Demographics

- Population is Aging
Initial Evaluation

- Thorough H&P
- Focus on:
  - PMH
  - Meds
  - PSH and Response
  - DNR / DNI
- Functional Status Pre-Op
- Social History
Co-Morbid Conditions

- Cardiac, Pulmonary
- Diabetes
  - Wound Infection, Delayed Healing
- PVD
- Decubitus Ulcers
  - Infection Risk
- Nutrition
Initial Evaluation

• Physical Examination
  – Skin/Soft Tissues
  – Vascularity
• Labs, CXR, EKG
• Films – Bone Quality
• Consent – Competent?
• Goals of Care
Treatment Goals

• Restore Pre-Injury Level of Function

• Social Assistance Post-op
Non-Operative Care?

Consider when:

- Moribund/Terminal Patient
- Refusal of Consent
- Futility of Surgery
- Patient Would Not Survive Procedure
Medical Clearance

- Based on Stability
- Patient Optimized
- Testing Required?
- Perioperative Care
- Type of Anesthesia
Fleisher LA, et al.
2014 ACC/AHA Perioperative Guideline

Published with permission
*J Am Coll Cardiol. 2014;64(22):e77-e137*
Cardiac Testing

- 253 Patients
  - 35 (15%) had Preop Cardiac Testing
    - Stress Thallium or Echo
    - Testing Due to New Dx (EKG, CHF) in 16 Patients
Cardiac Testing

• Conclusions
  – Preop Cardiac Testing
    • In 48% Did Not Lead to New Medical Tx.
    • In 52%, Recommendations were only made for Medical Management of Previously Known Cardiac Disease.
    • No changes in Perioperative Orthopaedic or Medical Management
    • Significant Delay to Surgery. (3.3 vs 1.9 days, p<0.001)

• Extrapolated to 250,000 US Annual Hip Fxs
  – Preop Cardiac Testing of 15% Would Cost nearly $47,000,000 annually.
## ASA Classification

<table>
<thead>
<tr>
<th>Physical Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal healthy patient</td>
</tr>
<tr>
<td>2</td>
<td>Patient with mild systemic disease</td>
</tr>
<tr>
<td>3</td>
<td>Patient with severe systemic disease that is limiting but not incapacitating</td>
</tr>
<tr>
<td>4</td>
<td>Patient with incapacitating disease which is a constant threat to life</td>
</tr>
<tr>
<td>5</td>
<td>Moribund patient not expected to live more than 24 hours</td>
</tr>
<tr>
<td>6</td>
<td>A declared brain-dead patient whose organs are being removed for donor purposes</td>
</tr>
</tbody>
</table>

*Add E for emergency procedures*
ASA Score

- **ASA**
  - Survival
    - Class 1 – 8.5y
    - Class 2 – 5.6y
    - Class 3 – 3.5y
    - Class 4 – 1.6y
ASA Score

- **ASA** → **LOS**
  - 1 ASA ➡ 2.053 Days

- **ASA** → **Cost**
  - 1 ASA ➡ $9300

*Projected cost assumes a female patient, without comorbid conditions other than ASA classification, in a non-elective case.*
Patients on Anticoagulation

- **ASA/Plavix**
  - Ok to Operate with **No Delay**
Patients on Anticoagulation

- **Coumadin**
  - IV Vit K vs FFP
    - Depends on Comorbidities and Response
  - May need bridging with LMWH
Patients on Anticoagulation

- **Direct Thrombin Inhibitor**
  - Dabigatran

- **Factor Xa Inhibitors**
  - Rivaroxaban
  - Apixaban

- **Difficult to Monitor/Reverse**
  - Currents Tests are Surrogates Only
  - No Antidotes
  - Highly Variable Strategies
  - Currently Wait Out (48-72 Hrs) if not Emergent
Cognitive Function

• Dementia
  – Afflicts > 5 million Americans
  – Most secondary to AD followed by Multi-Infarct

• Prevalence
  – 60-65 years ~ 1/100
  – >90 years ~ 50/100

• Ability to Consent, Rehab, Comply

• Fall Risk
Clinical Ramifications of Cognitive Decline

- Higher Incidence of Delirium
- Higher Mortality and Morbidity

Morrison: JAMA July 5, 2000
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Osteoporosis - Scope of the Problem

- 50% Caucasian Women will Fracture
- Most Serious Outcome - Hip Fracture
- 10-20% Excess Mortality at 1 year
- 25% Long Term NH Care
- Only 1/3 Regain Independence
- Psychological and Social Issues
- ↓ Quality of Life
Definitions

• **Insufficiency Fracture**
  Bone Fails with Normal WB

• **Fragility Fracture**
  Fall from a Standing Height or Less
Diagnosis - **DEXA BMD**

- Relationship (SD) to Norms
- **T-Score** - Reference Standard
  - Comparison to “young normal” adult same sex
- **Z-Score**
  - Comparison to age matched adult same sex
Orthopaedic Diagnosis - Osteoporosis

• **Clinical Presentation**
  - Presence of Insufficiency or Fragility Fracture

• **Bone Mineral Density (BMD)**
  - **2.5 SD** Below the Young Adult Average Value (T)
Further Diagnosis - Osteoporosis

- **Labs** Can Help R/O Secondary Causes
  - CMP, Serum Thyrotropin, Protein Electrophoresis, PTH, Vitamin D, Urine Calcium, Cortisol

- Clinical Utility of Biochemical Markers still Not Proven
FRAX

- Developed by WHO
  - Incorporates Risk Factors + BMD
    - Age, Sex, Ht, Wt, Family Hx, Previous Fx, Steroids,
      Smoking, EtOH, Secondary Causes, RA

- 10-yr Fracture Risk (%)
  - Hip
  - Other Major Fracture

- Online Tool
Pathophysiology - Osteoporosis

- Imbalance in Removal/Replacement of Ca
- Not an Organic Matrix or Mineralization Defect
- Loss of Trabecular Plates, Cortical Thinning
- Structural Weakening

"Mechanical Problem"
Surgical Issues - Osteoporosis

• Difficult Fracture Fixation
  – Poor Screw Purchase
  – Excessive Bowing (Distal Nail Penetration)

• Immobilization or Minimal WE ➔ Bone Loss

• Autogenous Bone Graft Not as Useful
Surgical Timing

• **Conflicting Results** Regarding M/M being Increased or Unaffected by Delaying Surgery

• **Early Surgery <48 Hrs** Reduces Hospital Stay
  – May also Reduce Complications and Mortality
Surgical Timing

- 92 Patients
- Delay Greater than 4 days Increases the 6-month and 1-year Mortality Risks versus <48 Hours to Surgery
Surgical Timing

Different Story in Polytrauma
- Elderly Patient with 3 or More Comorbid Conditions have a Worse Survival Rate if Treated within 24 Hrs
- Need to Individualize Treatment Plan
  - Pre-Existing Activity, Disease, Reserve, Injuries

Polytrauma in the elderly: specific considerations and current concepts of management

R. Dimitriou · G. M. Calori · P. V. Giannoudis

DOI 10.1007/s00068-011-0137-y

REVIEW ARTICLE
High Energy Trauma

- 6 x Greater Mortality for Elderly Polytrauma

- >65 yo Patient has 50% Mortality with ISS>20

- 24 - 44yo Patient has 50% Mortality with ISS>40
Choice of Anesthesia

- Literature Search of Pubmed and Cochrane (1967-2010)

- 56 references, covering 18,715 patients with hip fracture
Choice of Anesthesia

• Conclusions:
  – **Spinal Anesthesia**
    • Significantly Reduced Early Mortality, Fewer DVT, Less Acute Postop Confusion, Fewer MI, Fewer Pneumonia, Fewer Fatal PE, Less Postop Hypoxia.
  – **General Anesthesia**
    • Less Hypotension, Fewer CVA
  – Data suggests that Regional Anesthesia is preferred, but the limited evidence does not permit definitive conclusion for mortality or other outcomes.
Surgical Treatment Principles

• Plan for Possible Future Surgeries
  – Incisions
  – Implants

• Reduction
  – Gentle
  – Indirect
  – Impaction - ↑ Stability
Surgical Treatment Principles - Osteoporosis

• Fixation
  – Length
    • IM Nails, Long plates
  – Augmentation
    • Biologic Cements, Graft, Struts
  – Angular Stability
    • Locked screws with plates/nails
  – Arthroplasty
    • Shoulder, Elbow, Hip, Knee

• Allow WB if Possible
Recognition - Osteoporosis

• Ortho Often the First to See

• Assure All at Risk Patients Have F/U

• Develop a System in Your Hospital
  – Synthes Geriatric Program
  – AOA Own the Bone
Fractures Beget Fractures

- Risk of future fractures increases 1.5 - 9.5 fold following initial fracture

- History of fragility fracture is more predictive of future fracture than bone density
Treatment - Osteoporosis

Preventing osteoporosis *in all women*

- Stop smoking
- Calcium
- Vitamin D
- Weight-bearing exercise
- Medication
- Check your risk factors
- Reduce alcohol

*Patients*
Treatment - Osteoporosis

• Address Risk Factors
  – Avoid EtOH and Tob

• Ensure Nutrition
  – Ca (1200mg)
    • 600 mg po BID
  – Vitamin D (>1500 IU)
    • Other Nutrients
      – Magnesium
      – Silicon
      – Vitamin K
      – Boron
Exercise and Rehab

- Improve Strength, Endurance, Posture
- Maintain Bone Density
- Prevent Falls
- 30 Minutes Moderate Intensity Daily
- Post Fracture Rehab May Reduce Future Fracture
Fall Prevention

• Discuss with Family
  – Medications
  – Balance and Strength Training
  – Correct Vision
  – Walking Aids

• Fall Proofing the Home
  – Poor Lighting
  – Throw Rugs
  – Pets
Treatment - Osteoporosis

• Indication for Pharmacologic Intervention
  – T-score $\leq -2.5$ without other Risk Factors
  – T-score $\leq -1.0 - 2.5$ with other Risk Factors

• Fragility Fx
• FRAX Score Hip Fx 10-yr Risk $>3$
• FRAX Score Other Major Fx 10-yr Risk $>20$

Pharmacological Therapy

• **Anti-Resorptive Drugs**
  – Hormonal Replacement Therapy: Estrogen/Progestin
  – **Bisphosphonates:**
    - Alendronate, Ibandronate, Risendronate, Raloxifene, Zoledronic Acid
  – Selective Estrogen Receptor Modulators: Raloxifene
  – Calcitonin

• **Bone Forming Drugs**
  – Teriparatide
    - Recombinant Parathyroid Hormone
Bisphosphonates

- Long T1/2

- Side-Effects
  - GI
  - Jaw Osteonecrosis (Rare)

- Atypical Fractures
  - Risk with Long term use
  - Assess Both femurs
  - Difficult to heal

- Must weigh risks of use against huge benefits of other Fx Prevention
  - Hip, wrist, spine
Conclusions

• Osteoporosis: $\uparrow$ Prevalence – Recognition is Key
• Need Effective Tx to ↓ Fx Rate
  – Nutrition
  – Exercise
  – Fall Prevention
  – Medications
  – Assure Follow Up
• Surgical Improvements Help
Careful Consideration of Pre-op, Intra-op, and Post-op Factors Unique to Geriatric Population Necessary to Obtain Goal of Long Term Functional Recovery