This PowerPoint file is a supplement to the video presentation. Some of the educational content of this program is not available solely through the PowerPoint file. Participants should use all materials to enhance the value of this continuing education program.

The Evolution of Geriatric Trauma

Steven E. Brooks, MD  
Assistant Trauma Medical Director  
Assistant Professor of Surgery: Trauma and Burns, Surgical Critical Care, Acute Care Surgery  
Texas Tech University Health Sciences Center  
Lubbock, Texas  
EMS I 82615
Objectives

1. Identify the evolution of geriatric trauma as a public health issue.
2. Recognize how geriatric trauma patients are different, and the most common mechanisms of injury.
3. Describe the relationship of falls with intracranial bleeds, rib fractures, pneumonia, and mortality.
4. Identify the altered cardiac physiology and related effects in geriatric trauma patients.
5. Understand recommended practice management guidelines.

Geriatric Trauma: An Emerging Public Health Issue

- Geriatric population: age ≥60
- Just over 10% of the U.S. population
- Most rapidly growing segment of the U.S. population
- Expected to nearly double over the next 20 years
- 46 million in 2010 → 81 million in 2030 (22% of population)

Vanderbilt University

Annual Percentage of Geriatric Trauma Admissions (1996-2011)
Geriatric Trauma: An Emerging Public Health Issue

- Account for 33% of trauma healthcare expenditures
- Nine billion dollars per year in the U.S.
- 5th leading cause of death in all age groups
- 9th leading cause for those 65 years and older

Texas Tech University

Geriatric Trauma Admissions (2003-2012)
Geriatric Trauma: An Emerging Public Health Issue

- Most common traumatic insults include falls, followed by MVCs (motor vehicle crashes)
- Elderly population is especially vulnerable to violent crime
  - 10% of all geriatric trauma admissions are the result of violent assault
    - they are 5x more likely to die as a result of their attack as compared with their younger counterparts

Throwback to the 1980s

- 1984: Oreskovich (Harborview Medical Center) reviewed 100 consecutive trauma patients over 70 years of age
  - cited 85% survival rate
  - 88% did not return to previous level of independence
  - 64 falls, 12 burns, and 8 MVCs
- 1986: Horst (Henry Ford Hospital, Detroit) described 39 consecutive trauma patients over 70 years of age
  - cited 70% survival rate
  - “(Mortality in the elderly patient) should not differ substantially from other age groups.”

Not Just an Older Adult

- 1990 Scalea et al.
  - “To our knowledge, no one has described managing elderly trauma patients any differently than younger patients.”
  - “We would contend that the multiply injured elderly patient that has sustained (blunt) trauma is different...”

Geriatric Trauma Patient Age Distribution: 1989-2009

![Graph showing age distribution of geriatric trauma patients from 1989 to 2009.](image-url)
Compensatory Responses to Trauma
- Decreased vision and hearing
- Slower reflexes and hearing
- Poorer balance
- Impaired motor/cognitive function
- Decreased muscle mass/strength
- Decreased bone density
- Decreased joint flexibility

Comorbidities
- 80% of geriatric trauma patients have at least 1 or more chronic diseases:
  - HTN (hypertension)
  - arthritis
  - heart disease
  - pulmonary disease
  - cancer
  - diabetes
  - stroke
  - diabetes

Mechanisms of Injury
- Falls
- MVCs
- Pedestrian hit by car
- Suicide
- Assault/violence

Falls in the Elderly
- Emerging as the number 1 cause of admission to trauma centers
- 5-10 times more EMS calls for falls compared to MVCs
- 30% of the elderly fall each year
  - 6% result in fracture
  - 10-30% multi-trauma
  - 7% mortality

Texas Tech University: Geriatric Trauma Fall Data (2003-2012)
Geriatric Patients (≥65) with Chief Complaint of Injury from Fall
Geriatric patients (≥65) with chief complaint of injury from other blunt mechanism: 4%

Geriatric patients (≥65) with chief complaint of injury from MVC: 10%

Other trauma (≥65): 4%

Geriatric patients (≥65) with chief complaint of injury from fall: 82%
Practice Management Guidelines for Geriatric Trauma: The EAST (Eastern Association for the Surgery of Trauma) Practice Management Guidelines

The EAST Practice Management Guidelines

- Ivascu et al.: Posttraumatic intracranial hemorrhage in elderly patients with Coumadin-related coagulopathy
- Protocol
  1) rapid head-computed tomography
  2) initiation of INR-correcting therapy within 1.9 hours
  3) full correction of coagulopathy within 4 hours of admission
  • 75% decrease in mortality

Rib Fractures in the Elderly

- Mean number of rib fractures:
  • 3.6 +/- 2.5

The Journal of Trauma: Injury, Infection, and Critical Care

Relationship between pneumonia and number of rib fractures. Increasing pneumonia rates as the number of rib fractures increased were most notable for the elderly group
Rib Fractures in the Elderly

- Three rib fractures:
  - 19% risk of mortality
  - 31% risk of pneumonia

- Six or more rib fractures:
  - 33% risk of mortality
  - 51% risk of pneumonia

- The majority of complications resulting from rib fractures are related to chest wall pain, which limits pulmonary function
  - this inability of these patients to adequately clear their secretions + development of atelectasis from chest wall splinting → pulmonary function
  - pain from multiple rib fractures → prolonged mechanical ventilation → pneumonia

- Objective measures
  - incentive spirometry: goal 15 ml/kg (milliliters per kilogram)
  - adequate cough to clear secretions

- Significant decrease in overall mortality among those treated with epidural analgesia in both age groups

Texas Tech University: Geriatric Trauma Fall Data (2003-2012)

Geriatric Patients (≥65) with Diagnosis of Rib Fractures
Altered Cardiac Physiology

- Myocytes and conductive pathways
  - slowly replaced with fat and fibrous tissue
    - predisposes to arrhythmias and creates a stiffer heart
- Limited ability to compensate
  - increased demand
    - occult or obvious ischemia
- Impaired ventricular performance, reduced EF (ejection fraction), increased impedance of central elastic vessels
  - maximal HR (heart rate), stroke volume, cardiac output, EF, and oxygen uptake all decrease, whereas both end-systolic and end-diastolic volumes increase
- The elderly do not have the cardiac reserve needed to physiologically compensate in response to injury
- Blood loss and decreased cardiac filling pressures
  - inadequate peripheral oxygen delivery
- Blood pressures appear normal due to increased SVR (systemic vascular resistance)
- High afterload state
  - worsens cardiac output and oxygen delivery
- Compensation: increased HR and cardiac output
  - elderly respond with increased SVR which can result in a deceptively reassuring blood pressure
- Occult hypoperfusion
  - lactate and base deficit
  - early invasive monitoring

Normal Presenting Vital Signs are Unreliable in Geriatric Blunt Trauma Victims

- Heffernan et al. 2010
- Retrospective Review 2003-2008
- 2,194 geriatric and 2,081 young patients
- 251 (11.4%) geriatric and 49 (2.4%) young patients died
  - mortality increased considerably in the elderly patients for HRs >90 bpm (beats per minute), an association not seen until HR of 130 bpm in the young group
  - mortality significantly increased with SBP (systolic blood pressure) <110 mmHg (millimeters of mercury) in the geriatric patients, but not until a SBP of <95 mmHg in the young patients
- Conclusion:
  - new trauma triage set points of HR >90 or SBP <110 mmHg should be considered in the geriatric blunt trauma patients

Lactate and Base Deficit

- 274 patients, age 55 or older, admission base deficits were defined as follows and had the corresponding mortalities:
  - mild: -3 to -5 = 24% mortality
  - moderate: -6 to -9 = 60% mortality
  - severe: <-10 = 80% mortality
- Base deficit and lactic acid are accepted measures of hypoperfusion in trauma patients
The EAST Practice Management Guidelines

- Designated vs. non-designated trauma centers
- Elderly patients treated at a designated trauma center with dedicated surgeon intensivists
  - less likely to experience preventable adverse events
  - more likely to have a lower risk-adjusted mortality
- Maxwell et al. (Vanderbilt)
  - 43% of elderly patients are being admitted to non-designated trauma centers
- Under-triage in patients >55 is twice that of younger patients

1. Avoid under-triage: elderly trauma patients should be treated at centers that have resources and have attained excellence in care
2. In patients with ICB and warfarin-induced coagulopathy, coagulation profile should be immediately assessed and coagulopathy rapidly corrected
3. Base deficit of -6 mEq/L (milliequivalent per liter) should be used as a marker for severe injury and admission to ICU (intensive care unit) should be considered
4. Glasgow Coma Score of ≤8, which remains low after 72 hours warrants discussion regarding goals of care
   - at least 80% mortality or long-term placement

Geriatric Trauma Service: A One-Year Experience

- Creation of a geriatric trauma unit (G-60) at a level II trauma hospital
- One year of data collected
- G-60 group contained 393 patients
  - control contained 280 patients
- Exclusion criteria:
  - ESRD (end-stage renal disease) and patients on hospice
- Admission criteria:
  - age >60; injury within 48 hours of presentation; ISS (injury severity score) 4 or greater
- Additional key facts:
  - 4-fold increase in morbidity and mortality when elderly patient taken to the OR (operating room) >48 hours after admission
- Goals:
  - admission to hospital from ED (emergency department) within 2 hours
  - all consultants (geriatrics, orthopedics, etc.) to evaluate the patient within 2 hours of admission
  - patients requiring surgery should receive definitive repair within 48 hours of admission
- Findings:
  - decreased LOS (length of stay)
  - time to surgical intervention
  - overall morbidity and mortality
Geriatric Trauma Service: A One-Year Experience

Findings:
- G-60 group
  - 0% pneumonia
  - 1.3% respiratory failure
  - 1.5% urinary tract infection
  - 3.8% mortality rate
- Control group
  - 1.8% pneumonia
  - 6.8% respiratory failure
  - 3.9% urinary tract infection
  - 5.7% mortality rate

A decrease was seen among the G-60 group in all categories:
- Average ED LOS
- Average ED to OR time
- Average surgical ICU LOS
- Average hospital LOS

Geriatric Trauma Mortality: 1989-2009
Summary

- Elderly population (≥60) is the fastest growing age group
- Increase in trauma admissions and cost over the next 20 years
- Altered compensation to the stress of trauma
- Ground level falls and rib fractures are NOT benign
- Consider triage to designated trauma centers
- Do not rely on normal vital signs
- Risk of occult hypoperfusion
- Geriatric trauma patients can eventually return to a productive lifestyle and independence

“Geriatric care may not be the glamorous side of trauma surgery, but it is increasingly relevant and all trauma centers must find a solution that optimizes the care of these elderly trauma patients.”

- Mangram et al.

The Evolution of Geriatric Trauma

If you have any questions about the program you have just watched, you may call us at: (800) 424-4888 or fax (806) 743-2233. Direct your inquiries to Customer Service. Be sure to include the program number, title and speaker.

EMS I 82615