Management of the Elderly Orthopedic Patient

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Disclosures

• Lisa Miura, MD – None

• Joseph Schenck, MD - None
Objectives

**Know and understand:**
- Elements of perioperative management of selected medical problems
- Management of common postoperative complications such as hematomas and wound infections
- Best care practices related to the care of surgical orthopedic geriatric patients

*Focus today on hip fracture and elective total hip and knee surgeries*

Hip Fracture Management

- Co-management model
- Preoperative evaluation
- Timing of surgery
- Warfarin reversal
- Venous thromboembolism (VTE) prophylaxis
- Post-hospital care
- Best care practices
Hip Fractures

- Approximately 320,000 per year in the U.S.
- >90% occur in those greater than age 50
- Associated with high mortality and impairment of post-fracture activities of daily living
- Surgical disease but medical consultation usually involved and associated with improved 1-year mortality

AHRQ 2011; Hung, JAMA 2012; Adams, JAGS 2010

Co-management Model

- Usually consists of hospitalists co-managing patients with Orthopedic Surgery jointly or as the primary team
- **Multidisciplinary model outcomes**
  - Reduction in hospital mortality
  - Variable on lengths of stay – most shortened
  - Reduction of hospital complications
    - Delirium, urinary retention, infection, pneumonia

Marcantonio, JAGS 2001
Vidan, JAGS 2005
Pedersen, JAGS 2008
Case Study

- Mrs. M, 80 year old female with atrial fibrillation (on warfarin), HTN and mild dementia
- Presents to the Emergency Department with severe right hip pain after a ground level fall in her home
- Diagnosed with a right femoral neck fracture

**What is the best plan of care for this patient?**

Preoperative Evaluation

- Most common orthopedic postop complications:
  - Cardiopulmonary events
  - Thromboembolism
  - Infection
  - Bleeding
  - Delirium
  - Pressure ulcers
- Medical consultants often used to manage these issues

_Zuckerman, J Bone J Surg 1995_  
_Dolk, Upsala J Med Sci 1989_  
_Ochs Clin Geriatr Med 1990_  
_McLaughin, JGIM 2006_
Preoperative Evaluation

- Many hip fracture patients with significant underlying comorbidity

- **Goal: to ensure patient is medically optimized**
  - Coagulopathy: INR>1.6
  - Respiratory failure
  - Electrolytes: Na, K, HCO3
  - Heart failure
  - Sepsis
  - UTI
  - Pneumonia

McLaughlin, JGIM 2006

Preoperative Evaluation

**Case Study**: 80 yo with right femoral neck fracture

- Use of pre-printed order sets for admission/postop
  - Diagnostics
  - Geriatric-friendly medications
  - Pressure ulcer prevention
  - Antibiotic prophylaxis

- In ED or if direct admission
  - EKG
  - Chest x-ray
  - UA
  - Labs: Type & Screen, CBC, Comprehensive, PT/INR/PTT, vitamin 25-hydroxy-D, iPTH

Miura, JAGS 2009
Timing of Surgery

- **Issues with delayed surgery**
  - Delayed functional recovery
  - Complications of prolonged bedrest
  - Pain
  - Increased costs
  - Increased mortality

*Balance with need to stabilize coexisting medical conditions*

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Timing of Surgery

- Prospective, cohort study
- Multicenter: 4 hospitals
- N = 1,206 patients age >50 years

**Outcomes:**
- Benefits of early surgery
  - Decreased pre-operative pain
  - Shorter length of stay by 1.94 days (p<.001)
  - Fewer postoperative complications (OR 0.26, 95% CI 0.07-0.95)
- No effect on mortality or locomotion

*Orosz, JAMA 2004*
Timing of Surgery

• Meta-analysis of 16 observational studies on surgical timing and mortality
• N = 257,367 patients
• Patients without active comorbid illness

Outcomes:
• Delay in surgery >48 hours associated with:
  • Increased mortality at 30 days (OR 1.41, 95% CI 1.29-1.54, \(P < .001\))
  • Increased mortality at 1 year (OR 1.32, 95% CI 1.21-1.43, \(P < .001\))

Shiga, Can J Anaesth 2008

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Timing of Surgery

• Meta-analysis of 16 observational studies on mortality and postoperative complications
• N= 13,478 patients

Outcomes:
Risk of mortality lower with earlier surgery within 72 hours compared to delayed surgery (RR 0.81, 95% CI 0.68-0.96, \(P = .01\))
• Earlier surgery also reduced:
  • Pneumonia (RR 0.59, 95% CI 0.37-0.93, \(P = .02\))
  • Pressure ulcers (RR 0.48, 95% CI 0.34-0.69, \(P < .001\))

Simunovic, CMAJ 2010
Timing of Surgery

- Prospective, cohort study
- Measured time to surgery, reasons for surgical delay, mortality and complications
- N = 2,250 patients

Outcomes:
- Median time to surgery: 72 hours
- No increase in inpatient mortality or complications with surgical delays <120 hours
- Longer delays associated with higher mortality and medical complications

Vidan, Ann Intern Med 2011

Timing of Surgery

SUMMARY
- If medically stable, perform early surgery within 24-48 hours
- If active medical issues, address these first:
  - CHF
  - Active infection/sepsis
  - Unstable angina
  - Respiratory failure

*However, avoid delaying surgery greater than 72 hours*
- Increased risk of mortality, pain, and complications
Case Study

Case Study: 80 yo with right femoral neck fracture

- No other acute medical issues
- Availability of surgeon and OR
- Preoperative evaluation notable for:
  - INR 2.5

- Is she ready for surgery?
- What to do with her elevated INR?

Coagulopathy

- ~6-11% with therapeutic anticoagulation levels causing surgical delay
- Usually due to vitamin K antagonist, warfarin
- Most surgeons prefer INR < 1.5
- Vitamin K commonly used to reverse anticoagulation
  - Initial effects in 4-6 hours
  - Peak action 24-36 hours
  - Can decrease surgical delay by 44 hours without increasing complications
- Consider a vitamin K protocol
- For prompt reversal: fresh frozen plasma or prothrombin complex concentrates

Leonidou, J Ortho Surg 2013
Coagulopathy

<table>
<thead>
<tr>
<th>INR value</th>
<th>Surgery or Procedure within 24 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>INR &gt; 1.5 but &lt; 1.9</td>
<td>Vitamin K 0.5 – 1 mg IV slow IV (60min)</td>
</tr>
<tr>
<td>INR &gt; 1.9 but &lt; 3</td>
<td>Vitamin K 1 – 2 mg slow IV (60min)</td>
</tr>
<tr>
<td>INR &gt; 3 but &lt; 5. No significant bleeding.</td>
<td>For rapid (&lt;12 hours) reversal: Vitamin K 2 - 3mg mg slow IV (60min)</td>
</tr>
<tr>
<td>INR &gt; 5 but &lt; 9. No significant bleeding.</td>
<td>For rapid (&lt;12 hours) reversal: Vitamin K 5 mg slow IV (60min) and recheck INR in 6 hours. Repeat Vitamin K dose per sliding scale.</td>
</tr>
</tbody>
</table>

Recheck INR in 12 hours. If still elevated, may repeat vitamin K doses as above.

Recommendation for preoperative management of elevated (>1.5 INRs) in patients on Warfarin

Case Study

Case Study: 80 yo with right femoral neck fracture

- Use of vitamin K protocol:
  - Vitamin K 2 mg IV x1
  - Warfarin held
  - Repeat INR 1.4
- Medically stable for surgery within 24 hours
- Underwent right hemiarthroplasty
- Bridged with LMWH while warfarin was restarted postoperatively
Venous Thromboembolism (VTE) Prophylaxis

- DVT 50-80%, PE 10-20%, fatal 5-7%
- 40% reduction in VTE with either warfarin, UF heparin, LMWH heparin or fondaparinux
- All patients should have **intermittent pneumatic leg compression**
  - Systematic review of 5 trials, N=487
  - Lower rates DVT (7% without vs. 22% with)
- **Graduated compression stockings**
  - RCT with fondaparinux in 795 patients
  - No difference in prevalence of DVT

Handoll, Cochrane Database 2002

VTE Prophylaxis

**Low Molecular Weight Heparin (LMWH)**

- 2012 Chest guidelines give preference
- Reduces risk of asymptomatic DVT by 50%
- More effective than unfractionated heparin
  - Lower incidence of heparin induced thrombocytopenia (HIT)
  - Similar bleeding incidence
- Number of agents available
- Enoxaparin 30 mg SQ q12h or 40 mg daily
- Monitor if spinal/epidural anesthesia used

Falck-Ytter, Chest 2012
Warkentin, NEJM 1995
Nightingale, JAMA 1998
VTE Prophylaxis

Low-dose unfractionated heparin (UFH)
- 5,000 U SQ BID
- Most studied for VTE prophylaxis
- Effective in hip fractures
  - RR of asymptomatic DVT decreased 44% in 6 trials
- 2 systematic reviews LMWH versus UFH
  - 1: Both effective; could not detect superiority
  - 2: LMWH more effective
- Risk of heparin induced thrombocytopenia (HIT)

Handoll, Cochrane Database 2002
Falck-Ytter, Chest 2012

VTE Prophylaxis

Warfarin
- Compared to aspirin (ASA)
  - Significantly reduces VTE compared to placebo or ASA
- Has not been compared with unfractionated heparin
- Compared to LMWH
  - Less effective (DVT 21% warfarin vs. 7% LMWH) but target INR 1.5
  - Systematic review of THA/TKA, LMWH more effective
- Bottom line
  Warfarin is more effective than ASA but less effective than LMWH

Powers, Arch Intern Med 1989
Falck-Ytter, Chest 2012
VTE Prophylaxis

**Fondaparinux**
- Injectable Factor Xa inhibitor
- **Effective:**
  - VTE by day 11 lower compared to LMWH: 8.3% versus 19.1%
  - *Option for first-line therapy according to Chest 2012*
- **Issues:**
  - More bleeding events compared to LMWH
  - Increased bleeding in <50 kg and frail elderly
  - More costly

_Eriksson, NEJM 2001_
_Falck-Ytter, Chest 2012_

VTE Prophylaxis

**Direct thrombin or Xa inhibitors (aka Direct oral anticoagulants (DOACs))**
- Dabigatran, apixaban, rivaroxaban
- Do not require monitoring like warfarin
- Effective for hip and knee replacement surgeries
- Comparable to LMWH for VTE prevention

*Not studied in hip fracture population*
VTE Prophylaxis

Aspirin (ASA)

- Meta-analysis of 10 studies, ASA reduced VTE compared to placebo (OR 0.69 DVT and 0.40 PE)
- LMWH versus ASA:
  - RCT of 251 hip fx, LMWH with RRR 37% compared to ASA
  - RCT of 13,356 hip fx compared ASA or placebo; ¾ also received either LMWH or compression stockings
    - ASA with lower incidence VTE vs. placebo
    - No benefit in subgroup of ASA + LMWH
    - No difference all-cause mortality
    - ASA increased incidence of bleeding complications
- **Bottom line:** *ASA alone provides some VTE protection but suboptimal compared to other agents*

Antiplatelet Trialists’ Collaboration, BMJ 1994
Gent, Circulation 1996
PEP Trial, Lancet 2000

VTE Prophylaxis

Timing and Duration

- **Timing:**
  - *Chest 2012 guidelines:* suggests LMWH either 12 hr pre-op or 12 hr post-op
  - **Duration:** autopsy studies suggest that more prolonged prophylaxis warranted
    - *Chest 2012 guidelines:* consider extending prophylaxis up to 35 days, rather than 10-14 days
    - **AHRQ 2012 guidelines:** prolonged prophylaxis >21 days compared to 7-10 days decreased risk for VTE for THA patients but increased minor bleeding

Sobieraj, Ann Int Med 2012
Falck-Ytter, Chest 2012
VTE Prophylaxis

SUMMARY
• Data supports LMWH as first line therapy in hip fractures
• Warfarin effective, especially if patient on it at admission
• UF heparin effective but less than LMWH; also associated with HIT
• Aspirin least effective
• No data for use of DOACs in hip fracture patients
• All patients should have intermittent compression devices
• Recommendation: LMWH 12 hours post-op and continue for 21 days

Case Study

Case Study: 80 yo with right femoral neck fracture
• By POD #3 ready for discharge
• PT/OT: Ambulating to door
• Pain controlled
• Medical issues stable
• Team determined that skilled nursing facility (SNF) was the best setting
Post-Hospital Care

- Average # setting transitions high: 3.5
- 1/3 of hip fractures are rehospitalized in 6 months
- 89% due to nonsurgical reasons
- Mainstay of post-hospital care is rehabilitation
- Difficulty determining best single strategy
  - Patient’s capability, motivation, social support, comorbid conditions, availability
- Duration varies
- Follow-up with Orthopedics
  - Repeat hip x-ray at ~6 weeks (Fixation)/3 months (hemiarthroplasty)
- Recovery can take up to 1 year

Boockvar, JAGS 2003 & 2004
Handoll, Cochrane Database 2007

Hip Fx Best Care Practices

- Correct major clinical abnormalities
- Early surgery < 72 hours
- Regional anesthesia may reduce risk of delirium
- VTE prophylaxis
- Antibiotic prophylaxis: infection risk reduction 60%
- Pressure ulcer prevention measures
- Scheduled pain medications/protocol
- Delirium prevention
- Transfusion to maintain Hb 8 g/dL
- Early ambulation
- Nutrition supplementation
- Bisphosphonates and fall prevention

Hung, JAMA 2012
Orthopedic Management

- Weight Bearing Status
- Technique
- Wound Management
  - Dressings
  - Dehiscence
  - Seroma
  - Hematoma
  - Infection
- Perioperative Complications
- Frontier

Hip Fracture Types

- Femoral Neck fractures
  - Nondisplaced
  - Displaced
- Intertrochanteric Femur Fractures
  - Stable
  - Unstable/Subtrochanteric pattern
Weight Bearing Status

**Geriatric Fractures**
- Fracture type
- Surgeon preference
- Surgeon factors
- The Reality: People will splint themselves

**Elective Hip and Knee replacement**
- Weight Bearing as tolerated with fall precautions
- Hips: precautions
- Knees: Aggressive AROM

**Femoral Neck Fracture Patterns**

=Garden Classification 1961
- I: Valgus impacted or incomplete
- II: Complete non-displaced
- III: Complete partial displacement
- IV: Complete full displacement
Weight Bearing Status

Fracture Pattern
• 68 yo female GLF with nondisplaced femoral neck fx

Weight Bearing Status

Fracture Pattern
• 80 yo male GLF with displaced femoral neck fracture
Weight Bearing Status

Fracture Pattern
• 84 yo female GLF with displaced femoral neck fracture

Weight Bearing Status

Fracture Pattern
• 72 yo female GLF with comminuted peritrochanteric fx
Weight Bearing Status

Fracture Pattern

- 71 yo male GLF with ESRD, DM, Weight 155kg, on warfarin comminuted peritrochanteric fx

Early Weight Bearing
Post-Op Immediate WBAT

Rapid Healing
Technique

Technique
Technique

**Surgical wound management**

- Minimize surgical trauma
  - Seromas
  - Hematomas
- Irrigation
  - Antibiotics in irrigation of no benefit
  - Hemostatic agents
    - Efficacy?
- Infiltration
- Closure
- Dressing

*Barnes, Am J Infection Control 2014*
Wound Management

- Closure
- Staples, sutures, wound vacs, skin adhesives
  - Surgeon preference
  - Conflicting data as to infection rates
  - Sealing it makes some sense
    - Incontinence

Wound Management

**Dressings**
- Occlusive vs. non-occlusive vs. none
- Surgeon preference
- Antimicrobial impregnated dressings may be better
- Patient dependent factors
  - Incontinence: skin adhesives
  - Obesity: wound vacs
Wound Management

Dressings
• General guidelines
  • Keep clean and dry
  • Avoid saturation and leaving an old saturated dressing in place
  • When in doubt, change it
  • Do not stretch tape across skin

Wound Management

Dehiscence
• Risk factors: Edema, hematoma, diabetes, obesity, frail skin, trauma
• Call surgeon, if no response, send to hospital/Emergency Department
Wound Management

**Seroma**
- Call surgeon
- Manage with dry dressings
- Do not un-roof blister
- Debate as to whether the fluid is colonized with coag-negative Staph

Wound Management

**Hematoma**
- Surgical wounds
  - Total Knee hematoma can be devastating
  - Knee immobilizer; Call surgeon
  - Risk factors: fracture type, anticoagulation, elderly, diabetic, obesity
Wound Management

**Hematoma**
- Trauma
  - Rest soft tissues, warm moist compresses/K-pads
  - Monitor for signs of infection, skin loss/sloughing

Wound Management

**Infection**
- Surgical wounds
  - Call surgeon. Do not aspirate/open.
  - Contact surgeon prior to administration of antibiotics

10/10/2016
Orthopaedic Post-Operative Management

- Staples out 14-21 days
- Bedside x-rays if unable to transfer
  - Cost-effective
  - Humane management
- Checking fracture healing vs. implant position
- Duration of anticoagulation
  - 3-4 weeks?
  - Relative to mobility status delta vs. baseline?
- Physical therapy

Peri-Operative Complications

- Mortality
  - 30 day (as high as 10%)
  - 1 year (as high as 30%)
- Medical
  - CV (up to 33%)
  - Respiratory
  - Urinary (up to 60%)
  - Cognitive and neurologic (10-33%)
  - Endocrine/Metabolic (20-70%)
  - DVT/PE (up to 27%)
- Reduction in level of independence, ambulatory status

Carpintero, World J Orthop 2014
Post-Operative Complications

**Nondisplaced femoral neck fractures**
- Nonunion (5-30%), AVN, post-traumatic osteoarthrosis, infection

**Displaced femoral neck fractures**
- Related to implant, dislocation (0.5-10%), periarticular fracture, leg-length inequality, infection (2-20%), acetabular erosion
Post-Operative Complications

**Intertrochanteric femur fractures**
- Surgeon factors
- Infection, leg-length inequality, post traumatic DJD, malunion, nonunion, implant failure, hematoma

Frontier

**Total hip replacement**
- Patients are living longer, more active
- Higher risk, higher reward

**Regional anesthesia**
- Femoral nerve blocks
  - Lower narcotic usage

**Tranexamic acid**
- Antifibrinolytic
- Indisputable reduction in blood loss in total joint surgery
  - Transfusion rates markedly reduced; appears to be safe
- May be useful in hip fracture setting
  - Study in progress at OHSU involving intertrochanteric/subtrochanteric femur fractures

*Poeran, BMJ 2014*
Case Study

• 62 year old female who presents with a right subtrochanteric hip fracture after pivoting her hip

• Previous bilateral thigh pain, right greater than left for 2 months prior to fracture

• Oral bisphosphonate use for 6 years for osteoporosis (DEXA scan T score of – 2.6)

Thoughts?

FIGURE 1: Plain radiograph taken in anteroposterior view showing a right subtrochanteric hip fracture.
Atypical Hip Fractures

• Long-term use of bisphosphonates (BP’s) can paradoxically induce unusual fractures by suppressing bone remodeling
• Increased fracture risk reported in those on bisphosphonate therapy > 3 to 9 years
• In 70%, prodrome of weeks or months of thigh or groin discomfort before fracture
• 2013 specific diagnostic/imaging criteria by task force
• Delay in diagnosis and treatment may result from a lack of knowledge of this condition


Atypical Hip Fracture Key Points

• Atypical fractures are rare

• Clinicians should be alert to patient on prolonged bisphosphonates who present with bilateral thigh pain

• Benefit of fracture prevention with bisphosphonates clearly outweigh risk of atypical fracture

• Consider drug holiday for selected patients if cumulative duration of bisphosphonate therapy surpasses 5 years
Summary

• Review of the perioperative care of the orthopedic patient

• Best care practices for hip fractures

• Management of the most common postoperative complications

• New trends

Questions?

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