Field Triage for Trauma Patients: What’s the Evidence?

Craig D. Newgard, MD, MPH
Center for Policy and Research in Emergency Medicine
Department of Emergency Medicine
Oregon Health & Science University
Portland, Oregon

Objectives

- Role of field triage in U.S. trauma systems
- Development of field triage in the U.S.
- Accuracy of field triage
- Appreciate the deeper issues of triage:
  - Actual practice patterns
  - Which patients to target with triage
  - How to define “triage”
  - Under- vs. over-triage

EMS in Trauma Systems
Primary Trauma Triage

Background
- Definition: use of field-based information to identify injured patients requiring immediate transport to a trauma center
- Simple in concept, complex in practice
- Based on:
  - limited information in short time
  - often chaotic setting
  - distance, road, traffic, weather
- Issues:
  - Balancing outcomes, resources, cost
  - Regionalization of trauma care

History of Trauma Triage
- 1700’s
- Historical wars
- World war I & II
- Korean War
- Vietnam
- Middle East
- Civilian triage – 1976
  - American College of Surgeons triage criteria and hospital accreditation
Step 1 - Physiologic Criteria

- High yield
- Adults: sensitivity 30-65%, specificity 80-98%
  - GCS and respiratory/airway most predictive
  - no low-yield physiologic measure
- Children: sensitivity 27-76%, specificity 57-99%
  - age-specific values?
  - vital signs commonly missing from field
  - GCS and airway most predictive
Steps 2 & 3: Anatomic and Mechanism Criteria

- Intermediate yield
- Individually, these criteria have moderate sensitivity (20-50%) and specificity (10-60%)
- In sequence (triage algorithm), play important role

Step 4: Risk Factor Criteria

- Represent higher risk/higher complexity populations
- Has been limited evidence to demonstrate utility in context of triage guidelines

Overall assessment

- Sensitivity 95-97%, specificity 8-20%

(Norcross, J Am Coll Surg, 1995)
The Deeper Issues of Field Triage

How is field triage actually practiced?
Field Use of Trauma Criteria

- figure pending -

- n = 46,414 patients meeting triage criteria in 6 regions
  (Burnett et al. Prehospital Emergency Care. 2013)

- 60 hours in field - 10 ride-alongs
- 10 ambulance and fire agencies in 4 counties
- Interviews with 35 field providers
- Field observations
- “Roundtable” focus group with EMS agency leadership (n = 40)
- Qualitative methods
  - Key ideas, phrases, and recurrent themes
  - Conceptual framework of field triage
Theme 1: “Gut Feeling”
- Primary reason for trauma entries
- Heavily influenced by:
  - Dispatch information
  - Mechanism
  - Early visual cues from the scene, including appearance of patient
  - Provider experience

Theme 2: Provider Experience
- Significant factor in interpreting key information
- Most experienced provider guides decision-making
- Triage algorithm “for newbies”

Theme 3: Patient Preference
- For non-trauma entries, patient preference most important
- If no preference, proximity (closest hospital)
- EMS provider perceptions:
  - Surgical needs, costs, hospital resources, quality of care, avoidance of interhospital transfers
Theme 4: *Culture of Field Triage*

- “Encourages over-triage...we tend to err on the side of caution”
- Little or no penalty to field providers for activating the trauma system
- Under-triage strongly discouraged
  - Local non-trauma hospital providers
  - EMS agency quality assurance
  - Trauma QA committees
EMS cognitive processing for triage

- Similar to experienced clinicians
- Fast, heuristic, intuitive
- Rapid decisions rewarded in time-dependent environment
- Not algorithmic
- Reverse of current Field Triage Decision Scheme
- Experience is important

Is EMS judgment accurate?

A Comparison of EMT Judgment and Prehospital Trauma Triage

Evaluation of the Prehospital Index, presence of high-velocity impact and judgment of emergency medical technicians as criteria for trauma triage

Andrew Lattuada, PA-C,** Barry D., MD, MSCI;*** Lorraine Moore, PA-C;*** Stephanie Cannon, MSCI;***
Michele Giannini, MB, MD

Is paramedic judgement useful in prehospital trauma triage?

Stephen A. Muhlhauser**, Belinda J. Galleta, Peter Cameron**,***
Victorian State Trauma Registry and Monitoring Group (VSTORM)

Characterizing the use and predictive value of “emergency medical services provider judgment” in out-of-hospital trauma triage: A multile, mixed-method assessment

Figure 1. Frequency of using the “EMS provider judgment” criterion among triage-positive patients, by site (N = 41,991).
Which patients should be cared for at major trauma centers?

Patients shown to benefit from care in major trauma centers/trauma systems:

- **ISS ≥ 16**

- **AIS ≥ 3**

- **ISS > 12, or 2 or more AIS ≥ 2 injuries**

- **Specific “index” injuries**
Resource-based definitions

A consensus-based criterion standard for trauma center need


Injury Severity Score vs. Resource Use

<table>
<thead>
<tr>
<th>ISS</th>
<th>Resource Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-8</td>
<td>Admitted to the hospital for a spinal injury</td>
</tr>
<tr>
<td>9-15</td>
<td>Resource use: major non-orthopedic surgery, orthopedic surgery, ventilation &gt;96 hrs, transfusion, ICU stay &gt;=2 days, in-hospital mortality</td>
</tr>
<tr>
<td>16+</td>
<td>Did not use the INCREASE CFT criteria for resuscitation of cardiac arrest for trauma care or an inpatient critical care unit and included transfers for resuscitation of cardiac arrest for trauma care or an inpatient critical care unit</td>
</tr>
</tbody>
</table>


How to define “triage”?
1. By application of Field Triage Decision Scheme

2. By initial hospital destination (trauma center vs. non-trauma center)

3. By final hospital destination (trauma center vs. non-trauma center)

Under-triage vs. Over-triage:
Can we do better?
- National benchmarks (ACSCOT):
  - Under-triage <= 5% (the “missed” patients)
  - Over-triage <= 50% (wasted resources and cost)
- Reality of hitting national benchmarks
**Cost implications of over-triage**

### Table 1: Estimated Annual Cost Savings by Scenario (in Emergency Medical Services [EMS] Triage Patients for Patients Not Meeting National Field Triage Guidelines)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Cost Savings using full study sample in dollars</th>
<th>% of total cost saved</th>
<th>Cost Savings using only overtriage activations in dollars</th>
<th>% of total cost saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. All non-free activations transported to non-resource centers</td>
<td>$167,793.91</td>
<td>3.5%</td>
<td>$44,791.96</td>
<td>1.7%</td>
</tr>
<tr>
<td>2. Non-free activations transported to level 1 trauma centers</td>
<td>$67,599.59</td>
<td>1.3%</td>
<td>$18,919.15</td>
<td>0.7%</td>
</tr>
<tr>
<td>3. Non-free activations transported to level 2 trauma centers</td>
<td>$118,269.00</td>
<td>2.2%</td>
<td>$35,509.09</td>
<td>1.4%</td>
</tr>
<tr>
<td>4. Non-free activations transported to level 2 trauma centers transported to non-resource center</td>
<td>$16,488.80</td>
<td>0.3%</td>
<td>$4,862.64</td>
<td>0.2%</td>
</tr>
<tr>
<td>5. Non-free activations transported to level 1 or 2 trauma centers</td>
<td>$27,587.00</td>
<td>0.6%</td>
<td>$8,236.00</td>
<td>0.3%</td>
</tr>
<tr>
<td>6. Non-free activations transported to non-resource centers</td>
<td>$167,793.91</td>
<td>3.5%</td>
<td>$44,791.96</td>
<td>1.7%</td>
</tr>
</tbody>
</table>
Conclusions

- Triage is an integral aspect of trauma systems
- Field trauma triage processes are complex and imperfect
- Out-of-hospital decisions can have large downstream impact on outcomes and costs

Thank You.