET = 3.5 mL O2 uptake/kg/min
- >4 METS associated with decreased complication risk for surgery

<table>
<thead>
<tr>
<th>Physical activity</th>
<th>MET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light intensity activities</td>
<td>&lt; 3</td>
</tr>
<tr>
<td>sleeping</td>
<td>0.9</td>
</tr>
<tr>
<td>watching television</td>
<td>1.0</td>
</tr>
<tr>
<td>writing, desk work, typing</td>
<td>1.8</td>
</tr>
<tr>
<td>walking, 1.7 mph (2.7 km/h), level ground, strolling, very slow</td>
<td>2.3</td>
</tr>
<tr>
<td>walking, 2.5 mph (4 km/h)</td>
<td>2.9</td>
</tr>
<tr>
<td>Moderate intensity activities</td>
<td></td>
</tr>
<tr>
<td>bicycling, stationary, 50 watts, very light effort</td>
<td>3.0</td>
</tr>
<tr>
<td>walking 3.0 mph (4.8 km/h)</td>
<td>3.3</td>
</tr>
<tr>
<td>calisthenics, home exercise, light or moderate effort, general</td>
<td>3.5</td>
</tr>
<tr>
<td>walking 3.4 mph (5.5 km/h)</td>
<td>3.6</td>
</tr>
<tr>
<td>bicycling, &lt;10 mph (16 km/h), leisure, to work or for pleasure</td>
<td>4.0</td>
</tr>
<tr>
<td>bicycling, stationary, 100 watts, light effort</td>
<td>5.5</td>
</tr>
<tr>
<td>Vigorous intensity activities</td>
<td>&gt; 6</td>
</tr>
<tr>
<td>jogging, general</td>
<td>7.0</td>
</tr>
<tr>
<td>calisthenics (e.g. pushups, sit-ups, pullups, jumping jacks), heavy, vigorous effort</td>
<td>8.0</td>
</tr>
<tr>
<td>running jogging, in place</td>
<td>8.0</td>
</tr>
<tr>
<td>rope jumping</td>
<td>10.0</td>
</tr>
</tbody>
</table>
STEP 5 – RCRI SCORE

• RCRI = 0 – proceed to OR, no further testing
• RCRI = 1-2 – proceed to OR with heart rate control in carefully selected patients* or consider non-invasive testing **IF** it will change management

*Beta Blocker usage in the perioperative setting deserves its own lecture
STEP 5 RCRI CONTINUED

• For RCRI score of 3+, non-invasive testing may be indicated if it will change management for intermediate risk surgery or vascular surgery
GUIDELINES ARE NICE…

• But your clinical judgment is more important!

• Document your thought process
CORONARY ARTERY REVASCULARIZATION BEFORE ELECTIVE MAJOR VASCULAR SURGERY

- CARP trial
- 2004 VA trial
- Showed that coronary artery revascularization prior to elective vascular surgery (AAA, peripheral) in stable cardiac patients had no advantage long term over no revascularization, and just delayed surgery.
LECTURE OBJECTIVES

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WARFARIN ANTICOAGULATION AND SURGERY

- Many “low bleeding risk” procedures do not have to have their chronic anticoagulant stopped at all (including many dental procedures and diagnostic endoscopy)
- Some anticoagulation can just be stopped if patient is at low risk for thrombotic event prior to procedure
- In patients with moderate to high risk for thrombotic complication, bridging anticoagulation is required
CHA2DS2-VASC SCORE

- Diagnosed heart failure, past or current (1 point)
- Hypertension, treated or untreated (1 point)
- Age ≥ 75 years (2 points)
- Age 65-74 (1 point)
- Diabetes Mellitus (1 point)
- History of ischemic stroke, TIA, or thromboembolism associated with atrial fibrillation (2 points)
- Vascular disease (1 point)
- Sex – female (1 point)

This score helps determine the increase in annual stroke risk without anticoagulation

- 0 Points: 0
- 1 Point: 1.3%
- 2 Points: 2.2%
- 3 Points: 3.2%
- 4 Points: 4.0%
- 5 Points: 6.7%
- 6 Point: 9.8%
- 7 Points: 9.6%
- 8 Points: 12.5%
- 9 Points: 15.2%
## CHRONIC ANTICOAGULATION – TO BRIDGE OR NOT TO BRIDGE?

<table>
<thead>
<tr>
<th>Risk Stratification</th>
<th>Mechanical Heart Valve</th>
<th>Atrial Fibrillation</th>
<th>Venous Thromboembolic History</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High</strong></td>
<td>1) All mitral valve 2) Caged ball/tilting disk aortic valves 3) CVA/TIA within 6 mos</td>
<td>1) CHADS2 score 5+ 2) TIA/CVA within 3 months 3) Rheumatic valve dz</td>
<td>1) Within 3 months 2) Prot C/S def 3) Anti-thrombin def 4) Antiphospholipid</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td>1) Bileaflet mechanical aortic valve with any of: a.fib, h/o cva/tia, htn, dm, CHF, age &gt;75</td>
<td>1) CHADS2 3-4 not including TIA/CVA w/in 3mo</td>
<td>1) 3-12 mos 2) Non-severe thrombophilia 3) Active cancer 4) Recurrent VTE</td>
</tr>
<tr>
<td><strong>Low</strong></td>
<td>1) Bileaflet mechanical aortic valve prosthesis with none of the above risks</td>
<td>1) CHADS2 0-2 Not including TIA/CVA w/in 3mo</td>
<td>1) &gt;12 mos provoked or no other risk factors</td>
</tr>
</tbody>
</table>
AMERICAN COLLEGE OF CHEST PHYSICIAN GUIDELINES

• Low risk – no bridging required

• Moderate risk – poor evidence – if surgery is high risk of bleeding, consider no bridging. If less bleeding risk, consider bridging

• High risk – consider delaying elective surgeries, or bridge with UFH or LMWH
MODERATE RISK FOR CLOT, HIGH RISK TO BLEED...WHAT TO DO?

• Talk to your patient and the referring surgeon

• Document the patient’s thoughts – “I would rather bleed to death than have a stroke”

• The surgeon is the one who has to do the cutting – they need to be involved in this discussion

• Above all else, DOCUMENT!
REMEMBER!

- Bleeding can kill just like a clot! If you aren’t sure what to do, look up the surgical bleeding risk or ask a specialist (Heme, Cards) for an opinion.
THE NEW ANTICOAGULANTS

- Dabigatran – *Pradaxa* – direct thrombin (IIa) inhibitor – can monitor somewhat with aPTT and Thrombin Time (TT)

- Rivaroxaban – *Xarelto* and Apixaban – *Eliquis* – direct factor Xa inhibitors – only way to really monitor is with chromagenic anti-Xa levels
DABIGATRAN

- Half life = 12-17 hours, goes up to 28 hours in CrCl < 30
- 80% renal clearance
- Can dialyze about 60% in case of severe bleed
- Reduced creatinine clearance = reduced dabigatran clearance
- For minor, low bleeding risk procedures, d/c 2 days prior if CrCl >50 mL/min, or 3-5 days for lower (CrCl<30 should be 5 days)
- For major surgery, or a spinal or epidural, d/c 4-5 days prior
- Bridge as for Coumadin
RIVAROXaban

- Half life about 9-12 hours (closer to 9 with CrCl>50, higher for lower clearance)
- Only about 60% renal, 33% biliary clearance
- Low bleeding risk procedure with good CrCl, can stop 2 days in advance
- Major surgery or epidural, stop 3 days in advance
- Need to leave any epidural catheters in for 18 hours (24 hours if traumatic puncture) after last dose of Xarelto, and do not administer for at least 6 hours after catheter is removed (24 hours if traumatic) due to hematoma risk
DOCUMENTATION ACCURACY

- Accuracy and completeness of good documentation can dramatically increase Hospital reimbursement
- Use of HCC (Hierarchical Condition Categories) influences Quality Payment Program reimbursement from CMS
- Also clinically relevant, accurate documentation helps other providers understand the severity of a patient’s disease processes
WHY SHOULD PHYSICIANS CARE WHAT THE HOSPITAL GETS PAID???
BENEFICIAL SYMBIOSIS!
SYMBIOSIS

• If a physician’s host hospital thrives, better access to great patient care tools, better infrastructure, and better staffing

• Employed physicians benefit from a stronger employer with better insurance reimbursement

• Independent physicians benefit from better contract opportunities, better infrastructure

• The hospital, the physician, and the community all benefit
**EXAMPLE – APPENDICITIS WITH MALNUTRITION**

- Patient presents with Acute Appendicitis as primary diagnosis. The hospitalist notes the patient looks cachectic, has a BMI of <19, and temporal wasting.

<table>
<thead>
<tr>
<th>Secondary Diagnosis</th>
<th>Failure to thrive</th>
<th>Mild protein calorie malnutrition</th>
<th>Sever protein calorie malnutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global length of stay</td>
<td>1.7</td>
<td>2.8</td>
<td>4.6</td>
</tr>
<tr>
<td>Reimbursement</td>
<td>$6,060</td>
<td>$8,543</td>
<td>$14,282</td>
</tr>
<tr>
<td>Severity of Illness/Risk of Mortality</td>
<td>1/1</td>
<td>2/1</td>
<td>3/2</td>
</tr>
</tbody>
</table>
TAKE HOME POINTS

- Pre-operative management is a team affair
- Only do testing if it will change management or an outcome
- Functional capacity and an RCRI score can help avoid unnecessary pre-operative testing
- Bridging anticoagulation needs to be thought about days in advance
- Good documentation affects reimbursement
REFERENCES

• ACC/AHA 2014 Pre-operative evaluation guidelines
• ACCP 2012 Perioperative management of antithrombotic therapy
• Up-to-date
• An Overview of Perioperative Medicine 2012 – Mayo Clinic
• Remer MD, Erica – Optimal Preoperative Documentation, www.icd10md.com
SPECIAL THANKS TO

• Dr. Indu Rao
• Dr. David Stultz
• Dr. Robert Smith
• Dr. Richard Gregg
• Shelbi Wagner, for her eternal patience
ANY QUESTIONS?