Pediatric Train Injuries: A 10 Year Review from the Pennsylvania Trauma Outcomes Study Database

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Disclosures

• None
Background

- 9,070 railroad injuries in 2015
- 791 railroad deaths in 2016
- Adult literature suggests:
  - Young men at greatest risk
  - Orthopedic injuries are common
  - Pedestrians struck, MVC, “Train surfing”
Project Impetus

- 14M attempted to “Train Surf”
- Traumatic above knee amputation
- Serial debridement and wound closure with STSG
- Discharged home on HD 35
Project Impetus

• 14M attempted to “Train Surf”
• Traumatic above knee amputation
• Serial debridement and wound closure with STSG
• Discharged home on HD 35
Passenger Train Use 2017

- North East Corridor—Greatest station-density in US
- 6,388 miles of railway track in PA
Research Goals

- Determine
  - Incidence of train-related injuries requiring hospitalization in pediatric patients
  - At-risk pediatric populations
  - Patterns and severity of injuries
  - Health resource utilization
  - Clinical outcomes of children injured by trains
Methods

• PTOS Query:
  – Patients <21 years
  – ICD9 or ICD 10 codes for injuries involving trains:

<table>
<thead>
<tr>
<th>ICD 9 Codes</th>
<th>ICD 10 Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>E800.0-807.9</td>
<td>V05, V15, V25, V35,</td>
</tr>
<tr>
<td>E810.0-810.9</td>
<td>V45, V55, V65, V75,</td>
</tr>
<tr>
<td></td>
<td>V81, V87.6, V88.6</td>
</tr>
</tbody>
</table>

• Demographics, patterns of injury, resource utilization, and outcomes extracted
## Demographics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Total Patients Identified (N)</td>
<td>48</td>
</tr>
<tr>
<td>Age (mean, range)</td>
<td>15.3 years (1 - 20)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>• White</td>
<td>60.4%</td>
</tr>
<tr>
<td>• Black or African American</td>
<td>35.4%</td>
</tr>
<tr>
<td>• Other</td>
<td>4.2%</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>• Male</td>
<td>77.1%</td>
</tr>
<tr>
<td>• Female</td>
<td>22.9%</td>
</tr>
<tr>
<td>Drug Use</td>
<td>20.8%*</td>
</tr>
<tr>
<td>Alcohol Use</td>
<td>12.5%*</td>
</tr>
<tr>
<td>ISS (mean, range)</td>
<td>17.3 (4 - 59)</td>
</tr>
</tbody>
</table>

*Drug and alcohol use data available for 35.4% and 50.0%, respectively*
Ages of Train-Injured Patients

Mean = 15.3 years
Timing of Injuries

### Time of Day
- Day: 68.8%
- Night: 31.3%

### Seasons
- Spring: 31.3%
- Summer: 27.1%
- Fall: 25.0%
- Winter: 16.7%
Train Injuries by County

<table>
<thead>
<tr>
<th>Delaware County</th>
<th>Philadelphia County</th>
<th>Allegheny County</th>
<th>Erie County</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>7</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>
# Patterns of Injury

<table>
<thead>
<tr>
<th>Fracture</th>
<th>45.8%</th>
</tr>
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<tbody>
<tr>
<td>• Long Bone</td>
<td>31.3%</td>
</tr>
<tr>
<td>• Pelvic</td>
<td>20.8%</td>
</tr>
<tr>
<td>• Facial</td>
<td>14.6%</td>
</tr>
<tr>
<td>Concussion</td>
<td>27.7%</td>
</tr>
<tr>
<td>Intracranial Hemorrhage</td>
<td>25.5%</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>20.8%</td>
</tr>
<tr>
<td>Traumatic Amputation</td>
<td>16.7%</td>
</tr>
<tr>
<td>Solid Organ Injury</td>
<td>14.6%</td>
</tr>
<tr>
<td>• Spleen</td>
<td>8.3%</td>
</tr>
<tr>
<td>• Liver</td>
<td>6.3%</td>
</tr>
<tr>
<td>• Kidney</td>
<td>6.3%</td>
</tr>
</tbody>
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<tr>
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<td>14.6%</td>
</tr>
</tbody>
</table>

| Concussion        | 27.7%  |
| Intracranial Hemorrhage | 25.5%  |
| Pneumothorax      | 20.8%  |
| Traumatic Amputation | 16.7%  |
| Solid Organ Injury | 14.6%  |

49% experienced 2 or more of these injuries
## Resource Utilization

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Length of Stay (mean, range)</td>
<td>12.4 days (0 – 121)</td>
</tr>
<tr>
<td>Intubated on Admission</td>
<td>25.0%</td>
</tr>
<tr>
<td>ICU Admission</td>
<td>56.3%</td>
</tr>
<tr>
<td>ICU Days (mean, range)</td>
<td>5.3 days (1 – 18)</td>
</tr>
<tr>
<td>Consulting Services (mean, range)</td>
<td>7.1 services (0 – 15)</td>
</tr>
<tr>
<td>• PT/OT</td>
<td>64.6%</td>
</tr>
<tr>
<td>• Social Services</td>
<td>60.4%</td>
</tr>
<tr>
<td>• Orthopedics</td>
<td>52.1%</td>
</tr>
<tr>
<td>• Neurosurgery</td>
<td>47.9%</td>
</tr>
</tbody>
</table>
Surgical Interventions

<table>
<thead>
<tr>
<th>Surgical Procedure</th>
<th>% of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Surgery</td>
<td>64.6%</td>
</tr>
<tr>
<td>Internal Fixation</td>
<td>35.4%</td>
</tr>
<tr>
<td>Debridement</td>
<td>29.2%</td>
</tr>
<tr>
<td>Amputation</td>
<td>20.8%</td>
</tr>
<tr>
<td>Laparotomy</td>
<td>6.3%</td>
</tr>
<tr>
<td>Thoracotomy</td>
<td>4.2%</td>
</tr>
</tbody>
</table>
### Outcomes

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<thead>
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<tbody>
<tr>
<td>Mortality</td>
<td>10.4%</td>
</tr>
<tr>
<td>Discharge to rehab/long-term care</td>
<td>37.2%</td>
</tr>
<tr>
<td>FIM Score (mean, range)</td>
<td>16.3 (5 - 20)</td>
</tr>
</tbody>
</table>

**Functional Independence Measures (FIM):**

- Standard score of functional status (5-20)
  - Feeding
  - Locomotion
  - Emotion
  - Transfer mobility
  - Social Interaction
Take Home

• Adolescent, Caucasian males

• Orthopedic and traumatic brain injuries are common

• Pediatric train-trauma is uncommon, but serious:
  – Most patients survive (10% mortality)
  – 77.8% of survivors:
    • Required surgery
    • Discharged to rehab/long-term care
Questions?