Perioperative Medical Care of the Surgical Patient

South College PA Surgery Curriculum

Brian J. Daley, MD
Introduction

• “A chance to cut is a chance to cure”
• “Nothing heals like cold, hard steel”
• Surgery = stress and insults
  – Physiology of surgery
  – Maximize pre-operative condition of patient
  – Preoperative evaluation: H&P
  – Perioperative care: think of what can kill first...
First pants, THEN your shoes
Perioperative medical care:

- Surgical emergency
- Cardiac disease
- Pulmonary disease
- Renal dysfunction
- Liver dysfunction
- Diabetics
- Bleeding disorders
- Malnourished
Perioperative medical care:

- Surgical emergency
  - Trauma
- Cardiac disease
- Pulmonary disease
- Renal dysfunction
- Liver dysfunction
- Diabetics
- Bleeding disorders
- Malnourished
Surgical Emergency

- 76 yo WM “coded” in front of HLVI building; ACLS followed x 20 min with intermittent pulse return; intubated, IVs placed, brought to ER; SBP 60 with HR return
- MICU team called to eval; pt started on Neo-synephrine for bp
- Surgery called when Hct returned 14.2
Surgical Emergency

• What do you want to do?

  • HISTORY & PHYSICAL
    • History? (tailor to situation)
    • VS 70/20 135 16 (IMV) 36.4
    • “Pt is unconscious, intubated, not moving
      - abdomen is very distended, quiet BS”

• Keep DDx in mind during H&P
  • Why can’t he keep a bp?

• What do you want to do about it?
  • Risk of doing something vs. risk of doing nothing?

• What do you need to do before surgery?
Surgical Emergency

• AMPLE history
  – Allergies
  – Medications
  – Past medical history
  – Last meal
  – Events preceding the surgery
44 yo WF who presented to ER today with RUQ three days ago. RUQ U/S showed gallstones. CT scan of the abdomen/pelvis showed gallstones.
“Pre-op this patient”

- History and physical
- Informed consent for operation and blood
- Type and screen or type and cross
- CXR (age greater than 20)
- 12-lead ECG (age greater than 40)
- BMP, M/P, CBC, PT, PTT, INR
- NPO after MN (IV Fluids)
- Pre-op Note
- Pre-op Orders (hep 5000 units SQ, Abx, beta blocker)
- ?Bowel Prep
Perioperative medical care:

- Surgical emergency
- Cardiac disease
  - CHF
  - HTN
  - CAD
- Pulmonary disease
- Renal dysfunction
- Liver dysfunction
- Diabetics
- Bleeding disorders
- Malnourished
Chest Pain Work Up

- History of event
- Physical exam
- 12-Lead ECG
- CXR
- ABG
- Cardiac Panel
- BMP, M/P, CBC, PT, PTT, INR
- Chart Review
Tachycardia

- Delivery O2=1.34 hgb X O2 sat X SV X HR
- Hypovolemia (Think Bleeding)
- Anemia
- Hypoxemia
- MI
- Arrhythmia
- PE
- Pain
- anxiety
Cardiac disease in peri-op period

• CAD can cause any of these
• Risks for CAD:
  – age, sex, HTN, XOL, DM, tobacco
• Modify those risk factors you can...

medical therapy

will cover later...
Coronary Artery Disease

- Definition of CAD....

- **Physiology of surgery:**
  - ↑ myocardial oxygen demand
  - ↑ catecholamines: ↑ HR, ↑ contractility, ↑PVR
  - ↑ HR also causes decreased diastolic filling
    - Coronary arteries fill in diastole
    - Less blood flowing in coronaries: less myocardial O₂ supply
Myocardial Infarction

- Pt without risks has 0.5% chance of MI
  - Pt with risks has 5% chance of perioperative MI
- Perioperative MI has 17-41% mortality
- CAD causes MI....look at PMH
- Risk stratifications:

<table>
<thead>
<tr>
<th>MI Event Timeframe</th>
<th>Reinfarction Rate</th>
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<tbody>
<tr>
<td>MI w/in 3 months of OR</td>
<td>27% reinfarction rate</td>
</tr>
<tr>
<td>MI 3-6 months before OR</td>
<td>10% reinfarction rate</td>
</tr>
<tr>
<td>MI &gt;6 months of OR</td>
<td>5-8% reinfarction rate*</td>
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</tbody>
</table>
Myocardial infarction

- $O_2$ supply / demand imbalance: ANGINA
  - Surgical stress increases demand

- Treatment – “MONAB”
  - Morphine
  - Oxygen
  - Nitroglycerin
  - Aspirin
  - Beta-blockers

- Cardiac panel (troponin, CK-MB), ?Heparin
Prevention of perioperative cardiac events

1) Wait 6 months if possible
2) Beta-blockade*
   • 200 pts with CAD or risk factors for CAD
   • atenolol pre-op and peri-op in ½
   • MI reduced 50% in first 48h
   • 2 year mortality 10% vs 21%
3) Maintain peri-operative normothermia
   • ↓ cardiac events, esp. arrhythmias
4) Treat peri-operative hypertension

Prevention of perioperative cardiac events

5) Invasive monitoring (Swan Ganz) – no help

6) Pre-op CABG (CARP trial) – no difference

American College of Cardiology / AHA now recommends CABG in preop pts who ordinarily meet CABG criteria:

1. L main dz
2. 3V dz with LV dysfxn
3. severe prox LAD stenosis
4. MI despite maximal medical Rx
Prevention of perioperative cardiac events

7) Watch for and treat arrhythmias

Causes?  
"Drugs, electrolytes, ischemia, fluid shifts, body T"

Treatment?  
"underlying cause, rate control, conversion"
Perioperative medical care:

- Surgical emergency
- Cardiac disease
- Pulmonary disease
- Renal dysfunction
- Liver dysfunction
- Diabetics
- Bleeding disorders
- Malnourished
Pulmonary disease

- Patient-related risks
  - Chronic lung dz – wheeze, productive cough
  - Smoking
  - General health
  - Obesity
  - Age?
    - separate from others?

- Procedure related risks
  - Type of anesthesia
    - GETA alone ↓ FRC 11%
    - inhibited coughing peri-op
  - Surgical site
  - Duration of surgery
Modifiable pulmonary risks

- **Obesity physiology**
  - ↓ lung capacity, FRC, VC
  - ↑ WOB
  - hypoxemia

- **Tobacco**
  - Definition of “stopped smoking”...
  - “*When was your last cigarette?*”
“Surgeons as medical doctors”

Smoking cessation

- 83% of patients think MD’s are against smoking
  - 55% think THEIR DOCTOR is against it
- 55% say their MD has never advised to quit smoking
  - despite that 22% say MD inquired of smoking hx
- MD can make a difference
  - 81% have tried to quit if MD says to
  - 61% have tried to quit if MD says nothing
- Pts less likely to try to quit if advised to “cut down”

Pre-operative risk assessment: pulmonary function

- Patient history
  - unexplained dyspnea, cough, reduced exercise tolerance, OSA
- Physical exam:
  - wheeze, rales, rhonchi, ↑ exp time, ↓ BS
  - 5.8x more likely to develop pulmonary complications*
- Pre-operative CXR is mandatory over 40 yo
- ABG
  - no role for routine use
  - result should not prohibit surgery
    - caution if ↑ PaCO₂

* Lawrence et al Chest 110:744, 1996
Perioperative medical care:

- Surgical emergency
- Cardiac disease
- Pulmonary disease
- Renal dysfunction
  - Dialysis dependent
- Liver dysfunction
- Diabetics
- Bleeding disorders
- Malnourished
Renal dysfunction

- Not all renal failure is oliguric
- H&P
- Check BUN/Cr
- Assume DM have CRI
  - Volume status
  - Electrolytes.....*sequelae*?
    - Which ones?
- Drug metabolism
Renal dysfunction

- Dialyze preop to improve electrolytes, volume status
- No K⁺ in MIVF
- Very judicious MIVF while NPO
- *Altered drug metabolism*
- Altered platelet fxn
Perioperative medical care:

- Surgical emergency
- Cardiac disease
- Pulmonary disease
- Renal dysfunction
- Liver dysfunction
- Diabetics
- Bleeding disorders
- Malnourished

Why does hepatic disease cause coagulopathy?
# Child-Pugh Criteria for Hepatic Reserve

<table>
<thead>
<tr>
<th>Measure</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
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<tbody>
<tr>
<td>Bilirubin</td>
<td>&lt;2.0</td>
<td>2-3</td>
<td>&gt;3.0</td>
</tr>
<tr>
<td>Albumin</td>
<td>&gt;3.5</td>
<td>2.8-3.5</td>
<td>&lt;2.8</td>
</tr>
<tr>
<td>Prothrombin Time (PT) increase</td>
<td>1-3</td>
<td>4-6</td>
<td>&gt;6</td>
</tr>
<tr>
<td>Ascites</td>
<td>None</td>
<td>Slight</td>
<td>Moderate</td>
</tr>
<tr>
<td>Neuro</td>
<td>None</td>
<td>Minimal</td>
<td>“Coma”</td>
</tr>
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</table>
Child-Pugh Criteria for Hepatic Reserve

- Predictor of perioperative mortality
  - Class A: 0 - 5%
  - Class B: 10 – 15%
  - Class C: > 25%
- Correct what you can → vitamin K, FFP
- Anticipate bleeding, complications

(more later . . . )
Perioperative medical care:

- Surgical emergency
- Cardiac disease
- Pulmonary disease
- Renal dysfunction
- Liver dysfunction
- Diabetics
- Bleeding disorders
- Malnourished
Patients with special preoperative needs

- 37 yo WM with longstanding type I DM and with ESRD for 20 years, HD dependent, severe retinopathy, and s/p multiple LE amputations for non-healing diabetic ulcers.
- Admitted for Abx for wound infection
- Evening RN calls you for “nausea and sweating”
Patients with diabetes

- Possible occult CAD (diabetic neuropathy)
  - Look for “anginal equivalents”
    - SOB
    - Nausea
  - “All patients with longstanding DM have CAD”
- EKG, cardiac enzymes
Patients with diabetes

- Hyperglycemia facilitates infection
  - Warm medium with food for bacteria
- Treat suspected infection aggressively
- Tight glucose control has been shown to improve outcome of septic patients in the ICU
Perioperative medical care:

- Surgical emergency
- Cardiac disease
- Pulmonary disease
- Renal dysfunction
- Liver dysfunction
- Diabetics
- Bleeding disorders
  - Iatrogenic
  - Inherited
- Malnourished

Reasons patients are placed on anticoagulants:
- Atrial fibrillation
- Prosthetic heart valve
- DVT or PE
- CVA or TIA
- Hypercoagulable state

REVIEW: Merritt J Thrombosis and Thrombolysis 13(2), 97-103, 2002
Evaluation of patients for hemostatic disorders

• **History:**
  – Easy bruising, epistaxis
    • Cut when shaving
    • Heavy menstrual bleeding
  – Family history of bleeding disorders
  – ASA / NSAID’s
  – Renal disease
  – Hepatic disease (EtOH)

• **Physical:**
  – Ecchymoses
  – Hepatosplenomegaly
  – Excessive mobility of joints or excess skin laxity
  – Stigmata of renal or hepatic disease
Laboratory tests of bleeding function

- Prothrombin time (PT/INR)
  - Measures factor VII and common pathway factors (factor X, prothrombin/thrombin, fibrinogen, and fibrin)

- Partial thromboplastin time (PTT)
  - Intrinsic pathway and common pathway

- Platelet count quantifies platelets

- Bleeding time estimates qualitative platelet function
Patients who are iatrogenically anticoagulated

• **Coumadin** (warfarin)
  – Blocks vit K dependent factors (II, VII, IX, X)
  – Effect measured with PT / INR
  – *In general, want patients* < 1.5 (*ACS: 1.7*)
  – $t_{\frac{1}{2}} = 48h$
  – Reaction: **Why?**
Patients who are iatrogenically anticoagulated

• Aspirin (ASA)
  – Irreversibly acetylates COX, which blocks production of thromboxane A2
  – decreases platelet aggregation
    • Physician’s Health Study\(^1\)
      – primary prevention trial of 22,000 MD’s
      – 325 mg ASA qod vs. placebo
      – At 5 yrs, Rx group had 87% reduction in incidence of MI
    • MONAB....
  – Renders platelet dysfunctional for life
  – Half-life of platelet: 1 week

Patients who are iatrogenically anticoagulated

- Heparin – potentiates antithrombin III
  - Effect measured with PTT
  - $t_{1/2}$ 45-90 minutes
  - Check PTT q6h
  - Dosing:
    - Therapy: bolus dose 80 U/kg; IV infusion 18 U/kg/hr
    - Prophylaxis: 5000 U sq BID
- Reaction: *Heparin Induced Thrombocytopenia*
- Fragmin (dalteparin), Lovenox (enoxaparin)
  - Require less frequent monitoring
Patients who are iatrogenically anticoagulated

• Thienopyridines
  – inhibit ADP-induced platelet aggregation
  – Plavix (clopidogrel)
  – Ticlid (ticlopidine)

• GIIb/IIIa inhibitors
  – Abciximab
    • Murine chimeric monoclonal antibody Fab fragment
      that binds to the GP IIb/IIIa receptor
Inherited bleeding disorders

- Hemophilia A
- Hemophilia B (Christmas disease)
- Protein C or S deficiency
- von Willebrand’s disease
- Factor V leiden

- Antithrombin III deficiency
- Anti-phospholipid antibody syndrome
- ... Other factor deficiencies (rare)
Warfarin-induced skin necrosis

• protein C and S are vitamin K-dependent anticoagulants
  • shorter $t_{1/2}$ than factors II, VIII, IX, X
  • depleted first upon initiation of coumadin

• Transient hypercoagulation
Perioperative medical care:

- Surgical emergency
- Cardiac disease
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- Bleeding disorders
- Malnourished
Patients who are malnourished

• Proteins are essential for healing and regenerating tissue

• Malnourished patients have
  – Higher wound complications (dehiscence) and greater anastomotic leak rate
  – More postoperative muscle weakness (diaphragm)
  – Longer time in rehabilitation
Treating malnourishment

- “If the gut works, use it.”
- TPN vs. enteral feeds
- Preoperative “bulking up”
  - Gastric and esophageal cancers
    - Why are they malnourished?
  - How do you bulk someone up?
Perioperative medical care:  
(SUMMARY)

- Surgical emergency ➔ AMPLE history
- Cardiac disease ➔ Wait 6 months, Beta block, MONAB
- Pulmonary disease ➔ Risk stratify (patient, family, surgery team)
- Renal dysfunction ➔ Monitor e’lytes, volume closely
- Liver dysfunction ➔ Correct coagulopathy; risk stratify
- Diabetics ➔ Glucose control, anginal equivalents
- Anticoagulated ➔ Reverse anticoagulation if tolerated
- Malnourished ➔ Feed enterally
Patient Flow

Pre - op Assessment and Plan

- Pre-op Orders
- Operation
- Post – op Orders
In Class Assignment

- Write Pre-op Orders, Op Note and Post – op orders
- 48 y/o woman with gallstones, NKA on Zoloft and Avandia
Pre-op Orders

- Define Procedure
- NPO
- Consent
- Antibiotics, prophylaxis
Op Note

- Pre/Post op Diagnosis
- Procedure
- Surgeons
- Findings
- Specimens
- EBL, Fluids, drains, tubes
- Disposition
Post op Orders

- Where to, Dx, Doctor
- Nursing (VS, diet, activity, I&O)
- IV
- Meds
- Tubes
- Treatments
- Tests
- Alarms
Post op care

- 60% of surgery is outpatient
- New category of post op care
- Starts before OR in office
- Reinforced pre-op
- Seal the deal post-op
Answering service

- Call about pain
- More calls about pain
- Family member calling about pain
- Post–op expected outcomes or complications
- Unexpected events
Answering service

- Know the patient
- Know the source
- Know the problem
- Know the expected outcomes
- Know when to refer
  - Tonight
  - Tomorrow
  - As scheduled
Recovery Room Calls

- Emergence from anesthesia
- Emergent post–op problems
- Bleeding, bleeding, bleeding
- Loss of reduction/repair/tube
- Follow up tests
- Coordinate HR, >BP, chest pain, pain pain with anesthesia
Tubes

- ET
- NG
- Chest
- Drain
- G/J
- Ostomy
- Foley
Care of Tubes

• Document reason
  – Why we did this…

• Measurement
  – How much out or in….

• Purpose
  – IS it doing what we wanted it to do….

• Pitfalls
Post – op Fever

- Wind
- Water
- Wound
- Walking
- Wonder Drug
Atelectasis

- Micro – collapse of alveoli
- Begins with decreased FRV
  - Decrease ventilation
  - Decreased volume
- Precursor to pneumonia
- Increase Respiratory Volumes
Wound

- Surgical Sites
  - Superficial
  - Superficial Space
  - Organ Space
- Signs of Infection
  - Rubor
  - Tumor
  - Dolor
  - Calor
Wound Dehiscence

- Technical Failure
- Infection
- Signs
  - Copious serosanguinous fluid
  - Cover with sterile dressing
  - To OR
Pain

- Nocioreceptors
- Cerebral Factors
- Anxiety
- Inflammation
- Treatment
  - Reduce Inflammation
  - Cerebral Treatment
  - Manage Expectations
Pain Management

- **Adjuncts**
  - Rest, Ice, Compression, Elevation
  - Rx

- **NSAI**
  - First Line
  - Second Line
  - Acute v. Chronic
Prophylaxis

- **DVT**
  - Chemical
  - Mechanical
- **Peptic Ulcer**
  - Acid Reduction
- **Infection**
  - Antibiotics
  - Skin Prep
  - Dressings