Perioperative Considerations for the High Risk Patient

Luis C. Camarillo, MD
Assistant Professor of Internal Medicine
Division of Inpatient Medicine
Objective:

Provide a general overview of pertinent studies & guidelines that assist in the perioperative assessment and management of the high risk patient having non-cardiac surgery.
Mr. Clinical Vignette

- 75 year old Rancher/Farmer
- Direct admission from an outside hospital.
  - Referring doctor says that this patient has been not compliant
    - Either antibiotic regimen or follow-up appointments.
  - Primary Care Podiatrist has recommended an amputation of Right Hallux weeks ago
- 8 day h/o fever as high as 101.0 degrees.
- Severe pain, erythema, and swelling over his right foot - worsening
- Notable foul smell drainage
- Developed severe nausea and some vomiting.
- Unable to take any of his medicines.
- Transferred to S&W for a higher level of care
Mr. Clinical Vignette

- Past Medical & Surgical Hx:
  - Poorly controlled DM2 – Last HgbA1C of 14.5%
  - HTN
  - CAD s/p CABG (4yrs ago)
  - Hyperlipidemia
  - Hypothyroidism
  - CKD (baseline BUN/creatinine of 32/2.1mg/dL),
  - Ongoing tobacco abuse
  - Peripheral Vascular Disease
  - Amputation of Hallux of the left foot in 2009
  - GERD

- Current MEDS:
  - NTG PRN
  - Asa
  - Lisinopril
  - Metoprolol
  - Simvastatin
  - Levothyroid
  - Lantus insulin
  - Zantac

- ALL: NKDA
Dr. Rapid... Room 720 !!!

Operator overheard states...
Clinical Vignette

- Dr. Rapid is called due to Sinus Tachycardia
- Pulse of 150’s, BP = 88/40, Temp = 101.9, Resp rate = 26, and o2 sat = 89%
- Moderate distress due to dyspnea & palpitations, pain in right foot
- Dry oral mucosa, no JVD
- Tachycardic with a flow murmur noted
- Lungs – decreased breath sounds in bases
- Abdomen with no significant findings
- Neurologically with no deficits
  - except for decreased sensation over his hands and feet consistent with his DM neuropathy
- Extremities – discoloration c/w venous stasis, pulses decreased at 1+
- The affected right foot as shown here...
Clinical Vignette

University of Texas at San Antonio Classification
Grade 2D
Infected wound involving tendon/capsule with poor circulation.
Sinus Tachycardia
P~150’s
1. Do you find any reason to delay surgery for this particular patient?

Or Forever Hold Your Peace.
Unstable coronary Syndromes (UA or AMI)

Presence of 1 or more of these mandates further medical management and...

Decompensated Heart Failure (worsening or new-onset)

Significant arrhythmias

High-grade AVB
Mobitz II, CHB
Ventricular/Brady/ Tachy arrhythmias
Supraventricular arrhythmias, VT

Severe valvular Disease (Severe AS, Symptomatic MS)
Q & A

- Intern ask: "Can he go to the OR for his amputation?"
- Staff doctor: "Absolutely not"
  "Surgery needs to be delayed for now."

STABILIZE THEN ANALYZE
Stabilize first

- **IV fluid resuscitation**
  - Resulting in eventual improved hemodynamics
- **O2 per protocol**
  - Improving his O2 saturation and dyspnea
- After improving his blood pressure, he receives a small dose of **analgesics** and some **acetaminophen**.
- Once clinically improved, you order for pertinent **STAT labs**, port CXR, and EKG, appropriate cultures.
- Medical treatment with **IV antibiotics** (Ertapenem) and other medical therapy is initiated.
THEN ANALYZE

2. Know your role and responsibility.
Our Role and Responsibility – New Strategy

Consultant

PATIENT

LOW RISK

Intermediate RISK

High RISK

Noninvasive testing/Medical therapy

Postoperative M&M
PERIOPERATIVE MI
What occurs during surgery to induce a periop MI?

- Anesthesia
- Pain
- Hypothermia
- Bleeding
- Catecholamine release
- Tachycardia
- Hypertension

- Coronary Thrombosis
- Increased O2 Demand
- Decreased O2 Delivery

- Plaque Rupture
- Decreased O2 Delivery

Perioperative MI
3. Learn about your patient in order to identify CONTRAINDICATIONS ...
If the Checks Don’t Line Up, Then Holdup.
Initial Approach to the Patient

- **History:**
  - Age
  - Prior cardiac disease (MI, angina, CHF, arrhythmias, valvular disease)
  - Prior cardiac intervention
  - Prior cardiac evaluation (noninvasive test, angiography)
  - Risk factors (HTN, DM, Tobacco abuse, hyperlipidemia)
  - Associated diseases (PVD, stroke, CKD, COPD)
  - Current state (CP, dyspnea)
  - Functional capacity
  - Thorough review of medications/Allergies or Intolerances

- **Physical Exam:**
  - Vital signs
  - Mucosa (hydration/nutrition)
  - Lymph nodes, thyroid masses
  - Carotid bruits
  - JVD
  - Mumur (Aortic Stenosis, Mitral Stenosis)
  - S3 gallop
  - Crackles/wheezes
  - Hepatosplenomegaly/Pulsatile masses/Rectal exam/hernias
  - Edema
  - Peripheral pulses/bruits
  - Neurologic deficits
  - Mental status
  - MMSE
  - Skin (hydration/nutrition)
Initial Approach

- 71 year old man with a history of:
  - Poorly controlled DM2 – Last HgbA1C of 12.5%
  - HTN
  - CAD s/p CABG (4yrs ago)
  - Hyperlipidemia
  - Hypothyroidism
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  - Levothyroid
  - NTG PRN
  - Zantac
- All: NKDA

- After stabilizing Mr. P, we determine that...
- **2006 - Cath resulting in Single Vessel CABG**
- **Asymptomatic** since then
- **Does his own work on his ranch w/o CP or dyspnea**
Initial Approach

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Current Physical Exam -
- Pulse =98, BP = 124/70, Temp = 100.9, Resp rate = 16, and o2 sat = 99% on 2LPM
- Mild distress due to pain in right foot
- Moist oral mucosa, no JVD
- RR nl S1 & S2
- Lungs – CTA, bilat
- Abdomen with no significant findings
- Neurologically with no deficits
  - except for decreased sensation over his hands and feet consistent with his DM neuropathy
- Extremities – discoloration c/w venous stasis, pulses decreased at 1+
- Right foot - unchanged
4. Determine your patient’s **Cardiac** risk factors.
Review of Cardiac Risk Indices

- In the 1960’s:
  - 1963 – Dripp’s American Society of Anesthesiologists (ASA)

- In the 1970’s:
  - 1976 – New York Heart Association/Canadian Cardiovascular Society (NYHA/CCS)
  - 1977 – Goldman and colleagues
  - 1979 – Cooperman and colleagues

- In the 1980’s:
  - 1986 – Detsky and colleagues
  - 1987 – Larsen and colleagues
  - 1989 – Eagle and colleagues

- In the 1990’s:
  - 1990 – Pedersen and colleagues
  - 1996 – Vanzetto and colleagues
  - 1996 – American College of Cardiology/American Heart Association (ACC/AHA)
  - 1997 – American College of Physicians
  - 1999 – Lee and colleagues

- In 2002/2007:
  - American College of Cardiology Update
ACC/AHA Guidelines ('96, '02, '07)

- Consensus paper on standards for preoperative evaluation
- Non-cardiac surgery
- Stepwise algorithm
- Provided an organized assessment of
  - i) clinical markers (prior to coronary evaluation and treatment)
  - ii) functional capacity
  - iii) surgery specific risk.
- Clinical predictors derived from Goldman’s and Detsky’s criteria
- Shown to reduce costs of preoperative evaluation
ACC/AHA Guidelines

- Minimize unnecessary interventions
- Enhancing cardiac risk assessment
- Offered recommendations on beta-blockers, arrhythmias, and coronary evaluation/interventions.
## ACC/AHA Clinical Predictors

### Table 1. Clinical Predictors of Increased Perioperative Cardiovascular Risk (Myocardial Infarction, Heart Failure, Death)

<table>
<thead>
<tr>
<th>Category</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major</strong></td>
<td>Unstable coronary syndromes</td>
</tr>
<tr>
<td></td>
<td>• Acute or recent MI* with evidence of important ischemic risk by clinical symptoms or noninvasive study</td>
</tr>
<tr>
<td></td>
<td>• Unstable or severe† angina (Canadian class III or IV)‡</td>
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<tr>
<td></td>
<td>Decompensated heart failure</td>
</tr>
<tr>
<td></td>
<td>• Significant arrhythmias</td>
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<tr>
<td></td>
<td>• High-grade atroventricular block</td>
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<td></td>
<td>• Symptomatic ventricular arrhythmias in the presence of underlying heart disease</td>
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<tr>
<td></td>
<td>• Supraventricular arrhythmias with uncontrolled ventricular rate</td>
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<tr>
<td></td>
<td>Severe valvular disease</td>
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<tr>
<td><strong>Intermediate</strong></td>
<td>Mild angina pectoris (Canadian class I or II)</td>
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<tr>
<td></td>
<td>Previous MI by history or pathologic Q waves</td>
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<tr>
<td></td>
<td>Compensated or prior heart failure</td>
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<tr>
<td></td>
<td>Diabetes mellitus (particularly insulin-dependent)</td>
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<tr>
<td></td>
<td>Renal insufficiency</td>
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<tr>
<td><strong>Minor</strong></td>
<td>Advanced age</td>
</tr>
<tr>
<td></td>
<td>Abnormal ECG (left ventricular hypertrophy, left bundle-branch block, ST-T abnormalities)</td>
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<td></td>
<td>Rhythm other than sinus (e.g., atrial fibrillation)</td>
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<td></td>
<td>Low functional capacity (e.g., inability to climb one flight of stairs with a bag of groceries)</td>
</tr>
<tr>
<td></td>
<td>History of stroke</td>
</tr>
<tr>
<td></td>
<td>Uncontrolled systemic hypertension</td>
</tr>
</tbody>
</table>

ECG indicates electrocardiogram; MI, myocardial infarction.

*The American College of Cardiology National Database Library defines recent MI as greater than 7 days but less than or equal to 1 month (30 days); acute MI is within 7 days.

†May include “stable” angina in patients who are unusually sedentary.

**Functional Status Assessment**

- **Poor Status <4 METs**
  - Activities of Daily Living such as eating, dressing, bathing
  - Walking 2 mph
  - Writing
  - Household chores such as vacuuming

- **Moderate Status 4 to 7 METs**
  - Performing yardwork
  - Golfing w/o cart
  - Walking 4 mph
  - Climbing a flight of stairs

- **Excellent Status >7 METs**
  - Scrubbing floors/vigorous cleaning
  - Jogging (10 minute mile)
  - Singles tennis
  - Swimming

1 MET = Oxygen consumption of a 70-kg, 40 yo man at rest.

Mr. P
Cardiac Risks of Surgical Procedures

- **High risk surgery – risk of cardiac event >5%**
  - Emergency major operation - especially in elderly population
  - Major vascular procedures
  - Anticipated prolonged operations associated with large fluid shifts or blood loss.
- **Intermediate risk surgery - risk of cardiac event <5%**
  - Carotid endarterectomy
  - Head & Neck procedures
  - Orthopedic procedures
  - Urologic procedures
  - Intraperitoneal and intrathoracic procedures
  - Podiatry surgery
- **Low risk surgery - risk of cardiac event <1%**
  - Ambulatory procedures
  - Breast procedures
  - Cataract procedures
  - Dermatologic procedures
  - Endoscopic procedures
MAJOR Clinical predictors

STEP 1
Need for noncardiac surgery
  - Urgent or elective surgery
  - Emergency surgery
  - Operating room
  - Postoperative risk stratification and risk factor management

STEP 2
Coronary revascularization within 5 yr?
  - Yes
  - Recurrent symptoms or signs?
    - Yes
    - Recurrent coronary angiogram or stress test?
      - Yes
      - Favorable result and no change in symptoms
      - Operating room
      - Clinical predictors
    - No
      - Clinical predictors
  - No
    - Favorable result and no change in symptoms
    - Operating room

STEP 3
Recent coronary evaluation
  - Yes
  - Recent coronary angiogram or stress test?
    - Yes
    - Favorable result and no change in symptoms
    - Operating room
    - Clinical predictors
  - No
    - Favorable result and no change in symptoms
    - Operating room
    - Clinical predictors

STEP 4
Major clinical predictors
  - Consider delay or cancel noncardiac surgery
  - Medical management and risk factor modification
  - Consider coronary angiography
  - Subsequent care dictated by findings and treatment results

Intermediate clinical predictors
  - Go to step 6

Minor or no clinical predictors
  - Go to step 7

Major Clinical Predictors
  - Unstable coronary syndromes
  - Decompensated CHF
  - Significant arrhythmias
  - Severe valvular disease
Cardiac evaluation and care algorithm for noncardiac surgery based on active clinical conditions, known cardiovascular disease, or cardiac risk factors for patients 50 years of age or greater

Step 1
- Need for emergency noncardiac surgery?
  - Yes (Class I, LOE C)
  - Operating room
  - Perioperative surveillance and postoperative risk stratification and risk factor management
  - No

Step 2
- Active cardiac conditions*
  - Yes (Class I, LOE B)
  - Evaluate and treat per ACC/AHA guidelines
  - Consider operating room
  - No

Step 3
- Low risk surgery
  - Yes (Class I, LOE B)
  - Proceed with planned surgery†
  - No

Step 4
- Functional capacity greater than or equal to 4 METs without symptoms‡
  - Yes (Class IIa, LOE B)
  - Proceed with planned surgery§
  - No or unknown

Step 5
- 3 or more clinical risk factors¶
  - Vascular surgery
    - Class IIa, LOE B
    - Consider testing if it will change management
  - Intermediate risk surgery

1 or 2 clinical risk factors¶
- Vascular surgery
  - Intermediate risk surgery

No clinical risk factors¶
- Class I, LOE B

Proceed with planned surgery†

5. Determine your patient’s **Pulmonary** risk factors
Predicting Perioperative Pulmonary Complications

- Occur as Often as Cardiac Complications
- Increasing Length of Stay (LOS)
- Over past few years, investigators have expanded risk indices to include preoperative pulmonary assessment
Predicting Perioperative **Pulmonary** Complications

- Poor Functional status
  - 89% unable to climb 1 flight had complications
- Current Tobacco use
  - Smoking w/in 2 weeks of surgery
  - Irrespective of the absence of COPD
- Chronic Obstructive Pulmonary Disease
- Advanced age
- Obesity
  - Complications were similar for non-obese (7.0% vs. 6.3%)
  - Smetana et al (2005)
- Obstructive Sleep Apnea
  - More cardiac events, ICU transfer, intubation, or urgent CPAP
    - 24% versus 9% (p<0.004)
    - First 24 hours postoperatively
- Most significant risk
  - surgical site - closer incision to diaphragm
Intern: “Do we need to order any other tests.... and if so which ones?”

6. Order ancillary tests **ONLY if it impacts your patient’s care.**
Initial Lab Data

- **CBC**
  - Exclude anemia or thrombocytopenia
- **Complete Metabolic Profile**
  - Exclude anion gap
  - Check renal status
  - Exclude electrolyte derangements
  - Check glucose in DM2
  - On antihypertensive tx
- **Coagulation factors**
  - Exclude coagulopathy
- **TSH**
  - Document thyroid status
- **ECG**
  - Given h/o CAD
- **CXR**
  - Exclude active disease
  - Exclude new findings
- **Cardiac Biomarkers**
  - Beta Natriuretic Peptide (BNP)

CBC
- WBC 18k, HgB 9.1, plt = 234

Complete Metabolic Profile
- Na – 131, K – 4.1,
  - Creatinine – 3.2, normal GAP

Coagulation factors
- Normal INR

TSH
- normal

ECG
- **Sinus Tachycardia** initially
- **NSR** after fluid resucitation

CXR
- Scarring in bases, no acute process

Cardiac biomarkers – normal
- BNP – 99.1
- Blood cultures x 2
- Urinalysis with culture and sensitivity
Which Non-Invasive Test to Choose?

2D ECHO

EXERCISE STRESS TESTING

Dobutamine Stress Echocardiography

MYOCARDIAL PERFUSION IMAGING
What if noninvasive test is abnormal or high risk?

- Revascularization options for reducing perioperative cardiovascular risk:
  - CABG
  - Cath
CABG vs PCI

- Preoperative CABG
- Prior CABG maintains cardioprotection for 4-6 yrs.
- ACC/AHA recommends no further noninvasive testing if
  - Asymptomatic with CABG within the past 5 years.

- Preoperative Percutaneous Coronary Intervention (PCI)
- Reserved for those with obvious indication:
  - Acute coronary syndrome or angina refractory to medical therapy
  - ACC/AHA recommends after high-risk noninvasive testing
- Patients who have had PCI within 6 months to 5 years
- Remained Asymptomatic
- May proceed to non-cardiac surgery without further testing.
Thus...

Prophylactic Revascularization is rarely needed to get a patient through surgery.
Additional testing for Mr. P...

2D Echocardiogram

- Suggested if:
  - No prior echocardiogram
  - Deteriorated clinical status since last echocardiogram
  - Suspected valvular disease
  - Hypertrophic cardiomyopathy
  - Left Ventricular Ejection Fraction <35%
    - Predictive of Postoperative heart failure
    - Mortality in severely ill patients
    - Degree of LV dysfunction - useful
  - Not predictive of postoperative ischemic events

- As for Mr. P.:
  - None on record
  - Like to know his Ejection Fraction (EF)
  - Determine if there are any regional wall motion abnormalities
    - Especially given his recent episode of sinus tachycardia
    - Flow murmur on initial exam

EF = 46%, Grade 1/IV Diastolic Dysfunction, No RWMA’s
7. Address patient’s other medical issues one by one.

Intern: “How about his other medical problems?”
Mr. Clinical Vignette

- 71 year old man with a history of:
  - Poorly controlled DM2 – Last HgbA1C of 12.5%
  - HTN
  - CAD s/p CABG (4yrs ago)
  - Hyperlipidemia
  - Hypothyroidism
  - CKD (baseline BUN/creatinine of 32/2.1mg/dL),
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  - Amputation of Hallux of the left foot in 2009
  - GERD

- Current MEDS:
  - Lantus insulin
  - Metoprolol
  - Lisinopril
  - Asa
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- ALL: NKDA
Clinical Pearl: Diabetes

- **Differentiate** type 1 (always require some insulin) from type 2.
- DM1:
  - Reduce insulin by ½ morning of sx
  - Start sliding scale as well
- DM2:
  - Hold insulin in DM2 patients
  - Start insulin sliding scale.
- **Optimize** glycemic control (<200mg/dl) but not too tightly – unrecognized perioperative hypoglycemia.
- **Stop metformin** at least 48 hours prior to surgery
- All other oral hypoglycemics can be held the morning of the surgery unless they are longer-acting (stop earlier).
Mr. Clinical Vignette

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- **ALL:** NKDA
Clinical Pearl: Antihypertensives

- Day prior to surgery:
  - Usual Dose:
    - Beta blockers
    - Calcium Channel Blockers
    - ACE Inhibitors
  - Diuretics – Stop day before
Mr. Clinical Vignette

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ALL: NKDA
Clinical Pearl: Hyperlipidemia

If your patient is on a statin, then continue it.

  - Large, Retrospective trial reviewed database
  - Patients having high-risk non-cardiac surgery
  - Discovered those on statins had **reduced mortality** than those not receiving statins
  - Consider in all **high-risk** patients having non-cardiac surgery.

  - Small, prospective study
  - 100 pts randomized to atorvastatin or placebo prior to vascular surgery
  - Randomized @ 14 days prior & continued for 45 days total
  - Primary end-points of **cardiac death, non-fatal MI, & ischemic stroke**
  - FEWER end points noted in 8% statin group vs. 26% placebo group
    - $(p<=0.018)$
Mr. Clinical Vignette

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- ALL: NKDA
Clinical Pearl: Hypothyroidism

- Treatment of hypothyroidism **recommended** prior to any surgical procedure.
- Good thyroid function for at least **3 months prior**.
- **Serum TSH** should be documented.
- Usual dose of thyroid supplementation day prior to surgery.
- **Strategy results in improved morbidity & mortality.**
Mr. Clinical Vignette

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- **ALL: NKDA**
Clinical Pearl: Chronic Kidney Disease

- Preoperative renal status predictor of postoperative renal failure.
- Hou et al (1983)
- Studied 2,262 consecutive medical & surgical admissions
- Risk of deterioration:
  - 2.9% creatinine <1.2mg%
  - 4.4% creatinine >1.2mg%

Preventative considerations:
- 1) Conscientious of volume status
- 2) Treat infections aggressively
- 3) Avoid nephrotoxic drugs at all costs
“We don’t clear patients for surgery...we correct the correctable and hope for the best.”
8. Prevent the Preventable.
Perioperative Beta Blockers

- ACC recommends for patients with:
  - 1. known CAD or
  - 2. high cardiac risk pt scheduled for intermediate to high-risk surgery.
  - 3. Goal Pulse is 65 beats/min
  - 4. Long term beta blockade better than short term beta blockade
  - 5. Reduced mortality only in higher-risk patients

- Revised Cardiac Risk Index (RCRI) ≥ 2 points
  - High-risk type of surgery
  - Ischemic heart disease
  - Congestive heart failure
  - Cerebrovascular disease
  - Preoperative treatment with insulin
  - Preoperative serum creatinine > 2.0 mg/dL

*Fleisher et al. ACC/AHA 2006 update. Circulation 2006*
1. Leading cause of postoperative morbidity & mortality.
2. Even with prophylaxis, incidence of DVT is about 20%.
3. No data addressing the actual duration of DVT prophylaxis.
4. Should be continued until fully ambulatory.
Nutritional status

- **Predictor** of postoperative morbidity & mortality
- Increased mortality
  - >20% weight loss
  - Albumin < 3.2 g/dL (six fold increase)
- Preoperative nutritional supplementation
  - Controversial
  - Inconclusive
- Maximize patient’s nutritional status if time allows.
Preoperative Cognitive Status

- Preoperative Folstein MMSE to determine baseline mental status
  - detect occult dementia
- At least 30% patients develop postoperative delirium
  - Increases in-hospital morbidity
- Postoperative Delirium - strong predictor of poor outcomes

- Prevent common precipitants:
  - Pain — the most common precipitant
  - Physical restraints
  - Urinary catheters
  - Iatrogenic medical conditions
  - Beginning >3 NEW medicines
  - Malnutrition

- Prepare & Educate patients and their family about the potential of developing postop delirium
  - especially those patients with underlying dementia.
Mr. P Clinical Course

- After 48 hours
  - Became Clinically stable
  - All cultures were negative at 48 hours
  - From high risk to moderate risk surgical candidate for a moderate risk procedure.
  - Underwent an amputation of his right hallux
  - No postoperative issues except for pain
  - Went to Rehab for 2 weeks
  - Then Home
Take Home Points

1. Obtain a good H&P complete with
   - functional assessment
   - full medication list
   - recent cardiopulmonary issues
   - baseline mental status.

2. ACC/AHA guidelines are an excellent standard for preop evaluation for patients undergoing non-cardiac surgery.

3. Smoking Cessation at least 6-8 wks prior to procedure.

4. Order ancillary tests ONLY if it impacts your patient’s care.

5. Address patient’s other medical issues.

6. Prevent the Preventable
   - Perioperative beta blockers in high risk population
   - DVT prophylaxis

7. Communicate with the requesting physician/service explicitly & directly.

8. Prophylactic Revascularization is rarely needed to get a patient through surgery.
## Take Home Points: 
### Risk Factors for **Postoperative Mortality**

<table>
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<tr>
<th>Risk Factor</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Surgical procedure</strong></td>
<td>Major or emergency procedures</td>
</tr>
<tr>
<td><strong>Preexisting disease</strong></td>
<td>Cardiovascular, pulmonary, hepatic, renal, diabetes mellitus</td>
</tr>
<tr>
<td><strong>Functional status</strong></td>
<td>&lt;1-4 MET</td>
</tr>
<tr>
<td><strong>Nutritional status</strong></td>
<td>&gt;20% weight loss, anemia, serum albumin &lt; 3.2 mg/dL</td>
</tr>
<tr>
<td><strong>Ambulation</strong></td>
<td>Bedridden, immobilized</td>
</tr>
</tbody>
</table>
Cost of preoperative medical testing for all types of surgeries = $30 billion annually

About 1 million patients will have a perioperative cardiac complication = $20 billion annually

Preventing one postoperative complication by obtaining a preoperative consult and/or adhering to the current guidelines = *PRICELESS*
What about ANTIPLATELET agents?
What about his aspirin?

- Always be cognizant of ...
  - risk of bleeding >> thrombotic risk from withholding the drug
- Hold ASA day of surgery
- Resume aspirin approximately 24 hours (or the next morning) after surgery
  - Along as there is adequate hemostasis
What about Clopidogrel?

- Stop clopidogrel
  - at least 5 days or
  - preferably, within 10 days prior to surgery
- Continue ASA if at all possible
- However, clopidogrel is used in the context of stents or prior PCI, then may need cardiology consultation.
Variation of a Theme

What if he was on Coumadin?
Mr. Clinical Vignette - 77 years old

- **Past Medical & Surgical Hx:**
  - Poorly controlled DM2 – Last HgbA1C of 14.5%
  - HTN
  - CAD s/p CABG (4yrs ago)
  - Hyperlipidemia
  - Hypothyroidism
  - CKD (baseline BUN/creatinine of 32/2.1mg/dL),
  - Ongoing tobacco abuse
  - Peripheral Vascular Disease
  - Amputation of Hallux of the left foot in 2009
  - GERD
  - **Right Lacunar Stroke ~ 2 months ago**
  - **Atrial Fibrillation**

- **Current MEDS:**
  - NTG PRN
  - Asa
  - Lisinopril
  - Metoprolol
  - Simvastatin
  - Levothyroid
  - Lantus insulin
  - Zantac
  - **Coumadin**

- **ALL:** NKDA
Thromboembolic Risks with Non-Rheumatic Atrial Fib.

- **CHADS-2 Score:**
  - 1 point for
    - CHF
    - HTN
    - Age > 75
    - DM
  - 2 points for
    - Stroke/TIA

- 1 point for HTN
- 1 point for Age
- 1 point for DM2
- 2 points for prior CVA

Total CHADS score 5
# Annual Stroke Risk

## TABLE 2
Annual stroke risk in patients with atrial fibrillation, according to CHADS<sub>2</sub> score

<table>
<thead>
<tr>
<th>CHADS&lt;sub&gt;2&lt;/sub&gt; score*</th>
<th>Adjusted stroke rate† (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.9 (1.2–3.0)</td>
</tr>
<tr>
<td>1</td>
<td>2.8 (2.0–3.8)</td>
</tr>
<tr>
<td>2</td>
<td>4.0 (3.1–5.1)</td>
</tr>
<tr>
<td>3</td>
<td>5.9 (4.6–7.3)</td>
</tr>
<tr>
<td>4</td>
<td>8.5 (6.3–11.1)</td>
</tr>
<tr>
<td>5</td>
<td>12.5 (8.2–17.5)</td>
</tr>
<tr>
<td>6</td>
<td>18.2 (10.5–27.4)</td>
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</table>

*Assessment of the following comorbidities: congestive heart failure, hypertension, age ≥ 75, and diabetes (1 point each), plus history of stroke or transient ischemic attack (2 points).

† Expected rate of stroke per 100 patient-years

Reproduced, with permission, from Snow et al.⁴
Thromboembolic Risks with Non-Rheumatic Atrial Fib.

Albers et al. *Chest*, 2001
### Perioperative Anticoagulation: 2008 ACCP Guidelines

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<th>Atrial Fibrillation</th>
<th>Mechanical Valve</th>
<th>Recommend</th>
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<tr>
<td>CHADS2 = 5-6, recent CVA, or rheumatic AF</td>
<td>Any MVR; older (caged-ball or tilting disc) AVR; recent CVA</td>
<td>Full dose heparin bridge</td>
</tr>
<tr>
<td>CHADS2 = 3-4</td>
<td>Bileaflet AVR plus one additional stroke risk factor</td>
<td>Full or low dose heparin</td>
</tr>
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<td>CHADS2 = 0-2</td>
<td>Bileaflet AVR without AF or other stroke risk factor</td>
<td>Low dose or no heparin</td>
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*Full dose = therapeutic dose of heparin IV or LMWH SC*

*Low dose = DVT prophylaxis dose of heparin SC or LMWH SC*
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- Scott & White Surgical data provided by Department of Data Analysis and Reporting – Judy Jacobs and Teresa Ponder.