What is Re-Triage

- A subset of transfers into the trauma system for immediate availability of a higher level of care or emergent specialty care.
- Primary triage occurs in the field and is guided by well defined triage tools.
- 2011 Guidelines for Field Triage of Injured Patients
- Sasser SM, Hunt RC, Faul M, et al; Center for Disease Control and Prevention
- Secondary Triage (Inter-hospital transfer)
  - Less well defined
  - Chapter 6, Resources for Optimal Care of the Injured Patient offers a list of “Criteria for Consideration of Transfer”
  - Many LEMSAs have adopted guidelines to identify the need for “urgent” and “emergent” criteria.

System Performance

- How do we measure how well we get transferred patients into the system?
  - Retrospective review of transfer patients
  - Development of ongoing, concurrent quality measures
- How do we improve our performance as a system?
  - Develop a consistent message
  - Deliver the message through education
  - Deliver the message through feedback on performance

Retrospective Review

- Evaluation of all 2013 patients from each trauma center
- Development of a single database at Stanford, populated with de-identified patient records from each trauma registry
- Evaluate what data points are currently available and readily collected that will help improve and evaluate the re-triage process
- Evaluate performance and outcomes of transferred patients compared to patients triaged directly to a trauma facility
- Identify variables that should be collected in the registry to evaluate and improve the re-triage process

Special Thanks to the Social Emergency Medicine Group at Stanford University Medical School
- Ewen Wang
  - Associate Director Pediatric Emergency Medicine
- Elizabeth Pirrotta
  - EM Data Management & Analysis Specialist
- Trauma Registrars
Retrospective Review

Evaluation of all 2013 patients from each trauma center
Making progress
Development of a single database at Stanford, populated with de-identified patient records from each trauma registry
Done

Retrospective Review

Evaluate what data points are currently available and readily collected that will help us improve and evaluate the re-triage process
NTDB and TQIP require very little data on retriage and trauma transfers
Most centers collect very little specific to transfers
Although EMSA, LEMSAs, ACS and other bodies recognize that rapid retriage is an essential part of a successful system, there is no consistent & formal collection of data points to evaluate process and outcome measures of performance in our registries.

Retrospective Review

ED Documentation of
Documentation of pre-hospital or ED resuscitation SBP<90
Documentation of pre-hospital or ED resuscitation GCS<9
Penetrating injury to the head, chest or abdomen

ED Treatments
Electrical Countershock
Repair of Heart or pericardium
Pericardiotomy
Tracheostomy/cricothyroidotomy
Ventriculostomy

Retrospective Review

18772 records in database
11 trauma centers
Each trauma center collects and stores data slightly different so it is a complex task to combine each registry into a unified dataset
Evaluate performance and outcomes of transferred patients compared to patients triaged directly to a trauma facility
**Retrospective Review**

- Evaluate performance and outcomes of transferred patients compared to patients triaged directly to a trauma facility.
- What is the median time from arrival at the referring center to the arrival at a trauma center for all transferred patients compared to the rapid re-triage patients?
- How does the mortality rate for the rapid re-triage patients compare to patients that meet similar screening data points that were triaged to a trauma center primarily?
- Can we use this information to build a better tool to monitor this assessment?

**Early Results**

- Data from 10 of the 11 trauma Centers
- 18,772 patients were included in the database
- 1740 (9.3%) were transfers
- 234 (13.4%) of transfers had rapid re-triage criteria
- 62 (3.6%) of transferred patients died
- 47 (2.7%) transferred patients were rapid re-triage and died
- Reviewed ISS, Admission Rates
- LOS, Mortality Rates
- Penetrating vs Blunt

**Triage & Arrival Status Groups**

- 18,772 total patients
- 1.3% Rapid Re-Triage
- 6.9% Non-Re-Triage
- 78.9% Non-emergent Triage
- 13.4% Emergent Triage

**Median ISS**

- Rapid Re-Triage: 19
- Non-Re-Triage: 13
- Non-emergent Triage: 4
- Emergent Triage: 10

**Admit rate**

- Rapid Re-Triage: 88.1%
- Non-Re-Triage: 85.9%
- Non-emergent Triage: 48.2%
- Emergent Triage: 74.2%

**ICU vs. Ward admit rate**

- Rapid Re-Triage: 45.4% ICU, 45.2% Ward
- Non-Re-Triage: 33.7% ICU, 32.9% Ward
- Non-emergent Triage: 17.5% ICU, 11.7% Ward
- Emergent Triage: 38.4% ICU, 37.8% Ward
**Median Hospital LOS**

<table>
<thead>
<tr>
<th>Triage Type</th>
<th>ED</th>
<th>ICU</th>
<th>Ward</th>
<th>LOS (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid Re-triage</td>
<td>2.1%</td>
<td>6.0%</td>
<td>12.0%</td>
<td></td>
</tr>
<tr>
<td>Non-Re-triage</td>
<td>0.1%</td>
<td>0.8%</td>
<td>0.3%</td>
<td></td>
</tr>
<tr>
<td>Non-emergent Triage</td>
<td>0.7%</td>
<td>0.2%</td>
<td>0.8%</td>
<td></td>
</tr>
<tr>
<td>Emergent Triage</td>
<td>6.5%</td>
<td>5.5%</td>
<td>4.9%</td>
<td></td>
</tr>
</tbody>
</table>

**Mortality rate**

<table>
<thead>
<tr>
<th>Triage Type</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid Re-triage</td>
<td>29.1%</td>
</tr>
<tr>
<td>Non-Re-triage</td>
<td>1.7%</td>
</tr>
<tr>
<td>Non-emergent Triage</td>
<td>0.9%</td>
</tr>
<tr>
<td>Emergent Triage</td>
<td>16.9%</td>
</tr>
</tbody>
</table>

**Where did patients die?**

<table>
<thead>
<tr>
<th>Triage Type</th>
<th>ED</th>
<th>ICU</th>
<th>Ward</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid Re-triage</td>
<td>26 (17-38)</td>
<td>10 (4-18)</td>
<td></td>
</tr>
<tr>
<td>Non-Re-triage</td>
<td>146 (81-216)</td>
<td>113 (56-211)</td>
<td></td>
</tr>
<tr>
<td>Non-emergent Triage</td>
<td>191 (111-260)</td>
<td>165 (90-258)</td>
<td></td>
</tr>
<tr>
<td>Emergent Triage</td>
<td>39 (28-51)</td>
<td>38 (24-59)</td>
<td></td>
</tr>
</tbody>
</table>

**Elapsed time**

<table>
<thead>
<tr>
<th>Time Parameter</th>
<th>Rapid Re-triage</th>
<th>Non Re-triage transfer</th>
<th>Triage directly to TC</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>234</td>
<td>1259</td>
<td>17,021</td>
</tr>
<tr>
<td>% with recorded times</td>
<td>75%</td>
<td>78%</td>
<td>63%</td>
</tr>
<tr>
<td>Median ISS (IQR)</td>
<td>13 (5-25)</td>
<td>9 (4-13)</td>
<td>5 (1-9)</td>
</tr>
<tr>
<td>Mortality</td>
<td>47 (20-100)</td>
<td>15 (1-100)</td>
<td>498 (2.9%)</td>
</tr>
<tr>
<td>Time in to time out at TF, m</td>
<td>123 (66-213)</td>
<td>199 (122-279)</td>
<td></td>
</tr>
<tr>
<td>Time in TF to time in TC, m</td>
<td>171 (89-264)</td>
<td>253 (173-345)</td>
<td></td>
</tr>
<tr>
<td>Travel time TF to TC, m</td>
<td>38 (25-58)</td>
<td>42 (28-70)</td>
<td>18 (19-25)</td>
</tr>
</tbody>
</table>

**Time by Mortality**

<table>
<thead>
<tr>
<th>Of Rapid Re-triage Patients</th>
<th>Died</th>
<th>Survived</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>47</td>
<td>187</td>
</tr>
<tr>
<td>Median ISS (IQR)</td>
<td>26 (17-38)</td>
<td>10 (4-18)</td>
</tr>
<tr>
<td>Time in to time out at TF, m</td>
<td>146 (81-216)</td>
<td>113 (56-211)</td>
</tr>
<tr>
<td>Time in TF to time in TC, m</td>
<td>191 (111-260)</td>
<td>165 (90-258)</td>
</tr>
<tr>
<td>Travel time TF to TC, m</td>
<td>39 (28-51)</td>
<td>38 (24-59)</td>
</tr>
</tbody>
</table>

**Blunt vs Penetrating**

<table>
<thead>
<tr>
<th>Time Parameter</th>
<th>Blunt</th>
<th>Penetrating</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>124</td>
<td>110</td>
</tr>
<tr>
<td>Median ISS (IQR)</td>
<td>17.5 (10-26)</td>
<td>7 (1-14)</td>
</tr>
<tr>
<td>Mortality</td>
<td>39 (32-100)</td>
<td>8 (7.3%)</td>
</tr>
<tr>
<td>Time in to time out at TF, m</td>
<td>170 (114-234)</td>
<td>69 (46-140)</td>
</tr>
<tr>
<td>Time in TF to time in TC, m</td>
<td>204 (152-301)</td>
<td>110 (66-230)</td>
</tr>
<tr>
<td>Travel time TF to TC, m</td>
<td>45 (27-65)</td>
<td>36 (22-52)</td>
</tr>
</tbody>
</table>

- If penetrating injury patients can have 70 minute Time in to Time out transfer times, is this a transport agency problem? Why are the blunt trauma transfers so long?
- How quickly does the decision to transfer occur?
Summary of Findings

- Rapid Re-triage patients are Sicker (higher ISS)
- More likely to be admitted (overall and to ICU)
- Have longer LOS (mean and median)
- More likely to die (overall)
- More likely to die late deaths (in ICU)

- Blunt trauma transfer (rapid re-triage) patients
  - Have higher ISS’s
  - Have higher mortality rates
  - Have longer transfer times

System Performance

- Identify variables that should be collected in the registry to evaluate and improve the re-triage process
- Discussed with Lancet
- Very easy to build a custom regional “transfer in/PI” page to evaluate transfer performance, particularly if each TC will use the same page
- Cost is limited since it can be spread evenly across all eleven (now 12) trauma centers

System Performance

Retriage Criteria Data Points

- Blood Pressure/Perfusion
  - Any systolic Systolic BP < 90 at the referring facility or in transport
  - Transfusion of any blood products prior to TC arrival
  - Resuscitation with > 2 liters at the referring facility

- Neurologic
  - Any GCS < 9 prior to arrival at the TC
  - Any 2 documented 2 point GCS deterioration at the referring facility
  - Any documented open skull fracture
  - Any documented anisocoria

- Anatomic
  - Penetrating Injury to
    - Head
    - Neck
    - Chest
    - Abdomen
    - Flank or Back
    - Ischemia or loss of pulse in any extremity

- Transfer Times
  - Time of arrival at transferring facility
  - Time first transfer request received at TC
  - Time patient left transferring facility
  - Time patient arrived at TC
  - Mode of transport

System Performance

Retriage Criteria Data Points

- Other Data
  - Studies performed at the transferring facility
  - Procedures performed at the transferring facility
  - Common identifiers/code for referring facilities
  - Availability of referring facility records
  - Availability of transport agency records

System Performance

- Education
  - Development of a common message
  - EMSA looking at system-wide re-triage
  - Develop common goals
  - Evaluate different processes for best practice
  - Develop strategies for broad comprehensive delivery of the message
  - State Summit
  - Regional Meetings
  - Trauma Centers and “Buddy” hospitals
QUESTIONS?