ARIZONA DEPARTMENT OF HEALTH SERVICES

BUREAU OF EMERGENCY MEDICAL SERVICES AND TRAUMA SYSTEM

LEVEL I TRAUMA CENTERS PERFORMANCE MEASURES: INJURY SEVERITY SCORE AND MORTALITY ARIZONA STATE TRAUMA REGISTRY 2012

Prepared by:

Vatsal Chikani, MPH

Rogelio Martinez, MPH

Mary Benkert

Data and Quality Assurance Section

Report No. 14-1-LI

Purpose:

The purpose of this report is to provide Arizona's Level I Trauma Centers with their individual performance benchmarked against the aggregate.

Performance Measures:

The Arizona State Trauma Registry 2012 (ASTR) queried cases with an "Emergency Department (ED) or Hospital Arrival Date" (D1_04) of January 1, 2012, to December 31, 2012. The following process measures were analyzed:

1. Injury Severity Score (ISS)*
    - Trauma patients by ISS
        - ⇒ Distribution, payor source
    - Trauma Admissions
        - ⇒ By an ISS > 4; ISS >9, Abbreviated Injury Score (AIS) >2

**Patient ISS was calculated through the data element "ICD-9 Primary External Cause Code" (I2_13).*

2. Trauma Mortality
    - Trauma patients by ISS who died
        - ⇒ In the Emergency Department (ED) or were Dead on Arrival (DOA)
        - ⇒ In the hospital after admission

3. Survival Risk Ratio (SRR)

4. Trauma Team Activation in patients based on the Arizona guidelines on field triage. Please refer to page 25 and 26 on GD-097-PHS-EMS.

    - Systolic Blood Pressure (SBP) < 90 millimeters of Mercury

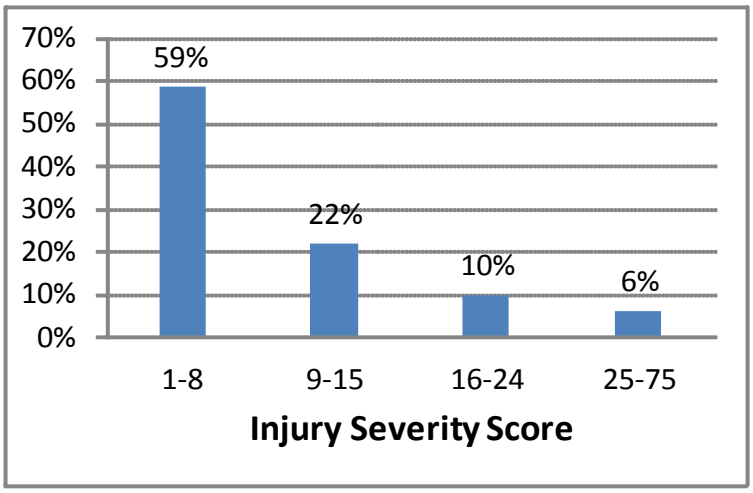
      OR
    - Glascow Coma Scale (GCS) ≤ 13

      OR
    - Respiratory Rate (RR) <10 or > 29 breaths per minute

For additional information on data elements and definitions please refer to the ASTR data dictionary.

State Measure 1: Injury Severity Score (ISS) (ICD-9)

Graph 1: ISS distribution of trauma patients at Level I Trauma Centers in Arizona



The injury severity of 80% of trauma patients treated at Arizona's Level I Trauma Centers was considered to be minor to moderate (ISS < 15).

Arizona's Level I Trauma Centers treated patients with severe injuries 16% of the time (ISS ≥ 16).

Table 1: ISS distribution of trauma patients at Level I Trauma Centers in Arizona (n=23,479)

Trauma patients entered into registry by ISS	N	%
Missing/NA/ND	781	3.3%
1-8	13,777	58.6%
9-15	5,156	21.9%
16-24	2,308	9.8%
25-75	1,457	6.2%

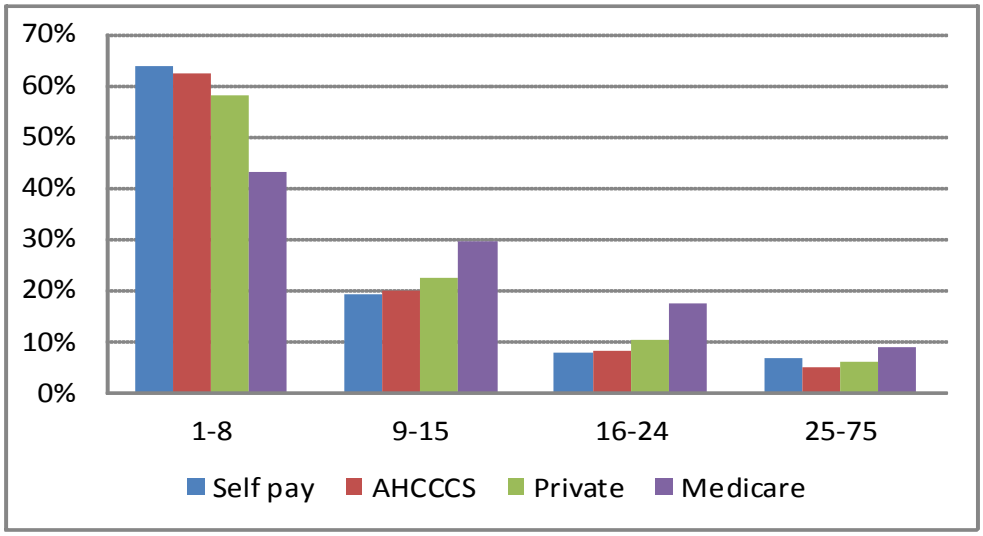
ISS=Injury Severity Score; NA=Not Applicable; ND=Not Documented

An ISS is a method of classification used to categorize patients by the severity and location of their injuries.

Graph 2: Payor status by ISS among Level I Trauma Centers in Arizona

The self pay group had a higher percentage of patients with a lower ISS as compared to other coverages.

Additionally, there was a higher distribution of trauma patients with an ISS > 16 who utilized Medicare for insurance coverage.



State Measure 1: Injury Severity Score

Table 2: Total trauma admissions by ISS

ISS	N	%
Missing/NA/ND	448	2.6%
1-8	8,081	46.9%
9-15	4,951	28.7%
16-24	2,289	13.2%
25-75	1,452	8.4%

ISS=Injury Severity Score: NA=Not Applicable: ND=Not Documented

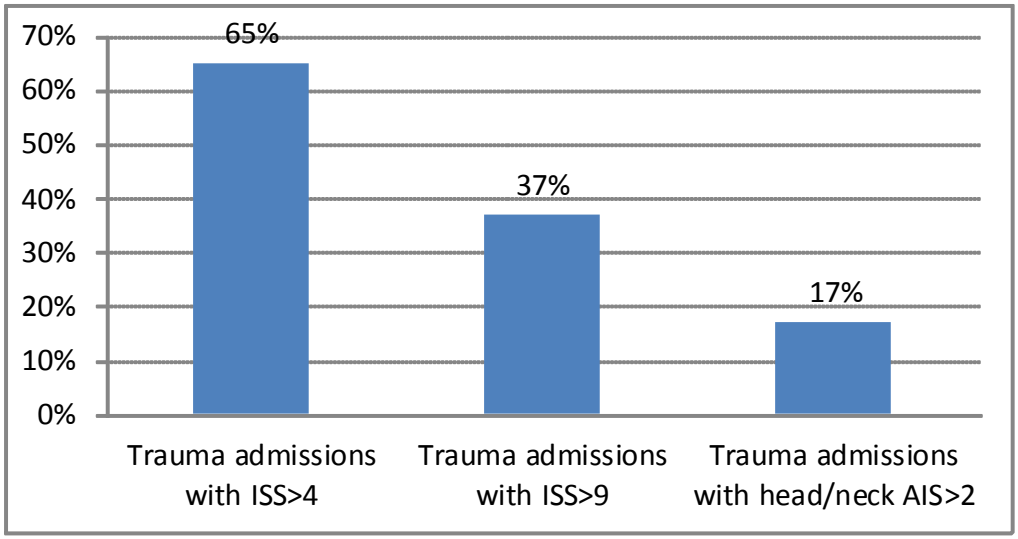
In 2012, there were 17,221 trauma patients admitted to Arizona's Level I Trauma Centers.

This represents 73% patients of the 23,479 trauma patients cared for at the Level I Trauma Centers. A vast majority (75%) of trauma patients who were admitted to a Level I Trauma Center had a mild or moderate injury (ISS <15).

The likelihood of admission increased with the severity of injury: 1-8 (58%), 9-15 (96%), 16-24 (99%), and 25-75 (99.6%).

Graph 3 shows that 65% of admitted patients had an ISS > 4. Overall, 37% of trauma admissions had an ISS > 9 and 17% of trauma admissions suffered head and/or neck injuries with an AIS > 2. An AIS > 2 is important because it identifies those patients with a major traumatic brain injury.

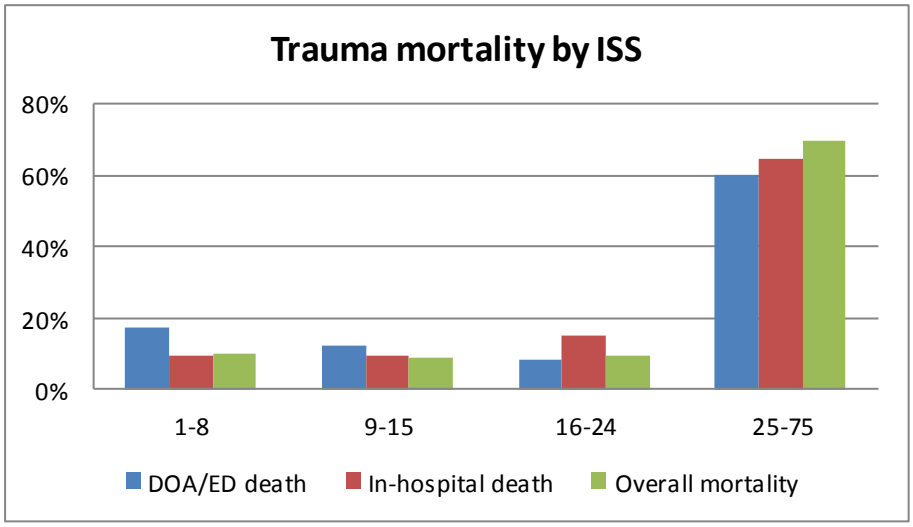
Graph 3: Total trauma admissions by AIS and ISS (n=17,221)



AIS=Abbreviated Injury Score; ISS=Injury Severity Score

State Measure 2: Trauma Mortality

Graph 4: Mortality of trauma patients in hospitals by ISS (n= 719)



DOA=Dead on Arrival: ED=Emergency Department

Graph 4 shows that there is a significant increase in patient mortality when they present with an ISS greater than 25.

Table 3: Mortality of trauma patients by ISS (DOA or ED)

	N	%
Missing/NA/ND	6	2.1%
1-8	48	17.1%
9-15	34	12.1%
16-24	24	8.5%
25-75	168	60.0%
Total mortality in ED or DOA	280	100.0%

Table 4: Mortality in admitted trauma patients for Level I Trauma Centers (in-hospital)

	N	%
Missing/NA/ND	8	1.8%
1-8	26	5.9%
9-15	29	6.6%
16-24	44	10.0%
25-75	332	75.6%
Total mortality in-hospital	439	100.0%

DOA=Dead on Arrival; ED=Emergency Department; ISS=Injury Severity Score; NA=Not Applicable; ND=Not Documented

Table 5: Total mortality of trauma patients by ISS in Level I Trauma Centers

	N	%
Missing/NA/ND	14	1.9%
1-8	74	10.2%
9-15	63	8.7%
16-24	68	9.4%
25-75	500	69.5%
Total mortality	719	100.0%

NA=Not Applicable; ND=Not Documented

State Measure 3: Survival Risk Ratio

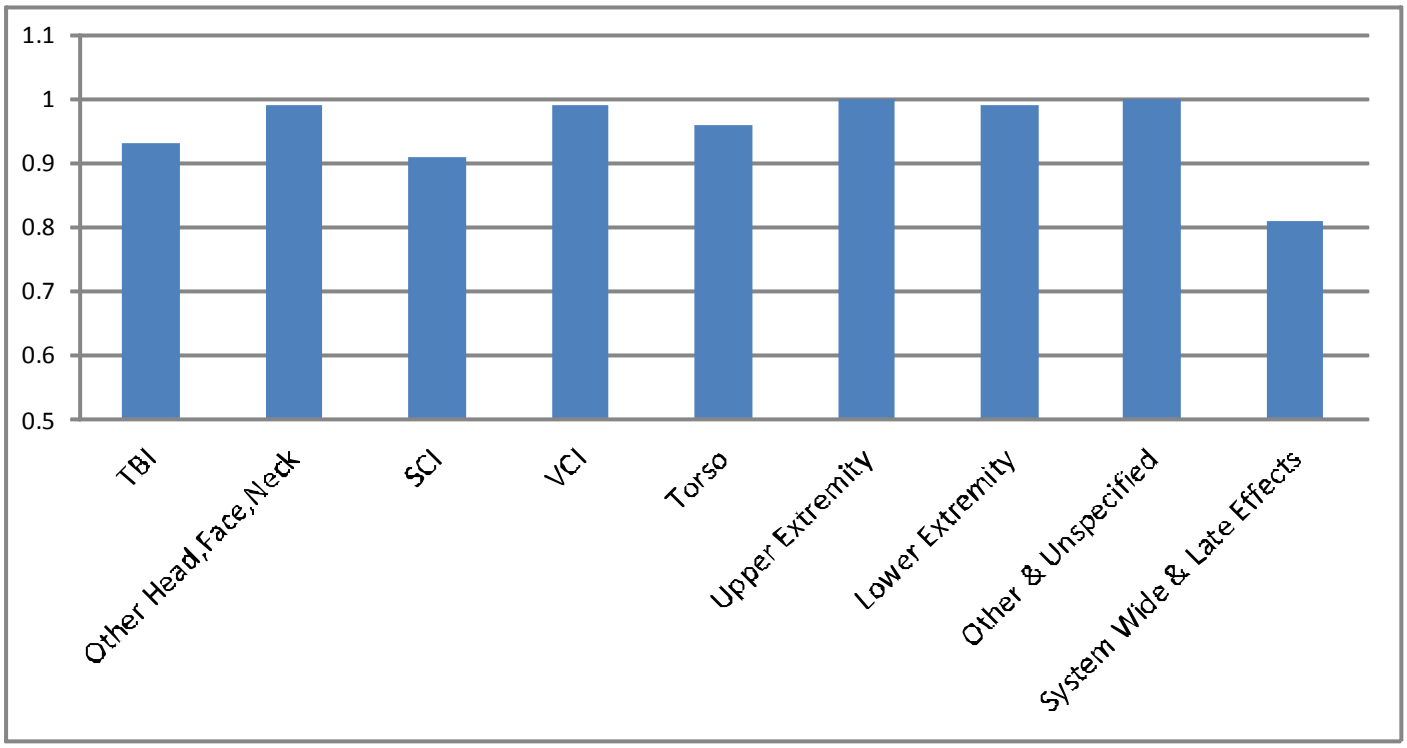
Survival Risk ratio (SRR) is a ratio of the number of patients surviving traumatic injuries over the total number of traumatic injury cases. A SRR of 1 indicates 100% survival, whereas a SRR of .95 indicates 95% survival. For example, patients with a Traumatic Brain Injury (TBI) had an SRR of 93% (5,642 survived / 6,067 TBI patients).

Statewide SRRs by nine comprehensive body regions are shown in following table.

Table 6: Survival risk ratio by body regions

Survival risk ratio by body region	N	% Frequency of Injury	SRR
TBI	6,067	26.6%	0.93
Other Head, Face, Neck	3,747	16.4%	0.99
Spinal Cord Injury (SCI)	236	1.0%	0.91
Vertebral Column Injury (VCI)	1,883	8.2%	0.99
Torso	4,372	19.2%	0.96
Upper Extremity	3,217	14.1%	1.00
Lower Extremity	2,859	12.5%	0.99
Other & Unspecified	351	1.5%	1.00
System Wide & Late Effects	26	0.1%	0.81

Graph 5: Survival risk ratio by body regions



State Measure 4: Trauma Team Activation

Table 7: Trauma Team Activation at a Level I Trauma Center for trauma patients who met the Arizona triage guidelines for transport

	N	%
Total patients with SBP <90 or GCS ≤ 13, or RR<10 or >29,	4,854	100.0%
Trauma team activated		
No	533	10.9%
Yes	4,321	89.0%

Table 8: Patient survivability by activation of the trauma team

	Died		Survived		Total patients (BP < 90) or (RR < 10 or >29) or GCS ≤ 13
	N	%	N	%	N
Trauma Team Not Activated	37	6.9%	496	93.0%	533
Trauma Team Activated	602	13.9%	3,719	86.0%	4,321

In 2012, Arizona's Emergency Medical Services Council and the State Trauma Advisory Board adopted the Center for Disease Control and Prevention Guidelines for Field Triage of Injured Patients. Ideally, trauma patients arriving by EMS would have a trauma team activation if the patient has a Systolic Blood Pressure (SBP) <90 or Glascow Coma Scale (GCS) ≤13, or a Respiratory Rate (RR) <10 or >29 breaths per minute.

Trauma team activation is vital to ensure a coordinated and capable response to injured patients. Although costly, this resource is an essential component of a trauma center that will improve patient care and outcomes.