Optimal Management of Geriatric Patients with Hip and Rib Fractures

American Association for the Surgery of Trauma
Geriatric Trauma Committee
Disclaimer

Slides contained herein represent general concepts of trauma care as defined by the members of the Education Subcommittee of the Geriatric Trauma Committee of the American Association for the Surgery of Trauma (AAST) and do not represent directives of the AAST itself. This educational program is not intended to dictate or establish the standard of care nor does it outline practice guidelines except where specified. This program is intended for educational use.
Objectives

- To Recognize What Constitutes Geriatric Trauma
- To Identify the Scope of the Problem
- To Differentiate the Physiology of Aging from Frailty
- To Recommend Practice Guidelines for Elderly Trauma Patients
What Is Geriatric Trauma?

Age 65 and over*

Includes Falls from Standing

Includes Hip Fractures

*Definition Used in Most Studies
Demographics and Outcomes
The Aging Tsunami

![Graph showing the growth in population for ages 65+ and < 65 from 2005 to 2020.](image)
Cause of Injury Age > 65

Pennsylvania, 2011
Geriatric Trauma Outcomes

A bar chart showing the average ISS (Injury Severity Score) from 2003 to 2013. The chart indicates data points for each year, with specific values for the years 2003-2013. The chart includes categories for ICU LOS (length of stay), LOS (mean length of stay), and Mortality %.
Physiologic Changes of Aging
Cardiovascular Changes with Aging

- Loss of Connective Tissue Elasticity, Change in Compliance
  - Increased SBP (and widened PP)
  - Increased Afterload
  - Decreased Diastolic Filling, depends on Atrial Kick
    - Tachycardia and Atrial Fibrillation Poorly Tolerated
    - Stiff Veins Less Able to “Buffer” Changes in Volume
      - Volume Shifts have Exaggerated Changes in Cardiac Filling Pressure
  - Peripheral Vasoconstriction remains Intact
Cardiovascular Changes with Aging

- Loss of SA Node Cells, Slowed Conduction
  - Conduction and Rhythm Abnormalities
- Myocyte Death without Replacement
  - Decreased Relaxation in Diastole
- Decreased Responsiveness to β-receptor Stimulation
  - Max. Heart Rate Decreased: 220 - Age
Pulmonary Changes with Aging

- Increased Chest Wall Stiffness
- Decreased Lung Compliance and Elasticity
- Decreased Strength and Endurance of Respiratory Muscles
Pulmonary Changes with Aging

- Decreased Alveolar Surface Area
- Impaired Gas Exchange
- Increased Non-Functional or Closed Airways (Dead Space)
  - Increased V-Q Mismatch

**TABLE 62-3 -- Normal values for arterial Po₂**

<table>
<thead>
<tr>
<th>Age (yr)</th>
<th>Mean and Range (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20–29</td>
<td>94 (84–104)</td>
</tr>
<tr>
<td>30–39</td>
<td>91 (81–101)</td>
</tr>
<tr>
<td>40–49</td>
<td>88 (78–98)</td>
</tr>
<tr>
<td>50–59</td>
<td>84 (74–94)</td>
</tr>
<tr>
<td>60–69</td>
<td>81 (71–91)</td>
</tr>
</tbody>
</table>

Renal Changes with Age

- Decreased GFR
- Decreased Functioning Nephrons by 1%/yr >40 years
- Decreased Concentrating Ability (Renin, Aldosterone, ANP)
- Decreased Free Water Clearance (ADH)
- Decreased Thirst Drive
Renal Changes with Age

- Often Asymptomatic
- Loss of Solute Excretion (K⁺; H⁺) and Resorption (Na⁺)
- Exacerbated by Diuretic Use
- Higher Risk of Volume & Electrolyte Abnormalities
- More Susceptible to Drug Toxicity
  - Higher Incidence of ATN and Acute Renal Failure
- Pre-Operative Renal Insufficiency Is a Strong Predictor of Peri-Operative Cardiac and Pulmonary Morbidity, as well as Renal Failure.
Cognitive and Behavioral Disorders

- “Geriatric Syndromes”
- Cognitive Impairment and Dementia
- Decision-Making Capacity
- Depression
- Risk Factors for Post-Operative Delirium
- Alcohol and Substance Abuse
Frailty
Frailty – Loss of Ability to Rebound
### Understanding Frailty

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodhouse et al</td>
<td>Those &gt; 65 years of age who depended on others for the activities of daily living and were often under institutional care</td>
</tr>
<tr>
<td>Campbell and Buchner</td>
<td>Condition or syndrome which results from a decline in the reserve of multiple systems and is a state of “unstable disability”</td>
</tr>
<tr>
<td>Lipsitz et al</td>
<td>Loose complexity in resting dynamics and show maladaptive responses to perturbations</td>
</tr>
<tr>
<td>Bortz</td>
<td>Concept of symmorphism &quot;an insidious and relentless thief of energy and vitality&quot;</td>
</tr>
<tr>
<td>Hougaard</td>
<td>A random effects model for time variables, where the random effect (frailty) has a multiplicative effect on hazard</td>
</tr>
</tbody>
</table>

**Physiologic Decline Affects All Organ Systems**
Mechanism of Injury

Falls

• Most Common Cause of Injury in the Elderly
• Most Responsible for Cause of Death
• By 2020, $54.9 billion Spent on Treatment of Geriatric Falls

http://www.cdc.gov/homeandrecreationalsafty/falls/fallcost.html
Increased Risk of Falling

• Osteoporosis
• Arthritis
• Dementia or Confusion
• Parkinson’s Disease
• Vision Problems
• Hearing Problems

• Heart Disease
• Blood Pressure Problems
• Diabetes
• Bowel & Bladder Incontinence
• Foot Disorders
The Medical Center
and
Geriatric Trauma
Under-Triage Increases Mortality

4534 Pts Age ≥65, 2000-2010
Level II Trauma Center
Undertriage = ISS >15 w/o Trauma Team Activation

Findings:
15% Undertriage Rate
Undertriage Doubled Mortality Rate

Rogers A et al, American Surgeon 2012; 78:711-715
Geriatric Trauma Pre-Hospital Strategies

“Normal” Vital Signs Might Not be Normal

Over-Triage is Better than Under-Triage

If In Doubt:
Designated Trauma Center

Pracht et al, Journal of Trauma 2011; 71:69-77
Geriatric Trauma Emergency Department Strategies

- Medical and **MEDICATION** History
- Thorough but Focused Evaluation
- Monitor / Assess Early and Often (Hgb, ABG, INR)
- Give IV Fluid in Small Boluses
Geriatric Trauma
In-Patient Strategies

Close Monitoring, Frequent Assessments

**Mental Status**
- Identify Pre-Existing Cognitive Impairment
- Look for Causes of Delirium
- Avoid Poly-Pharmacy

**Cardiovascular**
- Assess / Monitor for Occult Hypo-Perfusion and Myocardial Ischemia
Geriatric Trauma
In-Patient Strategies

Functional Status
- Physical Therapy
- Occupational Therapy
- Respiratory Therapy
- Geriatrics/Medical Consultation
- Physical Medicine and Rehabilitation Consultation
- Clinical Pathways

Geriatric Trauma
In-Patient Strategies

Pulmonary
- Assess Function – Serial Spirometry
- Assess Swallowing, Aspiration Risk
- Aggressive Pulmonary Toilette
  Incentive Spirometry, Deep Breathe and Cough,
  Chest PT, OOB to Chair
  Avoid Oversedation, Supine Position
- Pain Management
  Avoid Opioids and Benzodiazopines
  IV Acetaminophen; NSAIDs; Tramadol
Delirium Prevention

• Optimize Light/Dark & Sleep/Wake Cycle
• Decrease Disruptions at Night
• Re-Orient Regularly, Minimize Restraints
• Avoid/Minimize Sedatives, Benzodiazepines, Benadryl, Opioids
• Treat Pain Appropriately
• !!!MOBILIZE!!!
Geriatric Rib Fracture Management
AGE AND RIB FRACTURES

- Rib fractures in elderly (age ≥ 65) have worse outcomes
- Twice the morbidity and mortality as younger patients
- For each rib fractured, mortality increases by 19% and pneumonia by 27%

Bergeron E et al, J Trauma 2003; 54:478-485
Diagnosis

**High Index of Suspicion in Elderly**
- Mechanism of Injury
  - Fall
  - MVC
  - Assault or Elder Abuse

**Physical Exam**
- Tenderness to Palpation of Chest Wall

**Chest X-ray**
- Can Miss up to 66% of Rib Fractures

**Low Threshold for Computed Tomography (CT scan)**
- Better Sensitivity
- Low Risk in Elderly Population
Very Low Threshold to Admit

1. Hospital Admission Should Be Considered for All Patients over 65
   - Transfer to Trauma Center
     - ICU Not Available
     - Resources (e.g. Respiratory Therapy, Epidural Analgesia) Not Available
     - Lack of Familiarity of Providers in Treating Rib Fracture Patients
     - Potential Need for Operative Management

2. Admission to ICU if ≥ 3 rib fractures
Treatment Modalities

- Pain Control
- Pulmonary Hygiene
- Respiratory Support When Needed
Pain Control: Multi-Modality

**Pharmacologic**
- Narcotics
  - Oral
  - IV
  - Patient-Controlled Analgesia (PCA)
- Acetaminophen
- Gabapentin, NSAIDs, Muscle-Relaxants
- Use All with Caution as Side-Effects or Contraindications Due to Comorbidities are Common in Elderly!

**Non-Pharmacologic**
- Ice
- Splinting
- Early Mobilization
Pain Control
Options If Not Controlled with Standard Therapies

- Epidural Analgesia
- Rib Blocks with Long-Acting Local Anesthetic
- Ketamine Drip
Pulmonary Toilette: First Line

1. Head of bed at least 30 degrees unless contraindicated
2. Mobilize three times daily unless contraindicated
3. Minimize IV fluids
4. Incentive spirometry
   - < 15 ml/kg worrisome for impending failure
Pulmonary Hygiene: Second Line

For Patients Not Meeting Incentive Spirometry Goals or with Clinical Deterioration

- Flutter Valve (AKA Acapella device)
- Non-Invasive Positive Airway Pressure
- Cough Assist Device
Respiratory support

Oxygen via Nasal Cannula or Mask
- Does Not Prevent Atelectasis or Aid in Secretion Clearance

CPAP or BIPAP
- Non-Invasive Positive Pressure Ventilation
  - Improved Outcomes in Rib Fracture Patients
  - Use for High Risk Patients or Those Needing "2nd Line" Pulmonary Hygiene Techniques

Mechanical Ventilation via Endotracheal Tube
- Use Traditional Guidelines to Determine Indications
Geriatric Hip Fracture Management
Hip fracture
What next?
Admit to a Surgical Service
Trauma or Orthopedics
Admit to Surgical ICU
Target Within 2 Hours of Arrival

- Labs and Imaging While Still in the Emergency Room
  - Pre-Operative Labs
    - CBC
    - BMP
    - Urinalysis
    - Urine Culture
  - Pre-Operative Imaging
    - Xrays +/- CT Scans as Indicated by Orthopedics
    - ECHO as Indicated by Cardiology
- Perform EKG
- Place Foley Catheter
Place Appropriate Consults

- Orthopedics
  - If Admitted to Trauma Service
- Medicine - Pre-Operative Clearance
  - Cardiology Based on Medicine Assessment
- Anesthesia
- Physical Medicine & Rehabilitation (PM&R)
- Social Work (SW)
- Case Management (CM)
- Physical therapy (PT)
Optimize Patient for the OR

- DVT Chemoprophylaxis
  At least 12 hrs before the Operating Room

- Operative Repair <48 hrs of Admission Has Better Outcomes

- Follow Consultants Recommendations for Optimization
Post-Operative Management

- Return to SICU Post-Op
- Multimodal Pain Management
  - IV Acetaminophen
  - NSAIDs
  - Avoid Benzos & Opiates
- Blood Transfusions to Keep Hemoglobin >8 g/dl
- Early Mobilization with PT
- Disposition Planning with PM&R, SW, and CM
Summary

Elderly Population is Growing
Geriatric Care is Resource Intensive
Geriatric Care is Personnel Intensive
Elderly Have Worse Outcomes Than Younger Adults
Elderly Patients Require ICU More Often

If in Doubt,
Transfer to the Trauma Center
Summary

Pain Management
Avoid Opioids and Benzos

Rib Fractures
Aggressive Pulmonary Toilette
Low Threshold for ICU
Early and Aggressive Mobilization

Hip Fractures
Multi-Disciplinary Approach
Peri-Operative ICU
Early and Aggressive Mobilization
Questions and Thank You