G60 - Geriatric Trauma

Alicia J. Managram, MD

Medical Director of Trauma and Acute Care Surgery and Medical Director of Surgical Intensive Care Unit, John C Lincoln Health Network, Phoenix, Arizona

Objectives:
- Clarify the unique physiologic differences of the aged trauma patient
- Discuss the prognostic implications of severe traumatic injury in the elderly
- Describe the G60 concept
Innovations in Geriatric Trauma

“G-60 Trauma Service”

Alicia Mangram MD, FACS
Medical Director, Trauma Services
Medical Director Surgical Critical Care
Program Director General Surgery Residency
John C. Lincoln Hospital North Mountain
Phoenix, AZ
NO DISCLOSURES
Journey

Honored by Experts. Honored to Serve.
Life expectancy is increasing, people are living longer

Life Expectancy in 1900 was about 50 Years

Current life expectancy is 78 Years

Honored by Experts. Honored to Serve.
Growth in Geriatric Population

Population 60+ by Age: 1900-2050
Source: U.S. Bureau of the Census

Honored by Experts. Honored to Serve.
Elderly Population Growth

Population Growth Rate for All Residents and Residents over Age 65, Arizona & US, 2000-2020

Source: U.S. Census of Bureau and Arizona Department of Economic Security

Honored by Experts. Honored to Serve.
### The Aging of America

**Age > 65 is one of the fastest growing age groups**

<table>
<thead>
<tr>
<th>Decade</th>
<th>Number (millions)</th>
<th>Increase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2010</td>
<td>35-40</td>
<td>14</td>
</tr>
<tr>
<td>2010-2020</td>
<td>40-55</td>
<td>38</td>
</tr>
<tr>
<td>2020-2030</td>
<td>55-72.1</td>
<td>31</td>
</tr>
</tbody>
</table>

*Administration on Aging: US DHHS, 2010*
Demographics: 85+years

- In 2009, people age > 85 years numbered 5.6 million
- In 2010, this subset increased to 5.8 million
- By 2020 this subset is expected to reach 6.6 million: 15% increase for the decade

Administration on Aging/ DHHS, 2010
Geriatric Trauma

» Mortality/morbidity after trauma is strongly correlated with increasing age

» Trauma death rate per year [per 100,000]
  – All age groups = 56
  – Age >65 = 113.2
### 10 Leading Causes of Death (2010): 65+

<table>
<thead>
<tr>
<th></th>
<th>Heart Disease</th>
<th></th>
<th>6. Diabetes Mellitus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Heart Disease</td>
<td>2. Cancer</td>
<td>6. Diabetes Mellitus</td>
</tr>
<tr>
<td>2</td>
<td>Cancer</td>
<td>3. Chronic low respiratory disease</td>
<td>7. Influenza &amp; Pneumonia</td>
</tr>
<tr>
<td>3</td>
<td>Chronic low respiratory disease</td>
<td>4. Stroke</td>
<td>8. Nephritis</td>
</tr>
<tr>
<td>4</td>
<td>Stroke</td>
<td>5. Alzheimer’s Disease</td>
<td>9. <em>Unintentional Injury</em></td>
</tr>
<tr>
<td>5</td>
<td>Alzheimer’s Disease</td>
<td>6. Diabetes Mellitus</td>
<td>10. Septicemia</td>
</tr>
</tbody>
</table>

*CDC*
Violence and Injury

Injury and violence are serious threats to the health and well-being of Americans ages 65 and older.

*National Center for Injury Prevention and Control, 2007*
Healthcare and Modern Day Life Expectancy

CDC Data:
1900 life expectancy in U.S. – 49 years
2011 life expectancy in U.S. – 79 years

Honored by Experts. Honored to Serve.
Rise in Geriatric Trauma
An Increasing Elderly Population... 
Equals increasing Geriatric Trauma
### Distribution of Trauma Deaths Mechanism: Age<60 vs. Age>=60 (2008-2012)

<table>
<thead>
<tr>
<th>Trauma Mechanism</th>
<th>Age&lt;60 years</th>
<th>Age&gt;=60 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSW</td>
<td>29.7%</td>
<td>10.3%*</td>
</tr>
<tr>
<td>MVC</td>
<td>26.3%</td>
<td>28.3%</td>
</tr>
<tr>
<td>FALL</td>
<td>2.9%</td>
<td>33.2%*</td>
</tr>
</tbody>
</table>

*p<.05*
What’s Different About Geriatric Trauma?

Elderly trauma patients present a challenging clinical problem due to:

- Pre-existing health conditions
- Decreased physiologic reserve

- Prior operations
- Blood thinners
- Different patterns of injury
- Domestic abuse
- Self-inflicted injury

Physiology of Aging

» Pre-existing conditions
  — Prevalence of pre-existing conditions
    • 4th decade—17%
    • 6th decade—40%
    • 7th decade—69%
    • 9th decade—80%

» Pre-existing conditions make it difficult for patients to respond to the acute stress of trauma

Kauder et al., 2004
Prioritized Questions: 2008

» Should patients older than 60 years with poly-trauma and/or a significant mechanism of injury be considered as meeting the criteria for Trauma Team Activation (TTA)?

» Why should patients age>60 with minor injury severity scores (0-9) not be considered for TTA?

» Would these patients benefit from a higher level of activation?
The National Trauma Data Bank (NTDB) was queried for the period of January 1, 1999 to December 31, 2008, for all trauma patients and associated injury severity score (ISS).

Data abstracted was based on patient’s age and ISS.

For the period of review, the NTDB contained 802,211 trauma patients.

Elderly patients (age >60 years) accounted for 21% of all patients.
## NTDB Comparison of Morbidity

<table>
<thead>
<tr>
<th>ISS Category</th>
<th>% Morbidity</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age 13-60</td>
<td>Age &gt; 60</td>
</tr>
<tr>
<td>Minor (0-9)</td>
<td>1.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Major (10-15)</td>
<td>4.8</td>
<td>10.4</td>
</tr>
<tr>
<td>Severe (16-24)</td>
<td>10.9</td>
<td>16.4</td>
</tr>
<tr>
<td>Critical (&gt; 24)</td>
<td>27.3</td>
<td>28.0</td>
</tr>
</tbody>
</table>
Conclusion - 2008

» A relation exists between increased age, associated pre-existing medical conditions, and a poor physiologic reserve with resultant poorer outcomes

» It is essential to not under-triage the elderly patient with minor or major ISS

» A high index of suspicion is imperative with the elderly trauma patient
Should Age Be a Factor to Change From a Level II to a Level I Trauma Activation?

Vanessa K. Shifflette, MD, Manuel Lorenzo, MD, Alicia J. Mangram, MD, Michael S. Truitt, MD, Joseph D. Amos, MD, and Ernest L. Dunn, MD

The Journal of TRAUMA® Injury, Infection, and Critical Care • Volume 69, Number 1, July 2010
Patient age > 60 is an independent predictor variable with interactions with pre-existing co-morbidities and poor physiologic reserve which together are determinants for increased morbidity and mortality among geriatric trauma patients.
Effects of Aging

The trauma care given to older trauma patients should be distinctive from care younger trauma patients require with the same injuries.
2008

» Treating patients with isolated injuries in a setting of chronic medical problems can lead to fragmentation of care delivery

» Who will assume responsibility for these patients?
Geriatric Trauma unit now
“G-60” Trauma service

We organized a geriatric trauma service, led by trauma surgeons, that was specifically designed to expedite the care of geriatric patients through a multidisciplinary approach.
**“G-6o” TRAUMA SERVICE**

- Led by trauma surgeons
  - Collaboration with:
    - Internal medicine
    - Emergency medicine
    - Orthopedics
    - Neurosurgery
    - Anesthesia
    - Cardiology
    - Pharmacy
    - Trauma coordinator
    - Hospital administrators
    - Social worker
    - Nurse supervisor
    - Physical/Occupational therapy
    - Respiratory therapy
    - Nutritionists
    - Palliative Care
    - Case coordinator

- Requires BUY-IN from ALL collaborators
- Multidisciplinary rounds were instituted
INCLUSION CRITERIA

» Age ≥ 60

» Traumatic injury requiring hospital admission

» Injury occurred within the previous 48 hours

» Above criteria met = G-60 Activation
G-60 ACTIVATION

» Seen first by ED physician to establish criteria

» G-60 activation paged to all relevant services
  – Trauma service, hospitalist, PT/OT, nutrition, RT, G60 nurse supervisor, social work, case manager, pharmacy

» Goal of activation-to-exam of 30 minutes
  – Seen by trauma service and hospitalist initially

» Appropriate sub-specialists notified

» Expedited pre-procedure medical clearance

» Admitted to SICU or G60 Service
GOALS

» 30 minutes – ED presentation to trauma service evaluation

» 4 hours – ED presentation to inpatient room

» 36 hours – ED presentation to operating room

» 5 days – ED to safe and appropriate disposition
Trauma Surgeon Leadership

» Multidisciplinary
» Continuous Total Quality Improvement
» Strong Leadership
» Effective communication

Honored by Experts. Honored to Serve.
Multidisciplinary Rounds on Floor

» Team Members
  – Trauma surgeon
  – Nurse Practitioner
  – RN
  – Respiratory therapist
  – Occupational therapist
  – Physical therapist
  – Chaplin
  – Trauma service manager

Honored by Experts. Honored to Serve.
The Creation of a Geriatric Trauma Unit “G-60”

Alicia J. Mangram, MD, Vanessa K. Shifflette, MD, Christopher D. Mitchell, MD, Van A Johnson M.D., Manuel Lorenzo, MD, Michael S. Truitt, MD, Anuj Goel, MD, Mark A. Lyons, MD, and Ernest L. Dunn, MD, Dallas, Texas

• The American Surgeon 77: 1144-1146 (2011)
G-60

Our 1-Year Experience
Seniors At Risk For Injury: Falls

Honored by Experts. Honored to Serve.
Seniors At Risk For Injury: MVC

Honored by Experts. Honored to Serve.
<table>
<thead>
<tr>
<th>OUTCOMES</th>
<th>Control (n = 280)</th>
<th>G 60 (n = 393)</th>
<th>P - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average ED LOS (hours)</td>
<td>6.1</td>
<td>4.2</td>
<td>0.0001</td>
</tr>
<tr>
<td>Average ED to OR (hours)</td>
<td>52.9</td>
<td>37.6</td>
<td>0.0103</td>
</tr>
<tr>
<td>Average SICU LOS (days)</td>
<td>5.2</td>
<td>3.0</td>
<td>0.0002</td>
</tr>
<tr>
<td>Average Hospital LOS (days)</td>
<td>7.0</td>
<td>4.8</td>
<td>0.0002</td>
</tr>
<tr>
<td>MORBIDITY</td>
<td>Control (n=280)</td>
<td>G 60 (n=393)</td>
<td>P - value</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------</td>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>UTI</td>
<td>3.9% (11)</td>
<td>1.5% (6)</td>
<td>0.05</td>
</tr>
<tr>
<td>Respiratory Failure</td>
<td>6.8% (19)</td>
<td>1.3% (5)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td>1.4% (4)</td>
<td>0% (0)</td>
<td>0.05</td>
</tr>
<tr>
<td>Renal Failure</td>
<td>1.4% (4)</td>
<td>0% (0)</td>
<td>0.017</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>1.7% (5)</td>
<td>0.2% (1)</td>
<td>0.0078</td>
</tr>
<tr>
<td>DVT</td>
<td>0% (0)</td>
<td>0.2% (1)</td>
<td>0.398</td>
</tr>
<tr>
<td>PE</td>
<td>0.07% (2)</td>
<td>0% (0)</td>
<td>0.0934</td>
</tr>
<tr>
<td>Decubitus Ulcer</td>
<td>0.03% (1)</td>
<td>0 (0%)</td>
<td>0.2358</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MORTALITY</th>
<th>Control</th>
<th>G 60</th>
<th>P - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>5.7% (16)</td>
<td>3.8% (15)</td>
<td>0.2</td>
</tr>
</tbody>
</table>
Geriatric trauma service: A one-year experience

Alicia J. Mangram, MD, Christopher D. Mitchell, MD, Vanessa K. Shifflette, MD, Manuel Lorenzo, MD, Michael S. Truitt, MD, Anuj Goel, MD, Mark A. Lyons, MD, Deborah J. Nichols, RN, and Ernest L. Dunn, MD, Dallas, Texas

Provides risk-adjusted benchmarking to track outcomes and improve patient care.

Utilizes the infrastructure of the National Trauma Data Bank (NTDB)
  - collect valid and reliable data, provide feedback, identify institutional characteristics associated with improved outcomes.

Builds upon this existing infrastructure
<table>
<thead>
<tr>
<th>Status</th>
<th>N</th>
<th>Elderly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>7</td>
<td>29%</td>
</tr>
<tr>
<td>Average</td>
<td>120</td>
<td>6%</td>
</tr>
<tr>
<td>Low</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

**Conclusion:** Centers might be high performers for the young, yet not the elderly (Nathens, 2012)
ACS TQIP Geriatric Trauma Management Guidelines

Honored by Experts. Honored to Serve.
New “G-60” Innovations at JCL

» Continuous Intercostal Nerve Blocks
» Continuous Peripheral Femoral Nerve Block (CPNB)
  – Femoral nerve block for HIP Fractures
» Vulnerable Elder Survey (VES)
» Rib Plating
Out with the old, in with the new: a novel approach to treating pain associated with rib fractures.

Truitt MS, Mooty RC, Amos J, Lorenzo M, Mangram A, Dunn E.

Rib fractures ready for prime time

Continuous intercostals nerve blockade for rib fractures: ready for primetime?

Truitt MS, Murry J, Amos J, Lorenzo M, Mangram A, Dunn E, Moore EE.

Hip Fractures

» Annually, more than 300,000 people in the United States fracture a hip
Femoral Nerve Block
Fascia Iliaca Blocks

Honored by Experts. Honored to Serve.
Ultrasound Guided femoral nerve block
Femoral Nerve Block

» As with all blocks a FNB can reduce systemic opiate requirements with their side effects.

» Patients love it, trauma surgeon performs block in the ER or shortly after admission

» Adds yet another procedure
One of the joys of trauma surgery is that young “warriors”
- have few medical problems
- and get better

“G60” population demands that assumptions about patient physiologic reserve be abandoned and requires assessment of baseline functioning.
Vulnerable Elderly Survey-13 (VES-13)

» Assess pre-injury disability
## Scoring VES-13

<table>
<thead>
<tr>
<th>Item</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0-3</td>
</tr>
<tr>
<td>Self-rated Health</td>
<td>0-1</td>
</tr>
<tr>
<td>Physical function</td>
<td>0-2</td>
</tr>
<tr>
<td>Functional disability</td>
<td>0-4</td>
</tr>
<tr>
<td>Maximum possible score</td>
<td>10</td>
</tr>
</tbody>
</table>

*Wong (2012)*
VES-13 and Our “G60” service

Question: Is VES-13 an appropriate tool for use among G-60 population?

1. What is the nature of the relationship between age and VES-13 in G60 trauma patients?
2. Does preinjury VES-13 score (0-10 points, higher = greater risk) predict outcomes such as HLOS, medical complications, patient disposition or death?
Age-adjusted VES-Score vs. Age
## Associations: VES

<table>
<thead>
<tr>
<th></th>
<th>Discharge Disposition (Home vs. Elsewhere)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Home</td>
<td>Elsewhere</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>VES-Score &lt;3</td>
<td>19</td>
<td>18</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>51.4%</td>
<td>48.6%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>VES-Score &gt;=3</td>
<td>4</td>
<td>26</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>13.3%</td>
<td>86.7%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>44</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td></td>
<td>34%</td>
<td>65.7%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

Pearson’s Chi-Square = 10.62 (df=1), p = .001
## Associations: ISS

<table>
<thead>
<tr>
<th></th>
<th>Home</th>
<th>Elsewhere</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ISS ≤9</strong></td>
<td>16</td>
<td>32</td>
<td>48</td>
</tr>
<tr>
<td><strong>%</strong></td>
<td>33.3%</td>
<td>66.7%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>ISS &gt;9</strong></td>
<td>6</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td><strong>%</strong></td>
<td>37.5%</td>
<td>62.5%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>22</td>
<td>42</td>
<td>64</td>
</tr>
<tr>
<td><strong>%</strong></td>
<td>34.4%</td>
<td>65.7%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Pearson’s Chi-Square = 0.92 (df=1), p = 0.769
Future Directions

» VES-13

- Testing the ability to predict future important outcomes
  - Morbidity
  - Hospital re-admission rate
  - Mortality
  - Discharge disposition
Transition Coach

Del E. Webb Foundation Awards $500,000 Grant to Expand Transition Coach Services for Medicare Patients

- **Program focus:** Reduction of readmission in chronic disease population
- Late 2013 pilot program expanded to G-60 trauma population at network facility to decrease readmissions in this population and assure safety in their home environments to decrease future traumatic events

- **Long term goal:** Expand program to G-60 population at John C Lincoln

<table>
<thead>
<tr>
<th>Patients Seen by Transition Team</th>
<th>Home Visits</th>
<th>Phone Calls</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>19</td>
<td>143</td>
</tr>
<tr>
<td>G60 Patients</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G60 Patients</th>
<th>72</th>
</tr>
</thead>
</table>
Matrix Rib

- Plates are precontoured to fit an average rib shape, which minimizes intraoperative bending

- Intramedullary splints allow minimally invasive procedures

- Locking design for increased stable fixation

- Designed to be used without removing the periosteum

Honored by Experts. Honored to Serve.
Case

» Admitted on June 1, 2014
» Not intubated but continued with significant pain and increasing oxygen requirements
» OR on June 3, 2014 for rib fixation after neurologic exam and repeat CT head was stable
OUR G-60 POPULATION
G-60 POPULATION

Category 1

- 2011-697
- 2012-896
- 2013-1009

Honored by Experts. Honored to Serve.
Mechanism of Injury

- MVC-21%
- Falls-65%
- MCC
- Pedestrian
- Penetrating
- other
Disposition from the Trauma Bay

Honored by Experts. Honored to Serve.
G-60 LOS AVERAGE IN DAYS

Category 1

QRT 1
QRT 2
QRT 3
QRT 4
Acute Care Surgical “G60”

» FUTURE DIRECTIONS
“G60” summary

» Falls with Broken Bones are Traumatic
» They should be on the Trauma team
» Multidisciplinary approach is best
» COT see the importance of “G60” guidelines!!
» Procedures will come just take care of the patient
Trauma Surgeon Team

Alicia Mangram MD, FACS
Alexzandra Hollingworth MD, FACS
Francis Ali-Osman MD
Joseph Sucher MD, FACS
Trauma Nurse Practitioner's Team

Arleen Stienstra

Mary Collins

Kimberli Bruce

Michele Tamul
THANK YOU !!!!!!!