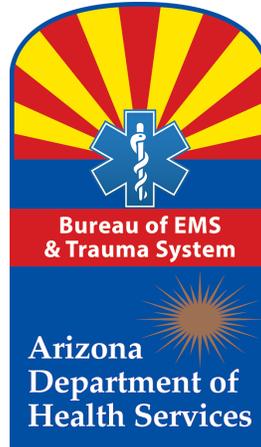


**ARIZONA DEPARTMENT OF HEALTH SERVICES
BUREAU OF EMERGENCY MEDICAL SERVICES AND TRAUMA SYSTEM**



**PERFORMANCE IMPROVEMENT TOOLKIT:
MAJOR TRAUMA
AZ-PIERS Q1 & Q2 2013**

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Report No. 14-1-EMS

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Purpose

The purpose of this report is to provide agencies with a level of comparison on their performance during Q1 and Q2 2013 on major trauma calls. This report can be used to support Quality Assurance initiatives in their communities.

This report analyzes five related performance measures:

1. Reduce the length of time between unit arrival on scene and unit en route to a hospital,
2. Increase the documentation of triage criteria to determine hospital destination,
3. Improve the documentation relating to the mode of transport decision,
4. Improve the documentation on airway protection, and
5. Improve the documentation related to the care of patients with Traumatic Brain Injury (TBI)

Methodology

The [Arizona Prehospital Information & EMS Registry System \(AZ-PIERS\)](#) was analyzed to find records where a traumatic injury occurred. The records in this analysis were pulled on February 20, 2014 and had:

1. A unit notified date range of January 1, 2013 to June 30, 2013; AND
2. "Injury Present" (E9.4) equal to "Yes" AND/OR
3. "Protocols Used" (E17.1) included one or more of the following; Bites and Envenomation, Burns, Drowning / Near Drowning, Electrical Injuries, Extremity Trauma, Head Trauma, Multiple Trauma, Back Pain, Spinal Immobilization Clearance, Pediatric Head Trauma, Spinal Cord Trauma, Thoracic injuries – adult, Thoracic injuries – pediatric, Trauma-Amputation, Trauma-Arrest.
4. "Patient Disposition" (E20.10) equal to "Treated, Transported by EMS'," "Treated, Transported by EMS (ALS)," "Treated, Transported by EMS (BLS)," or "Treated, Transferred Care"

Lastly, patient vitals [End Tidal CO₂ (ETCO₂), Systolic Blood Pressure (SBP), and Pulse Oximetry] are presented for **CONFIRMED Traumatic Brain Injury (TBI)**. Confirmed TBI were identified through the Hospital Discharge Database and merged with AZ-PIERS.

Limitations

Limitations: If a patient received care for an injury involving more than one submitting EMS agency, that patient would be counted multiple times (once for each EMS agency encounter).

Additionally, state benchmarks are restricted to only include those agencies participating in the registry. If your agency is not currently participating but would like to sign up please visit us on our [AZ-PIERS homepage](#).

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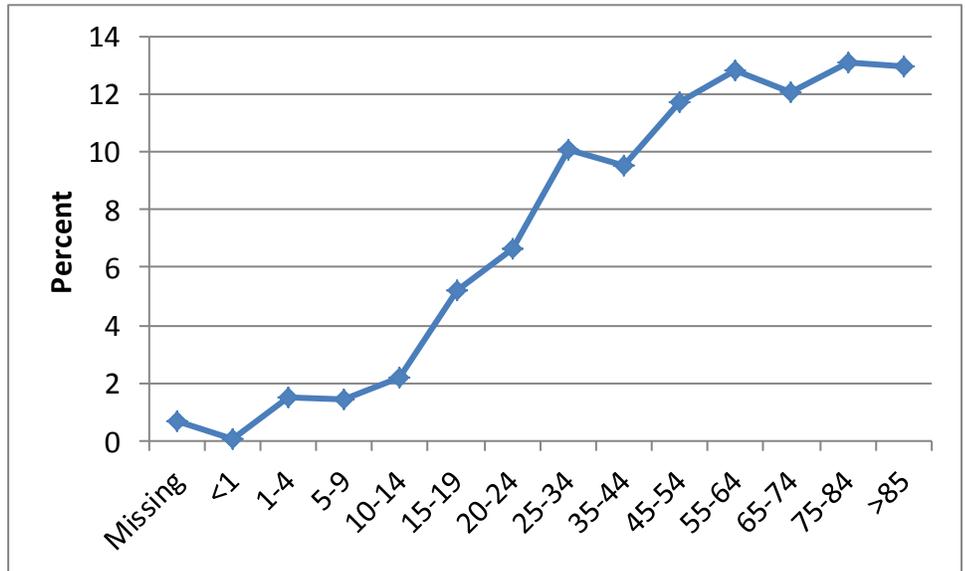
This quarterly report includes data from the thirty nine (39) pre-hospital agencies in the state of Arizona. AZ-PIERS received data on 14,482 trauma patients for two quarters in 2013.

Graph 1: Distribution of ages in AZ-PIERS (n= 14,482)

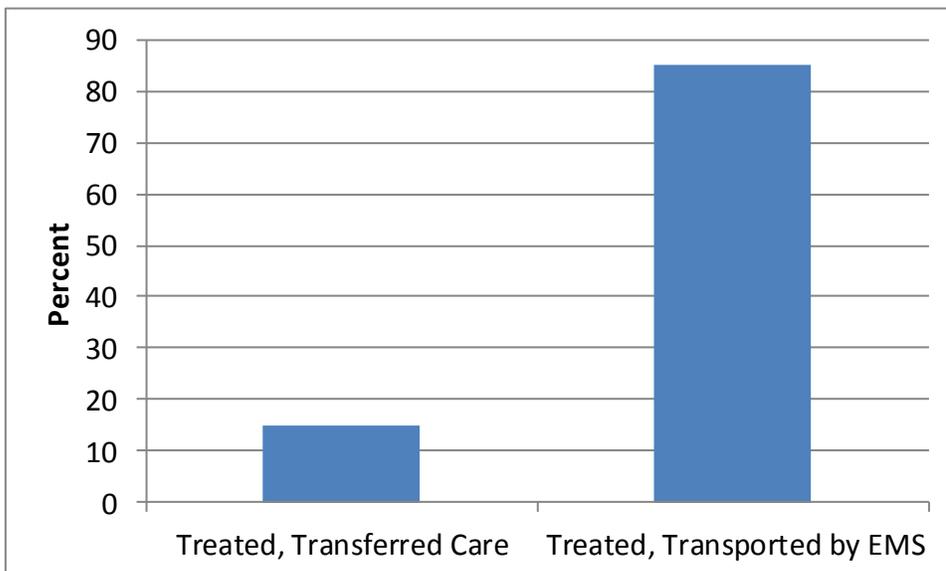
The largest percentage of patients were those greater than 45 years of age (62.7%).

Patients less than 19 years of age made up 11% of the trauma population.

The highest percentage of pre-hospital traumas occurred in 75-84 year olds.



Graph 2: Patient disposition in AZ-PIERS (n= 14,482)



A vast majority of patients (85%) were treated and transported by EMS.

Treated and transported means that the responding unit provided care and personally delivered the patient to a health care facility.

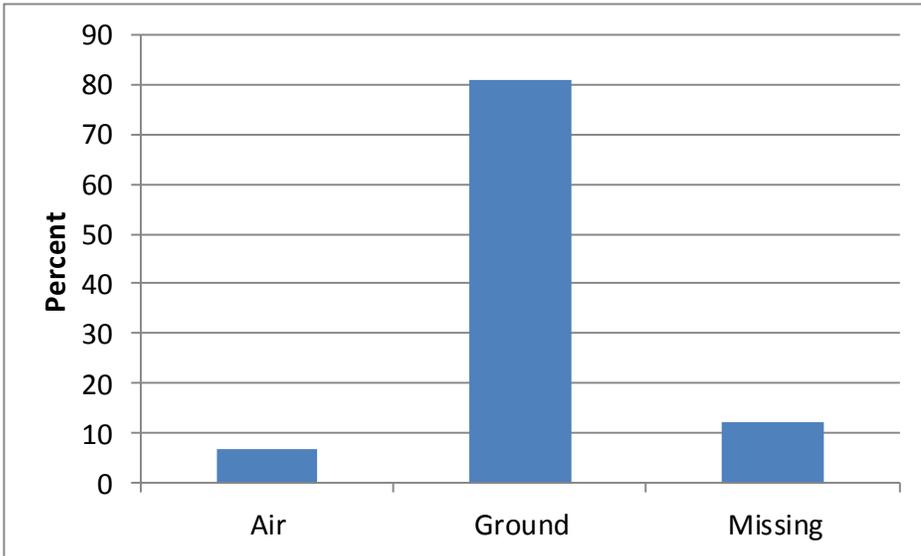
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Table 1: Trauma patient demographics

	N	Percent
Total Trauma Cases	14,482	100
Age		
Missing	96	0.66
<1	11	0.08
1-4	213	1.47
5-9	209	1.44
10-14	318	2.20
15-19	755	5.21
20-24	964	6.66
25-34	1,459	10.07
35-44	1,381	9.54
45-54	1,697	11.72
55-64	1,858	12.83
65-72	1,751	12.09
75-84	1,893	13.07
>85	1,877	12.96
Disposition		
Treated, Transferred Care	2,133	14.73
Treated, Transported by EMS	12,349	85.27

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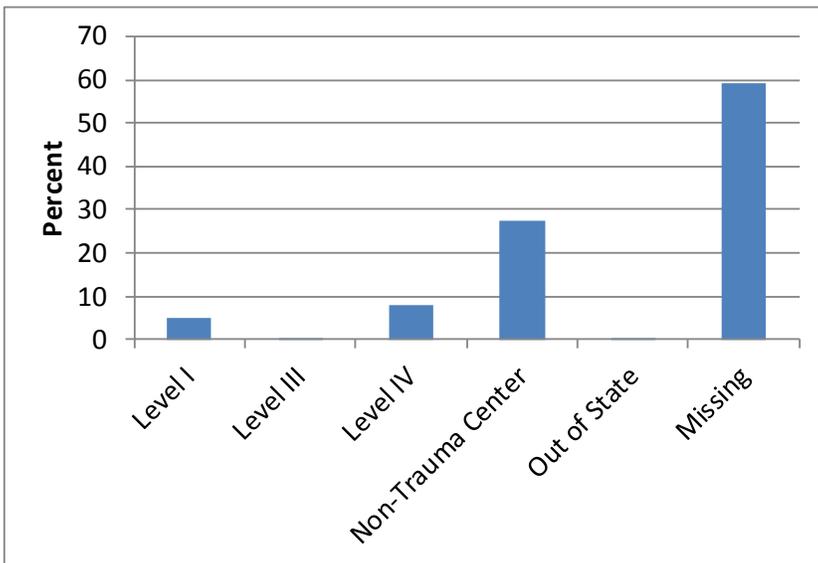
Graph 3: Patient transport method to health care facilities (n= 14,482)



Patients were transported to a health care facility 81% of the time.

There were 12.3% of cases with a missing value. The transport method was calculated by using EMS Agency ID (D01_01) and Transferred to Agency ID (IT5_04).

Graph 4: Trauma level designation for patients (n= 14,482)



Trauma Center Designation	N	Percent
Level I	612	4.94
Level III	6	0.05
Level IV	988	7.97
Non-Trauma Center	3,376	27.24
Out of State	66	0.53
Missing	7,344	59.26

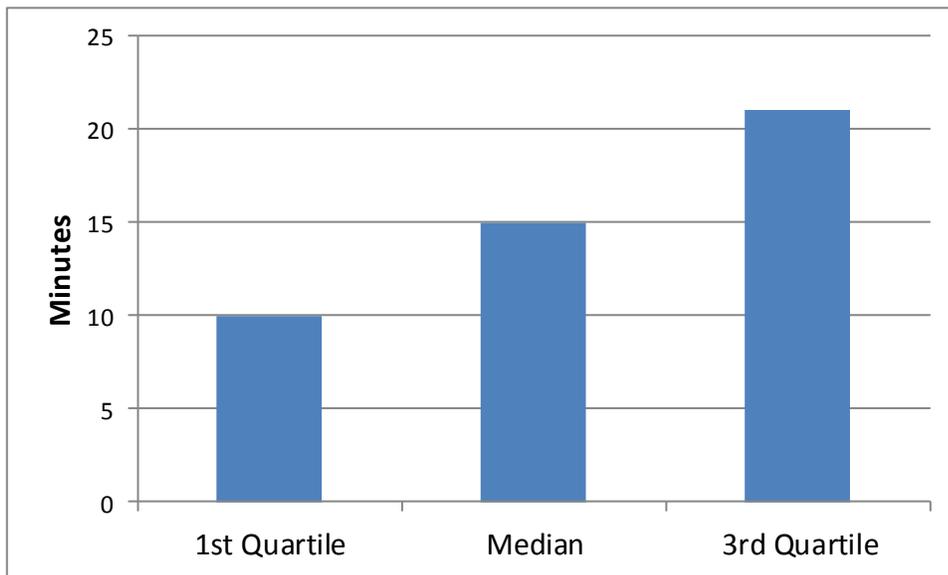
A majority of trauma destinations were missing (59%). This field was calculated through Destination Name (E20_01) and hospitals were categorized by DQA in the data analysis.

Most patients were transported to a non-trauma center approximately 27% of the time.

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Performance Measure 1: Reduce the length of time between unit arrival on scene and unit goes en route to a hospital

Graph 5: Scene time (minutes) (n= 13,108)



The median time that a unit was on the scene for providing care to a patient was 15 minutes. In 75% of cases, the scene time was less than 21 minutes.

In 5% of cases the scene time was unable to be calculated because Unit arrived on scene date/time (E05_06) or Unit left scene date/time (E05_09) was left blank.

Table 2: Scene time (minutes)

	N	Missing	1st Quartile	Median	3rd Quartile
Scene Time (Minutes)	13,795	687	10.0	15.0	21.0

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Performance Measure 2: Increase the documentation of trauma triage criteria in determining hospital destination

Graph 6: Trauma triage documentation (n= 14,482)

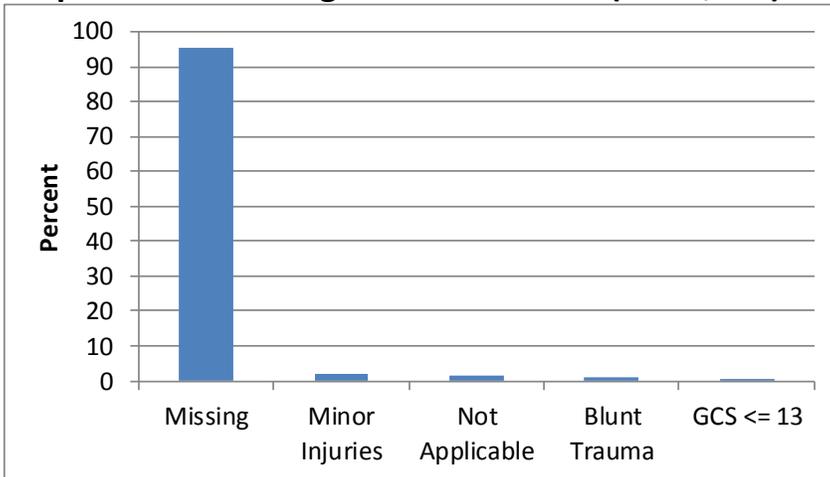


Table 3: Trauma triage documentation

	N	Percent
Trauma Triage Criteria Documentation		
Missing	14,003	96.6
Documented	479	3.3

Table 4: Reason for trauma triage (n= 14,482)

Triage Criteria	N	Percent
Missing	13,777	95.13
Minor Injuries	289	2.00
Not Applicable	225	1.55
Blunt Trauma (no hemodynamic trauma)	124	0.86
GCS ≤ 13	16	0.11
Other single system injury	13	0.09
Penetrating injuries to extremities	7	0.05
Penetrating injury to trunk, neck, or head	6	0.04
Paralysis resulting from trauma	4	0.03
Hemodynamic compromise from trauma	4	0.03
Unstable Pelvis	4	0.03
Not Known/ Not Available	3	0.02
Open or depressed skull fracture	3	0.02
Respiratory compromise resulting from trauma	3	0.02
GCS improving, Flail Chest, Amputation proximal to wrist or ankle, BSA < 10%	4	0.04

Emergency Medical Care Technicians (EMCTs) play an important role in the trauma system. Their ability to triage patients at the proper level of care affect a patient's outcome. Trauma centers have [requirements of services](#) that they must provide for their patients.

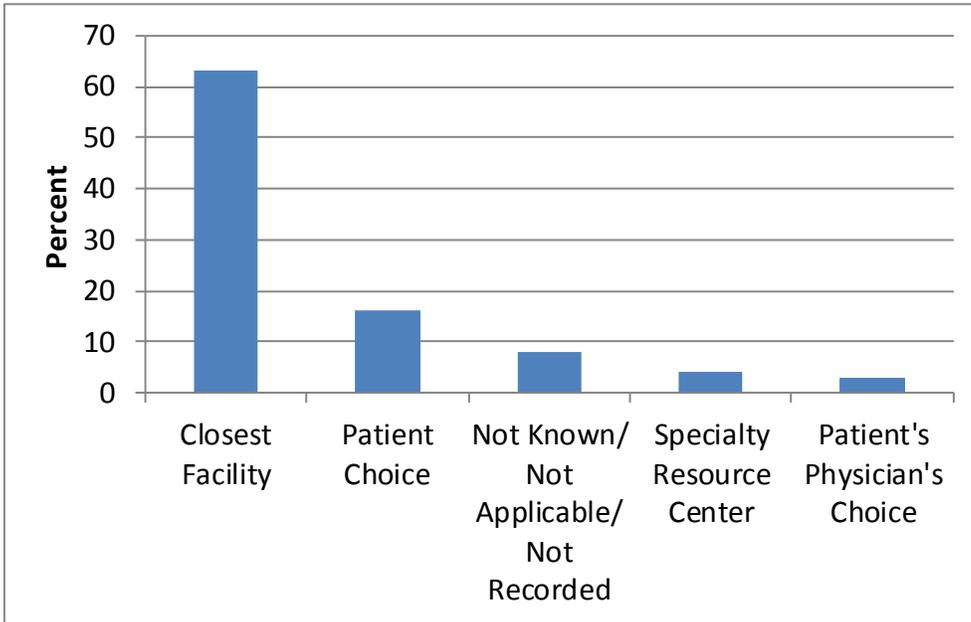
The Center for Disease and Control and Prevention has developed an evidence based guideline for appropriate [field triage for traumas](#).

Patient destination decisions can't be assessed due to improper document. This information is gathered from IT11_01.

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Performance Measure 3: Improve the documentation relating to the mode of transport decision

Graph 7: Reason for choosing destination (n= 12,392)



EMCTs transported a patient to their closest facility 63% of the time.

Other factors play a role for transportation such as patient choice (16%), specialty resources (4%), patient physician choices (3%), and protocols (2%).

Table 5: Reason for choosing destination (n= 12,392)

Reason	N	Percent
Closest Facility	7,836	63.23
Patient Choice	1,982	15.99
Not Known/Not Applicable/Not Recorded	985	7.95
Specialty Resource Center	526	4.24
Patient's Physician's Choice	368	2.97
Protocol	255	2.06
Family Choice	165	1.33
Missing	83	0.67
On-line Medical Direction	78	0.63
Other	57	0.46
Law Enforcement Choice	34	0.27
Diversion	21	0.17
Insurance Status	2	0.02

EMCTs protect the community and play an important role in choosing the right location at the right time for the patient.

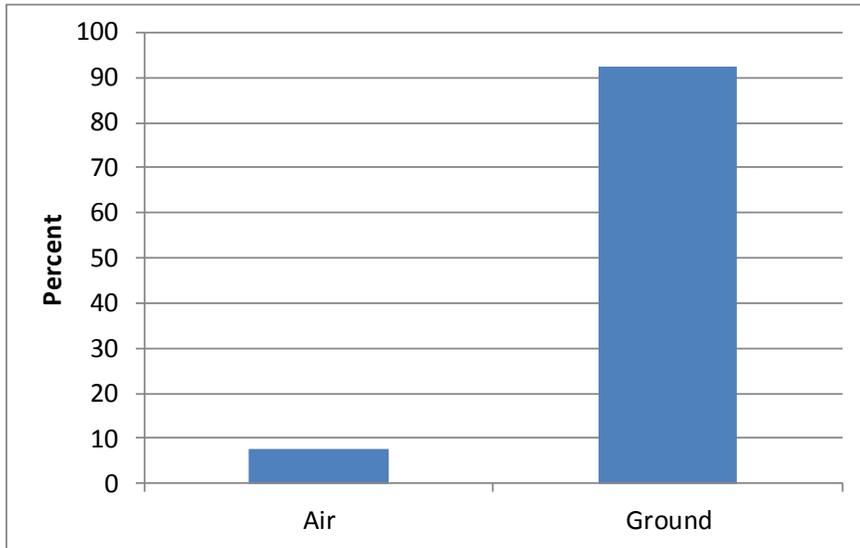
Oftentimes, there are fluctuations at a hospital's Emergency Department. Some contributing factors are flu seasons, mass casualty incidents, events, and times of day.

Understanding hospital fluctuations and the rationale for transport decisions will allow for appropriate systemic resource distributions.

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Performance Measure 3: Improve the documentation relating to the mode of transport decision

Graph 8: Mode of Transport to Hospital for Treated & Transported (n= 12,392)

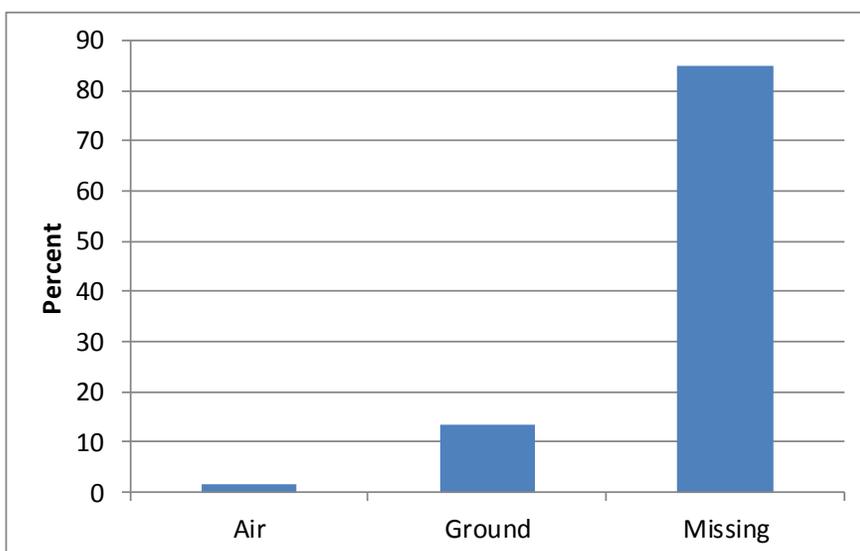


	N	Percent
Transport Type		
Air	940	7.5
Ground	11,452	92.4

A vast majority of trauma patients arrived to the hospital by ground transport (92%) versus air (7.5%).

When patients were treated and transferred to another provider the method of transport was missing (85%). This was recorded through the variable (IT5_04).

Graph 9: Mode of transport to hospital for treated & transferred care (n= 2,090)



	N	Percent
Transport Type		
Air	37	1.7
Ground	278	13.3
Missing	1,775	84.9

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Performance Measure 3: Improve the documentation relating to the mode of transport decision

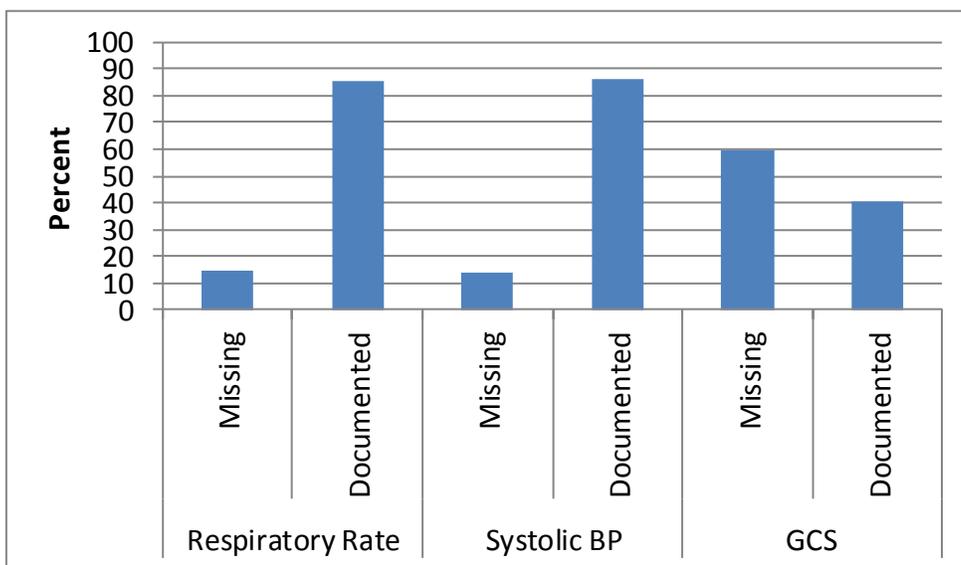
Table 8: Documentation of vitals for Revised Trauma Score (n = 2,090)

	N	Percent
Respiratory Rate Documentation		
Missing	299	14.3
Documented	1,791	85.6
SBP Documentation		
Missing	285	13.6
Documented	1,805	86.3
GCS Documentation		
Missing	1,247	59.6
Documented	843	40.3

A revised trauma score is a physiological scoring system that is based on the initial vital signs of the patient. A patient with a low revised trauma score will denote a high severity injury.

These elements have been demonstrated to predict deaths and survivability in patients. These data can help understand trends and interventions that will help save the lives of severely injured patients in Arizona.

Graph 10: Documentation of vitals for Revised Trauma Score (n= 2,090)



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Performance Measure 4: Improve the documentation on airway protection

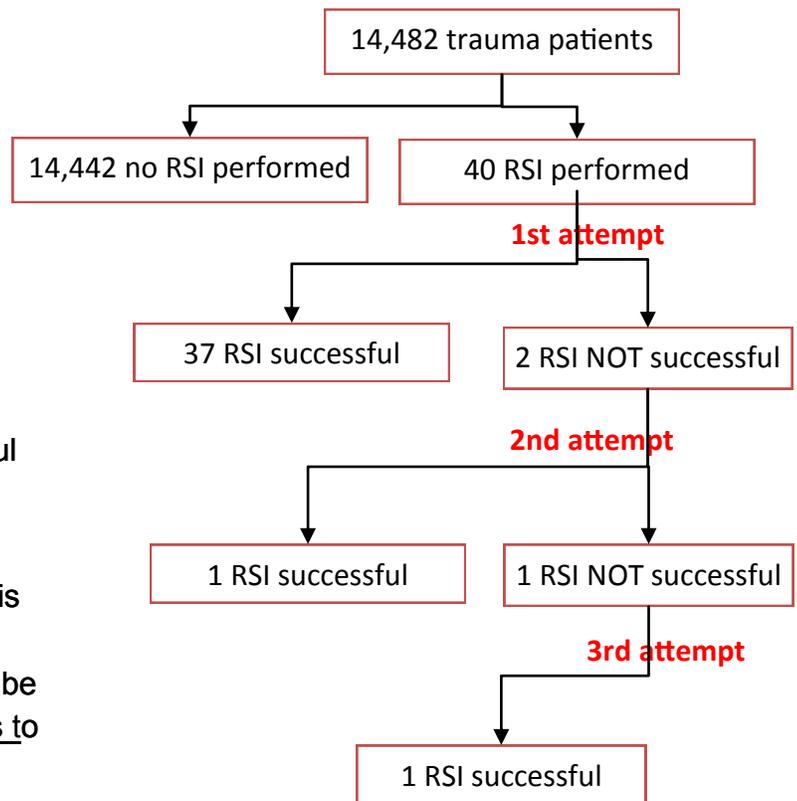
Table 10: Rapid Sequence Intubation (RSI) (n= 14,482)

	N	Percent
Rapid Sequence Intubation		
No RSI Performed	14,442	99.72
RSI Performed	40	0.28

Of the 14,482 trauma patients, 40 received a Rapid Sequence Intubation (RSI) (E19.03). An RSI can make a difference in death and disability. It is important for providers to recognize signs of impending respiratory failure, successfully perform an endotracheal intubation, and continuously monitor a patient for adverse effects.

Table 11: RSI Attempts & Success (n= 40)

	N	Percent
RSI Attempts		
1	37	92.5
2	2	5.0
3	1	2.5
RSI Success		
No	5	12.5
Yes	35	87.5



Of the 40 RSIs attempted, 37 were successful after the first attempt.

One can infer that there were a total of 39 patients that received an RSI in the state. This means 37 patients required 1 attempt to successful, 2 patients required 2 attempts to be successful, and 1 patient required 3 attempts to be successful.

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Performance Measure 5: Improve the documentation related to the care of patients with Traumatic Brain Injury (TBI)

Table 12: Total TBIs linked with Hospital Discharge Database

	N	Percent
Traumatic Brain Injury		
No	13,837	95.55
Yes	645	4.45

There were 8,586 TBI cases identified in the Hospital Discharge Database (HDD) between January 1 and June 31, 2013. These were merged with the AZ-PIERS records on date of birth (E6_16), patient first name (E06_02) and last name (E06_01) in SAS. This 100% merging technique resulted in a low identification rate of TBIs, but ensured an accurate match of the 645 (7.5%) cases identified.

A TBI can be classified as severe (Type 1), moderate (Type 2), or minor (Type 3). In 1.5% of cases, age was missing.

All patients with a TBI was transported to a hospital; 21% by air, and 79% by ground ambulance. Unfortunately, there were 58% of records with a missing hospital name (E20_01).

Surprisingly, 21% of patients did not go to a trauma center to receive their care.

[Arizona's trauma centers](#) can be found across the state. All trauma centers have specialized training to provide the best possible care for injured patients. If an EMCT suspects a TBI has occurred, they should consider transporting them to a trauma center.

This field was calculated through Destination Name (E20_01) and hospitals were categorized by DQA in the data analysis.

Table 13: TBI Demographics

	N	Percent
Total TBI Cases	645	100.00
Age		
Missing	10	1.55
Pediatric	70	10.85
Adult	565	87.60
TBI Type		
Type 1	317	49.15
Type 2	306	47.44
Type 3	22	3.41
Disposition		
Treated, Transported by EMS	645	100.00
Transport Method		
Air	137	21.24
Ground	508	78.76
Destination Type		
Level I	85	13.18
Level IV	40	6.20
Non-Trauma Center	134	20.78
Out of State	9	1.40
Missing	377	58.45

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Table 15: Documentation of Vitals in Traumatic Brain Injury Patients

	Patient Age				Total	
	Pediatric		Adult			
	N	Percent	N	Percent	N	Percent
Number of Times ETCO2 Recorded						
1	1	14.29	10	26.32	11	24.44
2-4	3	42.86	10	26.32	13	28.89
5-7	0	0	9	23.68	9	20.00
8+	3	42.86	9	23.68	12	26.67
ETCO2 between 35-45%						
No	4	57.14	25	65.79	29	64.44
Yes	3	42.86	13	34.21	16	35.56
Number of Times Systolic BP Recorded						
2-4	3	42.86	16	42.11	19	42.22
5-7	3	42.86	7	18.42	10	22.22
8+	1	14.29	15	39.47	16	35.56
Systolic BP Within Range						
No	0	0	2	5.26	2	4.44
Yes	7	100.00	36	94.74	43	95.56
Number of Times Pulse Oximetry Recorded						
2-4	3	42.86	12	31.58	15	33.33
5-7	1	14.29	11	28.95	12	26.67
8+	3	42.86	15	39.47	18	40.00
Pulse Oximetry ≥ 90%						
No	0	0	3	7.89	3	6.67
Yes	7	100.00	35	92.11	42	93.33

Performance Improvement Toolkit: Major Trauma
Data Source: Arizona Pre-Hospital Information & EMS Registry System
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Performance Measure 5: Improve the documentation related to the care of patients with Traumatic Brain Injury (TBI)

Table 14: Outcomes in TBIs (n= 645)

	N	Per- cent
Total TBI Cases	645	100.00
Discharge Status		
Home	395	61.24
Short-Term General Hospital	99	15.35
Skilled Nursing Facility/Intermediate Care Facility	41	6.36
Designated Cancer Center or Children's Hospital	6	0.93
Home with Home Health Services	9	1.40
Left against medical advice or discontinued care	8	1.24
Expired	19	2.95
Discharged/Transferred to Court/Law Enforcement	5	0.78
Discharged home with Hospice	2	0.31
Discharged to Hospice	10	1.55
Discharged/transferred to an Inpatient Rehabilitation Facility	31	4.81
Discharged/transferred to a Long Term Care Hospital	5	0.78
Discharged/transferred to a Psychiatric Hospital	5	0.78
Discharged/transferred to a Critical Access Hospital	1	0.16
Other	9	1.40
Final Outcome		
Alive	626	97.05
Dead	19	2.95

All systems of health care should be driven by the activities that will maximize positive outcomes for patients. In TBI cases, providers should maintain and document ET_{CO}₂ between 35-45%, SBP at or above 90 (or in pediatrics ≥70+2 x patient's age), and pulse oximetry above 90%.

These vital signs should be performed and documented for all patients, especially those with a suspected TBI. The missing values suggest that ET_{CO}₂ (ped 10%, adult 81%) documentation is an area of improvement, while SBP (ped .16%, adult .62%) and Pulse Oximetry (ped .31%, adult 1.71%) are regularly documented. ET_{CO}₂ was recorded through E14_13, SBP through E14_4, and pulse oximetry through E14_9.