Disclosure

- No Disclosures
SESSION OBJECTIVES

- Define the changing nature of trauma patients, based on national data sources
- Use trending data to suggest methods to improve systems for trauma preparedness, and how the military system of best trauma care will be integrated into the civilian practice
- Define changes in the care of trauma patient management that will impact outcomes
- Suggest needed changes in programs for trauma prevention, and designing performance measures
Best Practice

- What should be
  - No unexpected trauma deaths
  - Effective systems of prevention

Source: Zero Preventable Deaths

Military trauma system program documents
Current Practice

- **What is:** Preventable deaths occur, with uncoordinated trauma prevention programs, overutilization of immobilization, and subsequent complications.
- **Source:** NHAMCS data reports since 1992. National Trauma Data Bank
- **Current trauma literature**
Resulting Gaps

- What interventions are indicated
- Organized systems of care
- Joint Trauma System models in the military, applied in civilian system
- Improved education on trauma care for prehospital and ED providers
- Coordinated prevention programs
- Public education “Stop the Bleed” campaign
A Prevention Pause: Traffic Fatality Increase

- Traffic fatality estimates released by the National Safety Council, a nonprofit organization that works closely with federal auto-safety regulators.
- 40,200 people died in accidents involving motor vehicles in 2016, a 6 percent rise from the year before.
- First time since 2007 that more than 40,000 people have died in motor vehicle accidents in a single year.
- 2016 total comes after a 7 percent rise in 2015.
- Means the two-year increase — 14 percent — is the largest in more than a half a century.
Motor Vehicle Deaths

Figure 1. Annual Motor Vehicle Fatalities & Fatality Rates (1966-2016)

Source: FARS
Emergency Patients Keep Coming

(millions)
Population Utilization is Predictable

80/1000 Population

Walk-ins to ED
371 / 1000 Population

Total use 451 / 1000 Population
82% Walk-Ins
17% Arrival by EMS

Emergency Department

Transfer 2%
Admit 17%
Treat & Release 81%
LBTC 2%

General Population

EMS
Changing ED Patient Mix

- **1980s**: Mental Health: 40%, Injury: 20%, Illness: 40%
- **1990s**: Mental Health: 30%, Injury: 30%, Illness: 40%
- **2000s**: Mental Health: 20%, Injury: 40%, Illness: 40%
- **2010s**: Mental Health: 10%, Injury: 50%, Illness: 40%
SCOPE OF PROBLEM

- Leading cause of death age 1-44. For all age groups together, it is third behind cancer and atherosclerosis.
- Leading cause of “Years of Productive Life Lost” (YPLL), meaning that young active people are most frequent victims.
- Motor vehicle crash fatalities in 2011 were 32,367. (lowest death toll since 1949). All forms accidental death decreasing, esp work-related
- Cost of death and disability is over $671B in 2013
- Prevention Works! And why our health system gets more expensive
<table>
<thead>
<tr>
<th>MECHANISM</th>
<th>NUMBER</th>
<th>PERCENT</th>
<th>DEATHS</th>
<th>CASE FATALITY RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>380,800</td>
<td>44.18</td>
<td>16,623</td>
<td>4.37</td>
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<td>Motor Vehicle Traffic</td>
<td>223,866</td>
<td>25.97</td>
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<td>Struck by, against</td>
<td>55,662</td>
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<td>Transport, other</td>
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<td>4.56</td>
<td>903</td>
<td>2.30</td>
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<tr>
<td>Cut/pierce</td>
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<td>4.13</td>
<td>776</td>
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<tr>
<td>Firearm</td>
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<td>4.21</td>
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<td>Pedal cyclist, other</td>
<td>14,730</td>
<td>1.71</td>
<td>207</td>
<td>1.41</td>
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<tr>
<td>Other specified and classifiable</td>
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<td>1.59</td>
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<tr>
<td>Hot object/substance</td>
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<td>Fire/flame</td>
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<td>0.91</td>
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<td>Unspecified</td>
<td>7,834</td>
<td>0.91</td>
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<td>5.53</td>
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<td>Machinery</td>
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<td>0.94</td>
<td>99</td>
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<tr>
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<td>Overexertion</td>
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<td>Natural/environmental, Other</td>
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<td>0.28</td>
<td>38</td>
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<tr>
<td>Suffocation</td>
<td>885</td>
<td>0.10</td>
<td>240</td>
<td>27.12</td>
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<td>Poisoning</td>
<td>413</td>
<td>0.05</td>
<td>8</td>
<td>1.94</td>
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<td>Drowning/submersion</td>
<td>375</td>
<td>0.04</td>
<td>72</td>
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<td>Adverse effects, medical care</td>
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<td>11</td>
<td>4.91</td>
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<tr>
<td>Adverse effects, drugs</td>
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<td>NK/NR</td>
<td>10,005</td>
<td>1.16</td>
<td>403</td>
<td>4.03</td>
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<td><strong>Total</strong></td>
<td><strong>946,853</strong></td>
<td><strong>100.00</strong></td>
<td><strong>21,001</strong></td>
<td><strong>16.73</strong></td>
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<td>AGE</td>
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<td>DEATHS</td>
<td>CASE FATALITY RATE</td>
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<td>--------</td>
<td>---------</td>
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<tr>
<td>&lt;1 year</td>
<td>9,275</td>
<td>1.08</td>
<td>203</td>
<td>2.19</td>
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<td>1-4</td>
<td>24,734</td>
<td>2.87</td>
<td>540</td>
<td>2.18</td>
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<tr>
<td>5-9</td>
<td>28,094</td>
<td>3.26</td>
<td>618</td>
<td>2.20</td>
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<tr>
<td>10-14</td>
<td>28,065</td>
<td>3.26</td>
<td>559</td>
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<td>15-19</td>
<td>50,883</td>
<td>5.90</td>
<td>1,541</td>
<td>3.03</td>
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<td>20-24</td>
<td>66,103</td>
<td>7.67</td>
<td>2,562</td>
<td>3.88</td>
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<td>25-34</td>
<td>107,762</td>
<td>12.50</td>
<td>3,847</td>
<td>3.57</td>
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<td>35-44</td>
<td>82,781</td>
<td>9.60</td>
<td>2,776</td>
<td>3.35</td>
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<td>45-54</td>
<td>97,233</td>
<td>11.28</td>
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<td>3.42</td>
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<td>55-64</td>
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<td>11.81</td>
<td>4,058</td>
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<td>65-74</td>
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<td>10.23</td>
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<td>4.84</td>
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<td>75-84</td>
<td>90,960</td>
<td>10.55</td>
<td>6,056</td>
<td>6.66</td>
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<tr>
<td>&gt;84</td>
<td>85,932</td>
<td>9.97</td>
<td>7,418</td>
<td>8.63</td>
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<tr>
<td>NK/NR</td>
<td>83</td>
<td>0.01</td>
<td>56</td>
<td>67.47</td>
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<tr>
<td>Total</td>
<td>861,888</td>
<td>100</td>
<td>37,825</td>
<td>4.39</td>
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## Trauma in the Golden Years

<table>
<thead>
<tr>
<th>Year</th>
<th>% of Patients age 65-74</th>
<th>% of Patients over 75</th>
<th>Injury Visits per 1000 population age 65-74</th>
<th>Injury Visits per 1000 population over age 75</th>
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</thead>
<tbody>
<tr>
<td>2014</td>
<td>4.7%</td>
<td>7%</td>
<td>95</td>
<td>174</td>
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<tr>
<td>2006</td>
<td>4.9</td>
<td>7.5</td>
<td>111</td>
<td>188</td>
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<tr>
<td>1998</td>
<td>4</td>
<td>7</td>
<td>83</td>
<td>181</td>
</tr>
<tr>
<td>1992</td>
<td>4.1</td>
<td>4.5</td>
<td>71</td>
<td>116</td>
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</table>
## Payor Mix General ED vs. Trauma

<table>
<thead>
<tr>
<th>Payor</th>
<th>% of ED Visits, 2014</th>
<th>% of Trauma Patients in NTDB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>34.6%</td>
<td>35.1%</td>
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<tr>
<td>Medicaid, CHIP</td>
<td>34.9%</td>
<td>16.3%</td>
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<tr>
<td>Medicare</td>
<td>16%</td>
<td>27%</td>
</tr>
<tr>
<td>Self Pay</td>
<td>12%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Worker Comp</td>
<td>0.8%</td>
<td>1%</td>
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</tbody>
</table>
Zero Preventable Deaths after Injury

- A National Trauma Care System: Integrating Military and Civilian Trauma Systems to Achieve Zero Preventable Deaths after Injury in the Joint Trauma System models in the military, applied in civilian system
- C William Schwab, MD
- Scudder Oration delivered at the ACS Clinical Congress 2014
- Improve education on trauma care for prehospital and ED providers
- Coordinated prevention programs
- Improve public education “Stop the Bleed” campaign
The Changing Face of MCIs

The New Priorities of Trauma MCIs
Trauma

- Still Anything, Anytime, Anywhere, Any Number
- Care Options are changing
- Equipment is Changing Rapidly
Wartime and Sports Greatly Affect Care of Trauma Patients
WHAT ARE IMPORTANT AND CHANGING ELEMENTS OF TRAUMA CARE

- Military and Civilian Applications of Techniques and Tools
- Senior Trauma
- Sports Injuries and High Profile Care
- Packaging
- Ways to Stop Bleeding
- Preventing Late Complications
PREHOSPITAL TRAUMA CARE PRIORITIES

- Rapid response and extrication, integrating new technologies for locating incidents, and predicting severity, integrating visuals
- Prevent additional injury and initiate therapy in a timely manner
- Rapid transport to an appropriate receiving facility, giving advance notification to the medical personnel in that facility
- No field categorization system has yet been developed to precisely predict which patient needs which level of trauma center
- Especially with older patients
Concepts in Development

- Response Capabilities for MCIs
- Active Shooter Protocols
- Appropriate use of Helicopters
- Widespread use of Tourniquets
- Selective use of Spinal Motion Restriction
Prevent Cold, Acidotic, Coagulopathic
Permissive Hypotension along with prevention of Hypothermia
Medications
Tranexamic Acid, a clot stabilizer
Progesterone as a neuro protective agent for Traumatic Brain Injuries
The Changing Nature of Trauma
the Senior Trauma

- On thinners
- Pre-existing conditions
- Did primary medical event cause trauma?
- Package poorly using current tools
- Develop complications easily
- Usual markers of shock are missing
The Changing Face of MCIs

The Old Image of Trauma MCIs

- Newer Versions
Packaging

- Cervical Immobilization versus Spine Immobilization
- Pelvic Binders
- Fluid Warmers, Fluid Coolers
- Dressings Opsite, Tegaderm
Products

- Military versus Civilian Applications
- Disaster vs. Day to Day
- Adult, Pediatric, Geriatric, Special Needs
Critical Interventions

- ABCs
- Selective Spinal Motion Restriction
- Airway, Breathing
- Circulation (Warm)
- IV's where needed (Above and below diaphragm)
Pain Control is Essential, and a Long Term Prevention for PTSD

"A Little PAIN Never Killed Anybody..."
Transportation Issues

- What Effect w or w/o Helicopter Telemedicine
- What Hospital will Treat Him?
- Hospital Response - In-House
- Hospital Response to the scene

Trauma Centers are Reappearing
Saving a Life ABC

- Airways - Different then Cardiac Arrest
- Tourniquets
- Length of Needles for Chest Decompress
- IO Apparatus
- DARPA Foam
The Trauma Patient in Shock

- Sum of responses at organ and cellular level which reflect
- **Inadequate perfusion (The P Word)**
- Serum Lactate helps evaluate
- Pulse Oximeter best existing tool
- End Tidal CO2 may help evaluate
Permissive Hypotension

- Maintain or restore basic Perfusion
- Monitor patient continually to determine response to therapy and ongoing fluid needs
- Don’t infuse cold fluids
- “Damage Control Resuscitation”
- Endovascular control
Control Bleeding

- Gross hemorrhage controlled with direct pressure or pressure cuff, then tourniquet
- Trauma Dressings
- Skin Dressings
- Opsite, Tegaderm
- Elderly Skin Tear Dressings
Medicines and Monitors

- Tranexemic Acid
- Progesterone for TBI
- Pulse Oximeter as a Perfusion Meter
- ETCO2 for Head Trauma
Massive Extremity Injury, as IEDs

- Preserve Life
- Preserve Limb
- Tourniquet
Tranexamic Acid

- Synthetic derivative of the amino acid lysine
- Potent pro-hemostatic drug that stops fibrin degradation
- Prevents clot breakdown
- Drug reduces the need for blood transfusion in surgery pts
- CRASH-2 trial showed TXA given early after trauma saves lives
Tranexamic Acid

- U.S. military already gives TXA to soldiers with severe bleeding and includes TXA acid in its protocol for combat casualties.
- Greatest benefit was seen when TXA was administered within 1 hour of injury.
- TXA has been approved by the FDA for use in hemophiliacs undergoing dental work and for menorrhagia.
- NOT specifically FDA approved for hemorrhage in trauma patients.
- Approximately $200 for treatment.
Packaging

- Immobilization for movement
- Packaging, different for C Spine versus total spine
- Safe Airway and Breathing
- Circulation assessment and care
- Don’t Create New Wounds
Prevention

- Haddon’s Matrix
- Response
- Initial Rescue
- Definitive Care
- Rehabilitation
Integrating Innovation & Products

- Military versus Civilian Applications
- Tourniquets, Pelvic Binders
- Packaging of Trauma Patients and Trauma Dressings
- IO Apparatus
- Disaster Products, Victim Tracking
- DARPA Foam
- Hospital Response - In-House
- Fluid Warmers, Fluid Coolers
- Tranexemeric Acid, Progesterone
- Virtual Presence and Telemedicine
- ETCO2 for Head Trauma
- Pulse Oximeter as a Perfusion Meter
- Airways - Different then Cardiac Arrest
- Cervical Immobilization versus Spine Immobilization
- Balloon Catheters and other Endovascular Applications
Summary

- The Challenges of Change
- Congratulations on Successes in Prevention
- That is our Future