

Does Mechanism of Injury Predict Trauma Center Need for Children?

E. Brooke Lerner, Ph.D.
Department of Emergency Medicine
Medical College of Wisconsin

Co-Investigators

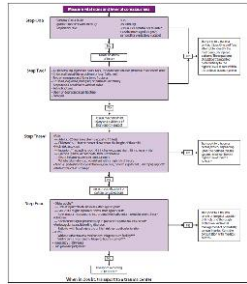
- Mohamed Badawy, University of Texas Southwestern
- Jeremy Cushman, University of Rochester
- Amy Drendel, Medical College of Wisconsin
- Nicole Fumo, Medical College of Wisconsin
- Courtney Jones, University of Rochester
- Manish N. Shah, University of Wisconsin
- David M Gourlay, Medical College of Wisconsin

Conflicts of Interest and Support

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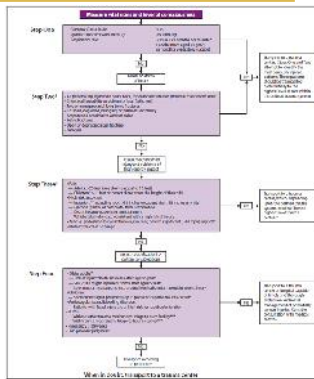
Trauma Triage

- Destination decision-making
 - Key EMS function
- Severely injured need trauma center
- EMS must identify severely injured
- Tool: Field Triage Guidelines



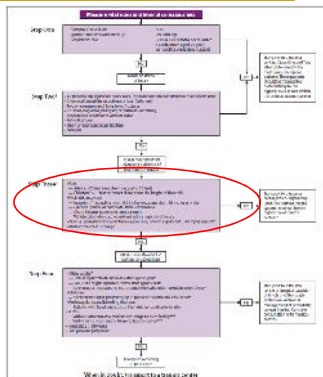
Field Triage Guidelines

- For adults and children
- Guideline found to have 35% pediatric under-triage rate
- 3rd step controversial
 - Mechanism of injury



Mechanism Step

- Falls
 - >10 feet or 2-3 x height
- High Risk MVC
 - Intrusion
 - Ejection
 - Death same vehicle
- Auto vs. Pedestrian
 - Thrown
 - Run over
 - Significant impact
- Motorcycle crash
 - >20mph



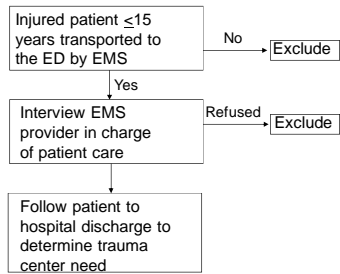
Objective

To determine if the Mechanism of Injury Step of the Field Triage Guidelines is accurate for identifying children who need the resources of a trauma center.

Methods

- 3 year prospective observational study
- 3 pediatric regional trauma centers
 - Dallas, TX
 - Milwaukee, WI
 - Rochester, NY

Process



Outcome – Trauma Center Need

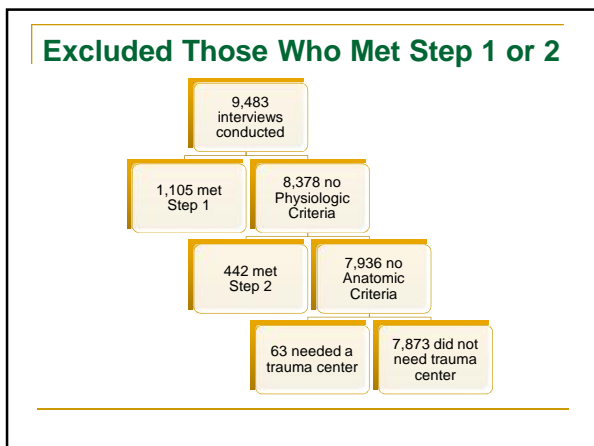
Consensus-Based Criterion Standard Definition	Time (hours)
Advanced airway management - excludes intubation solely for surgical purposes.	4
More than 1 unit of a blood product - included any blood received from EMS and was based on orders regardless of supply or time to infuse	4
Admitted to the hospital for spinal cord injury - identified based on discharge codes and/or procedure notes.	-
Thoracotomy and did not meet NAEMSP/ACS-COT criteria for termination	48
Pericardiocentesis and did not meet NAEMSP/ACS-COT criteria for termination	24
Emergency cesarean delivery	24
Vascular, neurologic, abdominal, thoracic, pelvic, spine or limb-conserving surgery	24
Intra-cranial pressure monitoring	48
Interventional radiology	4
Died before discharge but arrived not in cardiac arrest	-
Thoracostomy - added by investigators, not in original criteria	2

Data Analysis

- If mechanism criteria was documented as unknown
 - Treated as does not meet the criteria
- Descriptive statistics
 - Over- and under-triage rates
 - Positive likelihood ratios (+LR)

Results

- 9,483 children with provider interviews and outcome
- 231 (2%) needed the resources of a trauma center
 - Most had specific surgeries or needed an advanced airway
- Average age 7.7 years (IQR: 9)



Mechanism

	Number of cases (% of Sample n=7,936)	Number that Needed a Trauma Center (% with mechanism)
Falls	2,823 (36%)	17 (1%)
MVC	2,254 (28%)	20 (1%)
Auto vs. Pedestrian	562 (7%)	10 (2%)
MCC	12 (<1%)	0
Other	2,285 (29%)	16 (1%)

Other Mechanisms

Mechanisms	Percent of Other Mechanisms (n= 2,285)
Animal Bite	5%
Assault	13%
Burn	5%
Sport Related Injury Non-Fall	24%
Recreational Vehicle	4%
Shot	1%
Sledding	<1%
Stabbing	1%
Other	47%

Falls

	Trauma Center NOT Needed	NEEDED a Trauma Center
>10 feet	92	4
<10 feet	2,714	13
Age-Adjusted High Fall	146	4
Age-Adjusted Low Fall	2,660	13

- Fall greater than 10 feet
 - 3% Over-Triage
 - 76% Under-Triage
 - +LR 7.2 (95% 3.0-17.3)
- Age-adjusted fall
 - 3 years fall > 6 feet
 - 3-8 years fall > 8 feet
 - 8 years fall > 10 feet

MVC

		Trauma Center NOT Needed	NEEDED a Trauma Center
Ejection	Yes	41	0
	No	2,193	20
Intrusion	>12	31	0
	<12	2,203	20
Death of Another Passenger	Yes	30	2
	No	2,204	18

- 41 Ejected – 0 needed trauma center
- Intrusion >12 inches at seat or >18 anywhere – 0 needed trauma center
 - If use >12 at any position 1 case is identified
- Death of another passenger
 - 1% Over-triage
 - 90% Under-triage
 - +LR 7.5 (95%CI 1.9-29.1)

MVC – Not in Field Triage Guidelines

		Trauma Center NOT Needed	NEEDED a Trauma Center (TC)
Restraint Use	No	412	1
	Yes	1,822	19
Roll Over	Yes	290	2
	No	1,944	18
Prolonged Extrication	Yes	34	2
	No	2,200	18

- Restraint use
 - 1 identified that needed TC
- Roll Over
 - 2 identified that needed TC
- Prolonged Extrication
 - 2 identified that needed TC
- Using all 6 criteria
 - 5 identified that needed TC
 - 75% under-triage
 - 32% over-triage
 - +LR 0.8 (95% CI: 0.4 – 1.7)

Auto vs. Pedestrian of Bicyclist

		Trauma Center NOT Needed	NEEDED a Trauma Center
Thrown	Yes	198	4
	No	354	6
Run Over	Yes	62	3
	No	490	7
Significant Impact	Yes	167	7
	No	385	3

- Thrown
 - 36% Over-triage
 - 60% Under-triage
 - +LR 1.2 (95% CI .5-2.4)
- Run Over
 - 11% Over-triage
 - 70% Under-triage
 - +LR 2.7(95%CI 1.0-7.1)
- Significant Impact
 - 30% Over-triage
 - 30% Under-triage
 - +LR 2.3(95%CI 1.5-3.5)

Using All 3 Guidelines Criteria

	Trauma Center NOT Needed	NEEDED a Trauma Center
+ Criteria	313	9
- Criteria	239	1

- 9 children identified
 - 58% Over-triage
 - 10% Under-triage
 - +LR 1.6 (95% CI 1.3 – 2.0)

Helmet Use and Bicyclist Struck

	Trauma Center NOT Needed	NEEDED a Trauma Center
Not wearing a Helmet	154	3
Wearing a Helmet	28	0

- 10% wearing a helmet
 - Helmet use unknown for 9 cases
 - 85% Over-Triage
 - 0% Under-Triage

Conclusion

- Mechanism Step of the Field Triage Guidelines do not apply to over a quarter of injured children
 - Investigate other mechanisms predictive of trauma center need
- The current Step 3 criteria miss a significant number of children who need a trauma center
- Need to identify better criteria

Questions?

eblerner@mcw.edu
