

Care of the Hip Fracture Patient

An Evidence Based Review

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Outline

- **Hip Fracture: Some Background**
- **Preoperative Assessment and Cardiac risk stratification**
- **Perioperative Beta Blockade**
- **Other Perioperative Management Options**
- **Prevention of Venous thromboembolic events (VTE)**
- **Postoperative Care**
- **Delirium**
- **Other complications following surgery**
- **Prevention of Future Fractures**
- **Discharge Planning**

The Internists/Family Physician's Role in the Care of the Hip Fracture Patient...

- **Case:**

- **84 year old man with mild dementia who lives at an assisted care facility is found on the floor complaining of severe hip and groin pain.**
- **He is taken to the ED and found to have an intertrochanteric hip fracture.**
- **Because of his past history of a CABG 15 years ago, HTN, CRI and dementia, he is admitted to the medicine service....**

Questions...

- Men over the age of 90 have a _____% chance of having a hip fracture
 - A. 10
 - B. 20
 - C. 30
 - D. 40
- One year mortality following a hip fracture is nearly _____%
 - A. 5
 - B. 10
 - C. 20
 - D. 50

The Problem: Hip Fractures

- **Fastest growing US population: over 65 (20% by 2025)**
- **Life expectancy at age 65: 18.9 years; 75=11yrs; 85=7 yrs**
- **10% people over age 90 will live to 100**
- **Hip fracture= 2nd leading cause for hospitalization in older patients**

- **Increased incidence with increased age**
 - 4% in men age 64-69, 31% risk in men over age 90
- **Women over age 50: 15% lifetime risk hip fracture**

- **Bad Predictor**
 - **Increased mortality**
 - No significant decline in mortality since 1980s
 - 20% mortality over first year
 - **Decreased functional status**
 - 30% survivors discharged to skilled nursing facility

The Case...

- ***The patient has a mild dementia, but is clear enough to direct you to his advanced directives and DNR form.***
- ***He also is clear that he wishes to proceed with surgery, he was previously ambulatory and independent in his ADLs.***

?Conservative Management

- **Without surgery, many patients left with significant pain, shortened leg, immobility (without surgery, patient will be nonambulatory)**
- **May be option in severely demented, very ill, nonambulatory, or terminal patients if they are comfortable**
- **Goals of surgery: pain control, ambulation, decreased complications**
- **Do Not Hospitalize orders: often opt out clause that includes fracture/injury for symptom control**

Advanced Directives

- **DNR order not contraindication to surgical intervention**
- **Clarify with patient/family/guardian**
 - **UNC anesthesiology will not anesthetize patient unless DNR order is suspended**
 - **Outcome of suspending DNR order: patients with prior DNR order that was suspended during this period who had cardiopulmonary arrest had NO survival benefit**

Capacity and Informed Consent

- **Consistency in response**
- **Able to clearly describe situation and reason why or why not they wish to have or not have procedure**
- **Consistent with prior life events and decisions**
- **Consistent with family and cultural beliefs**
- **Not only related to underlying cognitive ability**

Preoperative Assessment

The Case...

- ***Although he had a CABG years ago, he has had no chest pain, no syncope, no DOE or PND and has no overt evidence of CHF on exam. His exercise tolerance is poor, and his baseline creatinine is 2.1 and albumin is 2.8.***
- ***Does he need further cardiac testing? Should surgery be delayed? What are some possible negative outcome predictors?***

Questions

- Predictors of bad cardiac outcome include:
 - A. creatinine over 2
 - B. insulin requiring diabetes
 - C. CAD with prior CABG but no recent symptoms
 - D. CHF on exam
 - E. all of the above
 - F. A, B, D
- Hip fracture surgery may be considered inherently more risky given that it is usually an emergent procedure in an elderly, frail patient
 - True/False

Cardiac Risk Assessment

- **1970s: Goldman Risk Assessment Tool**
- **1999: Revised Cardiac Risk Index (Lee et al)**
 - Identified independent predictors of adverse perioperative CV events from 2800 patients, then prospectively validated in 1400 patients

Cardiac Risk and Hip Fractures

- **Perioperative myocardial ischemia may occur in up to 35% of elderly patients undergoing HFS**
- **Studies of patients undergoing noncardiac surgery suggest that only 15% with perioperative MI have chest pain, only 53% will have any clinical symptoms**
- **Supports other observations that up to 50% of patients with perioperative ischemia go unrecognized**
- **?hidden symptoms with analgesia, ?symptoms (inc HR, dec oxygen, inc RR) attributed to other causes?**

Cardiac Risk and Hip Fracture

- **Hip fracture surgery inherently more risky**
- **Older patients, more likely to have underlying CAD and other comorbidities**
- **Falls/fracture as marker of frailty and poor outcomes**

Revised Cardiac Risk Index

- **1. Ischemic Heart Disease** (hx MI, q waves , hx of + exercise test, current ischemic type chest pain, use of SL NTG; does not include prior CABG/ PCI unless those features present)
- **2. CHF** (hx CHF, pulmonary edema, PND, rales, s3, cxr edema)
- **3. Cerebrovascular disease** (CVA or TIA)
- **4. DM treated with insulin**
- **5. Creatinine >2**
- **6. High risk surgery** (peritoneal, thoracic, vascular)
- **Risk of CV event (MI, pulm edema, vfib, cardiac arrest)**
 - 0 points: 0.4-0.5% risk
 - 1 point: 0.9 -1.3%
 - 2 points: 4-6.6% risk
 - >= 3 points: 9-11 % risk

Surgical Procedure Risks

- **High (CV risk over 5%)**
 - Emergent major operation in elderly
 - Aortic/major vascular surgery
 - Peripheral vascular surgery
 - Long procedures with fluid shifts/blood loss
- **Intermediate (CV risk <5%)**
 - Carotid endarterectomy
 - Head and neck procedures
 - Intraperitoneal/intrathoracic
 - Orthopedic
 - Prostate
- **Low (CV risk <1%)**
 - Endoscopic
 - Cataract
 - breast

Functional Status and Preoperative Risk

- **Patients reporting poor exercise tolerance known to have increased perioperative complications**
 - **20% vs 10% risk MI/CV event/ CNS event**

Other Preoperative Predictors

- **Serum Creatinine**
- **Dementia**
- **Serum albumin**
 - Significant predictor of 30 day mortality
 - Marker for frailty
- **Predictors of overall mortality and morbidity, not just CV events...**

Question

- A functional study that is “positive” for evidence of ischemia indicates at least a 50% chance of a negative cardiac event in the perioperative period
 - True/False

?Noninvasive Cardiac Testing

- **NPV Dobutamine echo/nuclear perfusion tests near 100% for perioperative MI/CV death**
- **PPV only 20%; Low + LR for perioperative CV event**
- **Negative study may help decrease probability of CV event; positive study does not help much**

Question

- If a patient is at high risk for a negative cardiovascular outcome with surgery, then undergoing cardiac catheterization with stent placement prior to surgery will improve the overall outcome
 - True/False

?Noninvasive Cardiac Testing

- **Big Question: will results of test change management?**
- **Options:**
 - **Perioperative Coronary revascularization**
 - **Perioperative PCI with stent**
 - **Optimize medical management**

Options...? Perioperative coronary revascularization

- **Coronary Artery Surgery Study (CASS) registry: retrospective data**
 - **Patients with CAD/CABG had decreased perioperative CV events compared to similar patients managed medically**
 - **Confounder: mortality with CABG (2.6%) may outweigh any benefit (the “survivors” more likely to survive future surgery)**

? Revascularization

- **Coronary Artery Revascularization Prophylaxis (CARP trial)**
 - Patients with stable but significant CAD randomized to preoperative coronary revascularization (59% PCI, 41% CABG) vs medical management
 - Most patients considered intermediate risk with RCRI ≥ 2
 - No difference in 30 d or 2 year mortality

? Revascularization

- **Stents**

- May be increased CV events immediately after
- Not clear how long to wait
- Stent months/years prior likely same protective value as prior CABG (Bypass Angioplasty Revascularization Investigation, BARI)
- Most suggest need to wait at least 6 months
- Complicated further by use of antiplatelet agents and risk of bleeding

Preoperative Assessment

- **In general, based upon RCRI and data re noninvasive testing:**
 - 1 point: no beta blocker, no test
 - 2 points: beta blocker, med management, no test
 - ≥ 3 points: beta blocker, ?preoperative test to further risk stratify
- In general, thought to do preoperative test in patient one would consider doing in regardless of surgery...

Preoperative Cardiac Assessment: Summary

- **Hip Fracture Surgery considered emergent/urgent**
- **Preoperative cardiac testing with low predictive value**
- **No evidence that invasive intervention with revascularization of benefit, stenting may be of harm**
- **Risk stratify by clinical criteria; little role for noninvasive testing; high risk patients need more intense monitoring for silent ischemia and optimization of medical management**
- **Selected patients: Echo to evaluate LV function**

The Case...

- ***Despite his prior history of CAD, he has not been on a beta blocker. The reason is not clear in the chart work he comes with to the ED.***
- ***Should he be started on a beta blocker? Is there anything else in the preoperative time that may be of benefit to him?***

Question

- Beta Blockers, when used in the perioperative period, have been shown to reduce mortality and CV events, but the overall benefit is likely modest and must be weighed with the risk of significant bradycardia and other side effects in the elderly...
 - True/False

Perioperative Beta Blockers...

- **Widespread acceptance of beta blockers prior to surgery to decrease risk of CV events/death**
- **Theory: decrease catecholamine surge**
- **Guidelines in reality based upon results from one dominant trial; other trials not so overwhelming**
- **Meta-analysis data: 11 RCTs, total 866 patients; overall only 20 total deaths, 18 MI**
- **8 deaths in BB groups, 12 in placebo groups; 2 MIs in BB group, 16 in placebo group**
- **90 episodes brady in BB group, 26 in placebo**

Beta Blockade: Poldermans trial

- **1999 RCT: patients with positive dobutamine echo undergoing major elective vascular surgery**
- **Bisoprolol vs placebo**
- **Decrease in cardiac death: 3.4% vs 17%**
- **Decrease in nonfatal MI: 0% vs 17%**
- **Overall risk of death/MI in placebo group: 34%**

Beta Blockade: Mangano trial

- **Effect of atenolol on mortality and CV morbidity after noncardiac surgery (1996)**
- **Atenolol given before and during hospitalization only**
- **Patients followed for 2 years (n=192/200)**
- **Initial mortality: 0% vs 8% in placebo group**
- **1 year: 3% vs 14% mortality**
- **2 years: 10% vs 21% mortality**

Perioperative Beta Blockade

- **Total numbers heavily skewed by data from Poldermans trial**
 - Patients with positive dobutamine echo undergoing elective vascular surgery
 - Higher risk, higher events
 - Overall data seems to support benefit for BB use with RRR of 15-35% range

Perioperative Beta Blockade: Is the Jury Out?

- **PeriOperative Ischemic Evaluation (POISE) trial**
 - Designed to look at 30 days metoprolol to prevent major CV events with any type noncardiac surgery
 - Planned to enroll 10,000 patients
- **Overall beta blockade in mod/high risk patients reasonable and likely modest benefit with RRR of 30% for CV mortality/nonfatal MI**
- **Higher risk patients= higher number of events,= more likely to see benefit**
- **Unclear in lower risk patients; risk of bradycardia may outweigh benefit in lower risk patients with LOW RISK OF EVENTS**

Preoperative Management

- **Optimize fluid status, renal function**
- **Optimize fluid balance if patient has symptomatic CHF**
- **Other possible medications:**
 - Alpha Blockers
 - Statins
 - Preoperative Pain control

?Alpha Blockers in the Perioperative Setting

- **Best evidence from one large study using Mivazerol (not available in US)**
- **Multiple small studies using clonidine in US**
- **All show modest benefit**
- **Data not too different from Beta Blockade trials**

What about Statins...

- **HMG CoA reductase inhibitors in retrospective trials show decrease in perioperative CV events**
- **Small RCT with 100 patients, atorvastatin vs placebo prior to major vascular surgery (14 day prior, continued for 45 d after): combined outcome of CV death/MI/stroke found in 8% patients with tx, 26% patients with placebo**
- **May be of benefit, not clear during urgent procedures...**

PRE operative Analgesia

- **Theory: decrease catecholamine response**
- **? Preoperative epidural analgesia vs conventional tx**
 - RCT of 77 elderly patients with hip fracture
 - Epidural analgesia started in ED
 - Outcome: CV mortality, MI, CHF, new afib
 - Control group: 7 events (4 deaths) vs 0 events in treatment group
 - Postoperative pain scores higher in control group for 1st 2 days, then equal
 - Problem with study: patients waited 1.6-3.5 days prior to surgery; may see more benefit when wait is longer...

Other Preoperative Management needs...

- **Diabetes:**

- **Metabolic control**
- **Hyperglycemia without prior diagnosis of DM in elderly with acute event = bad predictor**
- **Discontinue oral agents initially**
- **May need to cover with insulin, usually will need some amount of baseline insulin to avoid extreme fluctuations (infusion or glargine)**

Other Preoperative needs

- **Review and discontinue medications that are not needed/potentially harmful**
- **Review for medications that need to be restarted (antidepressants, antihypertensives) once stable**
- **Review for medications that may cause a problem with withdrawal (benzodiazepines, SSRIs)**

Preoperative Traction

- **Previously standard of care**
- **5-10 lbs applied to lower leg**
- **Intended to decrease preoperative pain and improve ease of fracture reduction**
- **Systematic review: no statistical benefit with pain control or surgery**
- **Use will therefore depend upon center and individual surgeon preference**
 - **Preoperative traction should be used for patient comfort only**

Preoperative Antibiotics

- **Given 30 minutes prior to skin incision and continued for 24 hours after surgery**
- **1st generation cephalosporin (cefazolin) or clindamycin**
- **Cochrane review: significant decrease in deep tissue infections and UTI**

Question

- What is the optimal timing for proceeding with surgery?

Timing of Surgery

- **Several earlier studies show that early surgery (first 24-48 hrs after fracture) associated with decreased mortality, pressure ulcers, delirium**
- **Confounder: patients with CHF or other acute issues or more comorbidities more likely to have delayed surgery and bad outcome; not clearly causal relationship**
- **Not ethical to do RCT**
- **General consensus: earlier the better, once stable...**

Surgical Management

- **Intertrochanteric**

- Sliding hip screw
- Long femoral nails for unstable intertrochanteric or subtrochanteric fracture
 - Lower OR time and less blood loss than hip screw

- **Subcapital**

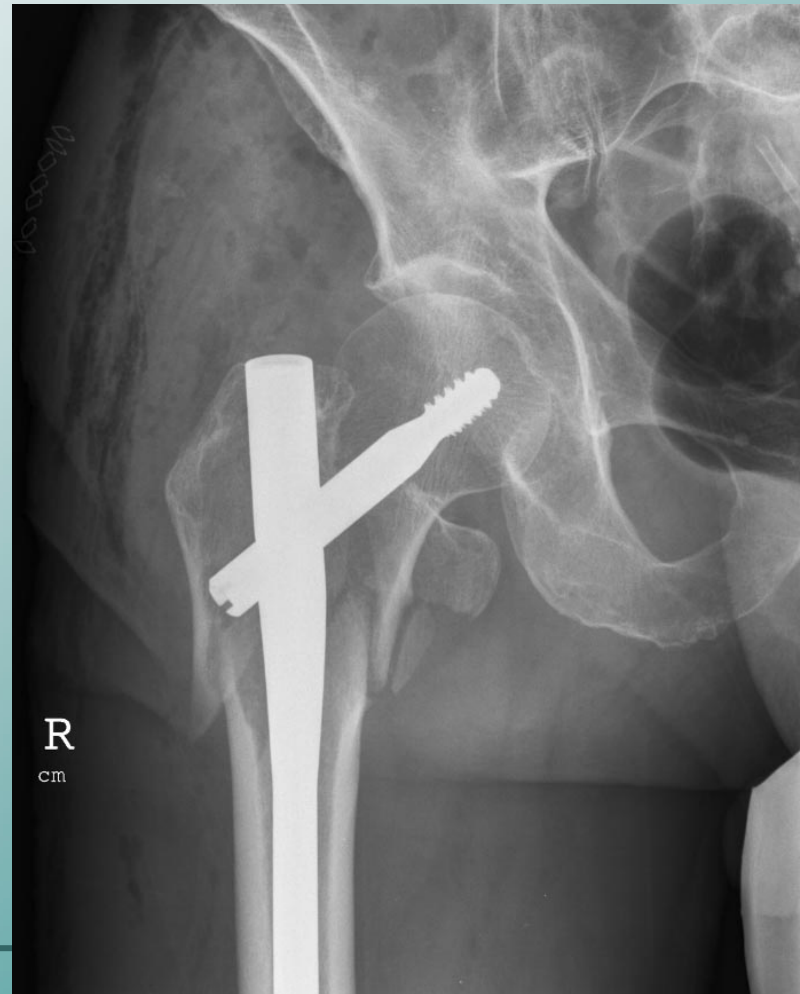
- Nondisplaced: Percutaneous screws
- Displaced: standard is hemiarthroplasty or total hip arthroplasty (vs internal fixation if not displaced); longer/more risk surgery...
 - Hemiarthroplasty = 60 min OR time
 - THR = 150 min OR time

Intertrochanteric Fracture

Sliding hip screw



Intramedullary nail



Femoral Neck Fractures

Screw fixation



Hemiarthroplasty



General or Regional Anesthesia?

- **Lots of small studies and several meta-analyses**
- **Some conflicting data**
- **Largest systematic review: over 2500 patients; 1/3 mortality reduction; decreased DVT by 44%, PE by 55%**
- **Other studies indicate decreased pneumonia, transfusion with regional blockade vs general**

The Case...

- ***He does well with the surgery; The resident wants to know if he should be started on heparin for DVT prevention...***
- ***What is the evidence to support anticoagulation in this setting? Is he at higher risk for bleeding or thrombotic events?***

Question

- List 3 options for prevention of DVT/PE for hip fracture patients that are supported by clinical care guidelines

Prevention of DVT and PE...

- **Clear Guidelines from 7th Conference on Antithrombotic and Thrombolytic Therapy, 2004**
- **Hip fracture patients: High risk for VTE;**
 - DVT 50% without prophylaxis
 - Proximal DVT 27%
 - Fatal PE 1.4-7.5%
- **PE causes 15% deaths after HFS**
- **Factors that increase risk of VTE : advanced age, delayed surgery, general anesthesia**

VTE prophylaxis guidelines...

- **Mechanical devices: data not great, likely better than nothing**
- **Aspirin: studies demonstrate better than placebo, but not as effective as other options**
- **Aspirin plus other forms of anticoagulation: decreases VTE but also causes significant increase in bleeding that outweighs any benefit of doing both...**

VTE prevention guidelines...

- **Multiple studies demonstrate decreased DVT/PE with LMWH**
- **Fondaparinux likely better than LMWH with no increased risk of bleeding (2% major bleeding risk with each)**
- **Low dose Unfractionated heparin (LDUH): 5000 SQ TID appears = to LMWH; may be more effective in HFS patients (increased anticoagulant effect in older patients with lower body weight/sq tissue)**
- **Avoid or adjust dose of LMWH in patients with renal insufficiency**

Fondaparinux

- **Synthetic pentasaccharide that increases antithrombin's ability to inactivate factor Xa**
- **RCT: 1000 patients after HFS, 40 mg enoxaparin vs 2.5 mg fondaparinux SQ**
- **Day 11: 8.3% fond group vs 19.1% enoxaparin group had VTE; risk of proximal DVT 0.9% vs 4.3%; no difference in risk of bleeding**

Fondaparinux...

- **RCT: 600 HFS patients, Fondaparinux vs placebo for 19-23 days (all had 6-8 days)**
- **Placebo: 35% risk VTE, Fondaparinux 1.4% risk; symptomatic VTE 0.3% treatment group vs 2.7% placebo group**
- **Nonsignificant trend toward increased bleeding**
- **No difference in mortality**

Summary of VTE prevention guidelines...

- 1. routine use of fondaparinux or LMWH or LDUH
- 2. can use vit k antagonist (warfarin), INR 2-3
- 3. recommended AGAINST use of ASA alone
- 4. If surgery delayed, begin LDUH or LMWH preoperatively
- 5. If surgery not delayed, begin anticoagulation 24 hours after surgery
- 6. Mechanical prophylaxis better than nothing
- 7. Continue anticoagulation at least 28-35 days after surgery, possibly longer (nearly 3% in fondaparinux study who received drug for first week still had symptomatic VTE if anticoagulation stopped at day 8)

The Case...

- *What analgesia should he be given?*
- *Should he be monitored for a perioperative cardiac event?*
- *What is his risk of delirium? How can this be prevented or managed? What other complications is he at risk for developing?*
- *What would be an appropriate level of discharge care?*

Question

- Delirium has also been associated with poor pain control and lower doses of narcotic agents in clinical trials...
 - True/False

Postoperative Analgesia

- **?epidural vs standard PCA vs intermittent nurse administered morphine**
- **No clear sweeping differences**
- **Some data that epidural route may provide better pain relief; no clear difference in time to recover physical independence**
 - Epidural route still has risk of respiratory depression, especially in elderly patients
 - Presence of epidural catheter in older patients may be difficult if patient develops delirium
 - Long acting, liposomal morphine injected as epidural used in younger patients, but fear of respiratory depression and other complications likely limits use in this population
- **Elderly patients with dementia or delirium may have difficulty with PCA**

Pain control

- **Assessment based upon patient's perception of pain (scales)**
- **May be difficult in very demented patients, although direct questioning may still work**
- **Nonverbal cues: agitation, tachycardia, facial expressions**
- **Morphine most predictable and likely less risk of increasing confusion when compared to other agents (avoid propoxyphene, meperidine)**

Pain Control

- **Some evidence that delirium is also associated with poor pain control; study of elderly hip fracture patients indicated that patients who received lower doses of morphine actually had higher rates of delirium**
- **Problem:** confounder with studies, those at higher risk for delirium may have received lower amounts of narcotics in this nonblinded study

Question

- Postoperative EKG and troponins may be of prognostic value in older hip fracture patients who are at high risk for silent myocardial ischemia
 - True/False

Postoperative Monitoring

- **50% Ischemic events in perioperative period silent**
- **Methods:**
 - Cardiac markers: CK-MB
 - Cardiac markers: troponin
 - Surveillance EKGs
 - Echo

Postoperative Surveillance

- **Cardiac Markers:**

- **CK-MB**

- Marker for ischemia, but not clearly associated with prognostic value

- **Troponin**

- 6 studies with over 2000 patients all demonstrate troponin to be statistically significant independent predictor of intermediate and long term outcomes
- Predictor of mortality and major CV events
- The higher the troponin, the higher the 1 year mortality

Postoperative Surveillance

- **EKG**

- **Study 2004: over 3000 patients undergoing noncardiac procedures, had EKGs in recovery room**
- **Postoperative EKG changes associated with increased risk of MI/pulmonary edema/vfib/ primary cardiac arrest/complete heart block (6.7% with changes vs 1.9% without changes)**
- **Not clear that this is clinically helpful**

Postoperative Surveillance

- **Elderly patients undergoing emergent/ urgent HFS considered high risk for CV event**
- **Highest risk: 2-3 days after procedure**
- **Not clear that routine monitoring with troponin levels is clinically helpful**

Postoperative Wound Drainage

- **Suction drainage with goal to decrease hematoma formation and improve healing**
- **Problem: increased risk of infection**
- **3 RCTS with 300 patients: no difference in infection, wound healing or transfusion**
- **No clear recommendation for this, most orthopaedists no longer use drains**

Foley Catheter: When to Remove

- **Evidence supports removing catheter after 24 hours**
- **Overall incidence of UTI after hip fracture: 25%**
- **May be complicated if patient receiving epidural anesthesia**
- **Urinary retention**
 - Evidence that I/O catheterizations restore bladder function earlier
 - D/C medications that can increase retention (sedatives, anticholinergics)

Question

- What is the most common medical complication following hip fracture surgery?

Bad Postoperative Events: Delirium

- **Most common medical complication following hip fracture**
- **Marker of bad outcome**
 - Increased mortality
 - Increased risk of needing SNF
 - Increased LOS
 - Interferes with rehab and functional status recovery
- **Prevention is key**
 - Multiple studies demonstrate targeted interventions significantly prevent delirium, but no significant impact once delirium develops

Delirium: Risk Factors

- **Advanced age**
- **Underlying cognitive impairment**
- **Prior delirium**
- **Alcohol abuse**
- **Malnutrition**
- **Depression**
- **Type of surgery**
 - **Hip fracture surgery: 30% risk**

Delirium: Things we do to cause...

- **Restraints**
- **Medications**
- **Poor pain control**
- **Foley catheters**
- **Other restraints:**
 - Oxygen tubing
 - Telemetry boxes
 - IV lines
- **Environmental: noise, disturbance of sleep**
- **Lack of hearing and visual aides**

Delirium: Medications...

- **Anticholinergics**
- **Antipsychotics**
- **Antibiotics such as quinolones**
- **H2 blockers, especially cimetidine**
- **Narcotics such as propoxyphene and meperidine**

Delirium after Hip Fracture surgery

- **Metabolic disturbance**
- **Infection: pneumonia, UTI, soft tissue**
- **Medications/polypharmacy**
- **Poor pain control**
- **Urinary retention**
- **Sleep disturbance**
- **Environmental issues/lack of vision/hearing aides**
- **Hypoxemia, hypercapnea**
- **ETOH/benzodiazepine withdrawal**
- **PE**
- **MI**

Delirium: How to Prevent

- **Identify high risk patients**
- **Confusion Assessment Method or other simple screens**
- **Decrease sleep interruptions, improve environment**
- **Family, orientation, sitter if needed**
- **Avoid restraints**
- **Use basic narcotics such as morphine or epidural analgesia**
- **Avoid polypharmacy, no anticholinergics (NO BENADRYL)**
- **Monitor for ischemia, oxygen status, infection**
- **Do not tie down with tubes and lines; WBAT immediately!**
- **Get foley catheter out ASAP**
- **Provide adequate analgesia**
- **Provide adequate bowel regimen**
- **Monitor for urinary retention, I/O caths when needed**

Question

- Antipsychotics have been shown to be of proven benefit in the management of patients with delirium
 - True/False

Delirium and Antipsychotic use

- **Increase use of atypical antipsychotic agents for management of patients with delirium**
- **NO data that this improves outcomes, likely just makes a patient a more sedated delirious patient**
- **NOT approved for this indication**
- **May improve behavioral scores in subset of patients with aggressive behavior or psychotic symptoms associated with their delirium**

Delirium and Antipsychotics: The Downside

- **Side Effects**

- Sedation
- Orthostasis
- Increased delirium
- CV risks, QT prolongation
- Edema

- **FDA Black Box Warning**

- April 2005
- Observation in multiple studies of increased risk of sudden death and stroke in elderly patients

Antipsychotic use

- **Agents and dosing in older patients**
 - Haloperidol: 0.5mg
 - Risperidone: .25-.5mg
 - Olanzapine (zyprexa): 2.5 mg-5mg
 - Quetiapine (seroquel): 25 mg

 - Would not use in elderly under most circumstances:
 - Ziprasidone (geodon)
 - Clozapine

Delirium: summary

- **Look for it and try to prevent it**
- **Tight medication review, avoid notorious agents (especially meperidine, benzodiazepines, and drugs with anticholinergic effects)**
- **Decrease physical restraints (including foleys, tubing, etc)**
- **Get family/caregiver involvement**
- **Avoid Antipsychotics and benzodiazepines!**
- **But treat pain (narcotics as needed)**

Other complications: Malnutrition

- **Poor nutritional status independently associated with increased morbidity and mortality**
- **No great data for NG/PEG feeding**
- **Enteral supplements may decrease postoperative complications, ?decrease LOS**
- **Postoperative parenteral nutrition: increased complications in elderly**
- **Likely marker of bad outcome...**

Other Complications: Pressure Sores

- **Rates 10-40% after HFS**
- **Decrease with frequent turning, early OOB status, WBAT, removal of foley catheter and other lines, foam mattresses**

Other Complications: *Pneumonia*

- **25-50% of all hospital deaths after HFS**
- **Significant cause of later deaths after HFS as well**
- **May be decreased with regional anesthesia, early weight bearing, pulmonary toilet, incentive spirometry**

Other complications: ?transfusion

- **Anemia and worsening anemia common in ill elderly and during postoperative period**
- **Evidence that liberal transfusion to keep Hgb 10-12 may worsen outcome**
- **Data unclear in elderly in postoperative period; may not tolerate as low Hgb; lower Hgb associated with worse outcome, but not clear if causal**
- **Recommend moderately restrictive transfusion guidelines, keep Hgb 7-9, BUT no evidence to support keeping Hgb over 10**

Prevention of Future Fractures

- **Who is at risk for hip fracture?**
 - Age over 65
 - Any prior fracture
 - Benzodiazepine/anticonvulsant use
 - High resting HR
 - Inability to rise from chair without using arms
 - LOW BMI
 - Not walking for exercise
 - Poor depth perception/vision
 - Poor health perception

Fracture Reduction

- **Treatment of Osteoporosis**
- **Prevention of Falls**
- **Prevention of Fracture if patient falls**

Treatment of Osteoporosis

- **70% patients over age 80 have osteoporosis**
- **Hip fracture without major trauma: diagnosis of osteoporosis**
- **More than BMD: older patient more likely to have fracture than younger patient with SAME BMD (falls risk, brittle bones, cognition, visual impairment, etiology of fall, etc)**

Osteoporosis: ?Treatment at Discharge

- **5-6% patients admitted with hip fracture adequately treated for osteoporosis at discharge, only 12% at 5 years**
- **Review of medicare data: only 20% patients with hip fracture had any prescription tx over 2 years; patients over age 74 (at highest risk) were least likely to receive treatment**
- **Discharge medications carry weight!**
- **No significant contraindication in most to treating at time of discharge**

Osteoporosis: Treatment Options

- **Calcium**

- **Fewer than 1/2 adults take adequate amount**
- **1500 mg/day**
- **Calcium and vit d shown to decrease risk of hip fracture**

Osteoporosis: Vitamin D

- **Prior recommendations of 400-800 IU of vitamin D supplementation not nearly adequate**
- **High prevalence of Vitamin D deficiency in frail elders, especially residents of nursing facilities**
- **Vitamin D linked to reduction in falls risk in elderly**
- **Likely effects on muscle as in addition to bone**

Osteoporosis: Vitamin D

- **Recent meta-analysis of 29 randomized trials demonstrated reduction in fractures in patients over the age of 50 given calcium and vitamin D (at least 800 IU/day)**
- **Data not too convincing for Vitamin D replacement at only 400 IU/day (the amount in a standard MVI)**
- **Even moderately low vitamin D levels can lead to elevated PTH levels, therefore increasing bone breakdown and osteoporosis**

Osteoporosis: Vitamin D

- **Can I overdose my patient?**
 - **Not likely**
 - **Vitamin D intoxication leading to hypercalcemia has been associated with doses of more than 50,000 IU/day (or 25-hydroxyvitamin D levels over 150 ng/ml)**
 - **Vitamin D intoxication is NOT seen with doses of up to 10,000 IU /day for up to 5 months**
 - **Vitamin D replacement still needed in Primary hyperparathyroidism!**

Vitamin D: recommendations

- **All people need at least 800 IU /day of vitamin D3 (hard to get in diet alone)**
- **Sensible sun exposure**
- **Check 25-hydroxyvitamin D level in at risk patients (?all older patients, definitely ALL HIP FRACTURE PATIENTS)**
- **?other markers such as PTH (elevated PTH levels associated with vitamin D levels less than 40 ng/ml-75-100nm/L)**

Vitamin D deficiency: Treatment Recommendations

- **50,000 IU vitamin D2 every week for 8 weeks, repeat 25-hydroxyvitamin D level, repeat for additional 8 weeks if still less than 30 ng/ml**
- **Maintenance dose of 50,000 IU Vitamin D2 every 2-4 weeks**
- **Goal: 25 hydroxyvitamin D levels 30-60 ng/ml and normal PTH level**
- **Same replacement treatment for primary hyperparathyroidism (will not result in hypercalcemia!)**

Osteoporosis: Treatment Options

- **Calcitonin**

- **Acute pain with vertebral compression fractures**
- **Not as effective as other options**

Osteoporosis: Treatment Options

- **Estrogen replacement**
 - FDA approved
 - Limited use after HERS trial
 - Other options: Selective Estrogen Receptor Modulators (Raloxifene)

Osteoporosis: Treatment Options

- **Bisphosphonates**
 - Decrease bone resorption
 - Decrease in hip and vertebral fractures
 - Alendronate, risodronate
 - IV: pamidronate, zolendronate
 - Ibandronate (Boniva): once monthly
 - Those at highest risk of fracture (i.e., prior fractures) shown to have greatest benefit

Bisphosphonate: concerns

- **Risk of esophageal irritation**
 - Usually overestimated
 - Not contraindicated: dilated benign strictures, hx PUD, GERD
- **Bisphosphonate Associated Osteonecrosis**
 - Jaw osteonecrosis in patients with underlying dental disease, usually IV preparations
 - CASE REPORTS: Likely overestimated!!!
- **? Decrease in wound/bone healing: again, case reports that likely overestimate any true problem**
- **Contraindicated in patients with renal failure**

Zoledronic Acid

- **New evidence from Health Outcomes and Reduced Incidence with Zoledronic Acid Once Yearly (HORIZON) Recurrent Fracture Trial**
- **RCT of over 2000 patients with hip fracture, allocated to either IV zoledronic acid vs placebo within 90 days of fracture, followed for nearly 2 years**
- **All patients received Calcium and Vitamin D**
- **Enrolled patients were unable/unwilling to take an oral bisphosphonate**
- **No patients on recent oral bisphosphonates included**

HORIZON trial: Zoledronic Acid

Outcome	Zoledronic Acid	Placebo
New Fracture	8.6%	13.9%
Mortality	9.6%	13.3%

Zoledronic Acid...

- **Concerns:**
- **No increased risk of jaw osteonecrosis, poor healing, atrial fibrillation seen at 2 years**
- **Criticism of study: No head to head trial looking at IV zoledronic acid vs oral bisphosphonates**

Zoledronic Acid: Recommendations

- **Evidence to suggest decrease future fracture rate and decreased mortality with the use of once yearly IV zoledronic acid in patients with hip fractures**

PTH: Teriparatide

- **Intermittent PTH: optimize bone strength**
- **Improved BMD, decreased fractures**
- **SQ, expensive**
- **Option for severe osteoporosis, those on bisphosphonates for 7-10 years, those who cannot tolerate oral bisphosphonates**
- **Not for use in combination with bisphosphonate**

Fracture Reduction: Prevention of Falls

- **Home assessment**
- **Rehab**
- **Strengthening and gait assessment**
- **Assistive devices**
- **Cognitive assessment**
- **Urinary incontinence**
- **Medication review**
- **Peripheral neuropathy**
- **Visual impairment**
- **ETOH use**
- **Prior falls: fear of falling cycle**

Fracture Reduction

- **Hip Protectors?**
- **Multiple studies demonstrated conflicting data; many believed that the devices could be effective but were not actually used (poor adherence)**
- **HIP PRO: RCT looking at soft hip protectors to prevent hip fractures in nursing home residents showed NO efficacy, despite good adherence, after 20 months of follow up**

Discharge planning

- **Weight Bearing as Tolerated (WBAT) immediately after surgery**
- **Assistive devices:**
 - Cane (opposite injured hip)
 - Multiple legged canes: increase base support but heavier and more difficult to maneuver; can trip patients...
 - Pick Up walker: good support, but heavier and require cognition to coordinate pick up and move...
 - Rolling walker: good for dementia, bad for parkinsonian gait...

Discharge planning

- **Rehab possible at multiple sites, no clear benefit to one over another**
 - Home
 - Inpatient rehab
 - Subacute rehab/SNF

Putting It All Together...

Summary Guidelines: Evidence Based Care of the Hip Fracture Patient

- **Preoperative assessment: Capacity, delirium risk, cardiac risk assessment based upon the revised criteria which includes creatinine and other markers**
- ***Noninvasive testing for cardiac assessment does not usually make sense prior to HFS***
- **Echo and evaluation for CHF OK, but do not delay surgery**
- ***Surgery should proceed as quickly as possible (24-48 hrs) once patient is medically stable; surgery not emergent***
- ***Perioperative beta blockers, beginning prior to surgery, are reasonable in patients at moderate or high risk (most patients with HFS), but benefit expected is modest***

Summary of Guidelines: Evidence Based Care of the Hip Fracture Patient

- *If possible, regional anesthesia rather than general anesthesia*
- **Postoperative care: WBAT immediately, removal of foley catheter after 24 hours, adequate pain control, aggressive prevention of pressure sores, removal of lines/boxes ASAP, surveillance for pneumonia**
- *VTE prophylaxis: LDUH, LMWH if normal creatinine; would not combine with aspirin; begin anticoagulation prior to surgery if surgery is delayed*
- **VTE prophylaxis should be continued 3-4 weeks; consider longer in high risk patients**

Summary of Guidelines: Evidence Based Care of the Hip Fracture Patient

- ***Follow for delirium; avoid medications such as anticholinergic agents; try to avoid restraints and antipsychotics***
- **Transfuse if unstable, cardiac ischemia, or Hgb <7; DO NOT transfuse to keep hgb greater than 10**
- ***Discontinue all unnecessary medications, stop meds that increase future falls risk***
- **Follow nutritional status and use supplements; no indication for NG/tube feeding**

Summary of Guidelines: Evidence Based Care of the Hip Fracture Patient

- ***Treat Osteoporosis***
 - ***Everyone should get calcium***
 - ***Check Vitamin D levels***
 - ***Replace vitamin D at appropriate dosing (50,000 /week ...)***
 - ***IV zoledronic acid once yearly***

References:

- Beaupre LA. Best Practices for elderly hip fracture patients. J Gen Int Med 2005; 20: 1019-25
- Beliveau MM. Perioperative care for the elderly patient. Med Clinics of North America 2003; 87(1)
- Detsky AS. Predicting cardiac complications in patients undergoing noncardiac surgery. J Gen Int Med 1986; 1: 211-219
- Devereaux PJ. Are the recommendations to use perioperative beta-blocker therapy in patients undergoing noncardiac surgery based on reliable evidence? Can Med Assoc J 2004; 171(3).
- Devereaux PJ. Surveillance and prevention of major perioperative cardiac events in patients undergoing noncardiac surgery: a review. CMAJ 2005; 173(7)
- Eagle KA. ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery: a report of the ACC/AHA task force on practice guidelines 2002
- Eriksson BI. Fondaparinux compared with enoxaparin for the prevention of venous thromboembolism after hip fracture surgery. NEJM 2001; 345: 1298-304.
- Eriksson. Duration of prophylaxis against VTE with fondaparinux after hip fracture surgery. Arch Int Med. 2003; 163: 1337-42
- Foss NB. Effect of Postoperative Epidural Analgesia in Rehabilitation and pain after hip fracture surgery. Anesthesiology 2005; 102(16)
- Geerts et al. The 7th AACP conference on antithrombotic and thrombolytic therapy. Chest 2004; 126(3).
- Goldman. Multifactorial index of cardiac risk in noncardiac surgical procedures. NEJM 1997; 297

References...

- Grayburn PA. Cardiac events in patients undergoing noncardiac surgery: shifting the paradigm from noninvasive risk stratification to therapy. *Ann Int Med* 2003; 138: 506-11.
- Haddleston JM. Medical care of elderly patients with hip fractures. *Mayo clin Proc* 2001; 76(3): 295-8
- Handell HH. Heparin, LMWH, and physical methods for preventing DVT and PE following surgery for hip fractures. *Cochrane database systematic review* 2002
- Hanson MR. Management of dementia and acute confusional states in the perioperative period. *Neurol Clinics* 2004; 22(2)
- Hassan SA. Outcomes of noncardiac surgery after CABG or coronary angioplasty in the bypass angioplasty revascularization investigation (BARI) *Am J Med* 2001; 110: 260-66.
- Herbert PC. A multicenter randomized controlled trial of transfusion requirements in critical care. *NEJM* 1999; 340: 409-17.
- Holick MF. Vitamin D deficiency. *NEJM* 2007; 357: 266-281.
- Kiel DP, Magaziner J, Zimmerman S, Ball L, Barton B, Brown K, Stone J, Dewkett D, Birge S. Efficacy of a Hip Protector to Prevent Hip Fracture in Nursing Home residents: The HIP PRO Randomized Controlled Trial. *JAMA* 2007; 298(4): 413-422.
- Lee TH. Derivation and prospective validation of a simple index for prediction of cardiac risk of major noncardiac surgery. *Circulation* 1999; 100: 1043-49.

References...

- Lyles K, Colon Emeric C, Magaziner J, Adachi J, Pieper C, Mautalen C, Hyldstrup L, Recknor C et al; Zoledronic Acid and Clinical Fractures and Mortality after Hip Fracture. NEJM 2007; 357: 1799-809.
- Mangano DT. Effect of atenolol on mortality and cardiovascular morbidity after noncardiac surgery. NEJM 1996; 335(23): 1713-20
- Matot I. Preoperative cardiac events in elderly patients with hip fracture randomized to epidural or conventional analgesia. Anesthesiology 2003; 98(1)
- Morrison RS. The medical consultant's role in caring for patients with hip fracture. Ann Int Med 1998; 128: 1010-20
- Morrison RS, et al. Relationship between pain and opioid analgesics on the development of delirium following hip fracture. J Ger 2003; 1: 76-81.
- Perez JV. Death after proximal femoral fracture. Injury 1995; 26(4): 237-40.
- Poldermans D. The effect of bisoprolol on perioperative mortality and myocardial infarction in high risk patients undergoing vascular surgery. NEJM 1999; 341(24): 1789-94

References

- Rao SS. Management of hip fracture: family physician's role. *Am Fam Phys* 2006; 73(12)
- Rasmussen S. Early discharge in people with hip fracture shifts rather than reduces costs to society. *Evidence Based Healthcare* 2003; 7(3)
- Reilly DF. Self reported exercise tolerance and the risk of serious perioperative complications. *Arch Int med* 1999; 159(18): 2185-92
- Rigg JR. Epidural anesthesia and analgesia and outcome of major surgery: a randomized trial. *Lancet* 2002; 359(9314): 1276-82
- Rinfret S. Value of immediate postoperative electrocardiogram to update risk stratification after major noncardiac surgery. *Am J Card* 2004; 94(8)
- Roberts SE. Time trends and demography of mortality after fractured neck of femur in an english population. *BMJ* 2003; 327 (7418): 771-5.
- Rodgers A. Reduction of postoperative mortality and morbidity with epidural or spinal anesthesia: results from overview of randomized trials. *BMJ* 2000; 321 (7275)
- Rosenthal RA. Assessment and management of the geriatric patient. *Crit Care Med* 2004; 32(4)

References...

- Tang B, Eslick GD, Nowson C, Smith C, Bensoussan A. Use of calcium or calcium in combination with vitamin D supplementation to prevent fractures and bone loss in people aged 50 years and older: a meta-analysis. *Lancet* 2007; 370: 657-66.
- Urwin SC. General vs regional anesthesia for hip fracture surgery: a meta-analysis of randomized trials. *B J Anaesth* 2000; 84(4): 450-5
- Wesorick, Eagle. The preoperative cardiovascular evaluation of the intermediate risk patient. *Am J Med* 2005; 118(12)
- Wolinsky FD. The effect of hip fracture on mortality, hospitalization, and functional status. *Am J Pub Health* 1997; 87: 398-403
- Wu WC. Blood transfusion in elderly patients with acute myocardial infarction. *NEJM* 2001; 345: 1230-36