ARIZONA DEPARTMENT OF HEALTH SERVICES

BUREAU OF EMERGENCY MEDICAL SERVICES AND TRAUMA SYSTEM

PERFORMANCE IMPROVEMENT TOOLKIT:

STROKE

AZ-PIERS 2014

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Report No. 15-4-EMS-STROKE

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Purpose:

The purpose of this report is to provide agencies with data to assess and compare their stroke performance. This report can be used to support ongoing Quality Assurance initiatives.

This report analyzes three stroke performance measures:

1. Frequency of transports to a stroke center based upon EMS evaluation,

2. Documentation of symptom onset time,

3. Documentation of stroke patient assessment.

This analysis also reports outcomes for stroke patients in the state's EMS system.

Methodology:

From January 1, 2014, to December 31, 2014, we queried 318,783 records from the Arizona Prehospital Information & EMS Registry System (AZ-PIERS) and 2,953,519 records from the Arizona Hospital Discharge Database (HDD). AZ-PIERS was then restricted to the 290,902 records with a 911 call and a patient disposition of either treated and transferred, or treated and transported. These records were matched against the HDD records using a step-wise deterministic approach. A total of 251,202 (86.4%) AZ-PIERS records were successfully matched to HDD. Using the matched records, EMS suspected stroke and hospital confirmed stroke cases were identified:

EMS-Stroke cases: *Provider's Primary Impression* (E09_15) = "Stroke" or "TIA"

HOSP-Stroke cases: *Principal Diagnosis* = ICD-9 codes 430-434 and 437.3

The 4,632 hospital confirmed stroke cases were analyzed in order to evaluate the quality of EMS care for stroke patients in Arizona.

Limitations:

If a patient received stroke care from more than one submitting EMS agency, that patient would be counted multiple times in AZ-PIERS (once for each EMS agency encounter).

There are some variables with missing documentation. There are three possibilities as to why documentation is missing or null for a specific data element in AZ-PIERS:

1. The ePCR vendor failed to properly map the data element,
2. The provider failed to document the procedure,
3. The provider failed to perform the procedure.

Lastly, state benchmarks are restricted to only include those agencies participating in the registry. If your agency is not currently participating, please visit us on our AZ-PIERS homepage for information on how to sign up.

Table 1: Stroke recognition results by EMS and hospital

	N	Percent
*EMS-Stroke = Yes	3,029	NA
*HOSP-Stroke = Yes	4,632	NA
EMS-Stroke = Yes & HOSP-Stroke = Yes	1,361	44.9%
EMS-Stroke = No & HOSP-Stroke = Yes	3,271	70.6%
EMS-Stroke = Yes & HOSP-Stroke = No	1,668	55%

*EMS-Stroke=Yes is EMS Primary Impression equal to stroke
HOSP-Stroke=Yes is Principal hospital diagnosis is equal to stroke

In 2014, EMS agencies transported and identified a stroke (EMS-Stroke) in 3,029 incidents. Hospitals identified 4,632 incidents of strokes (HOSP-Stroke) in the same year.

Both EMS and hospitals identified strokes in 1,361 incidents. EMS failed to document a hospital confirmed stroke in 3,271 incidents.

Graph 1: Stroke recognition results by EMS and hospital

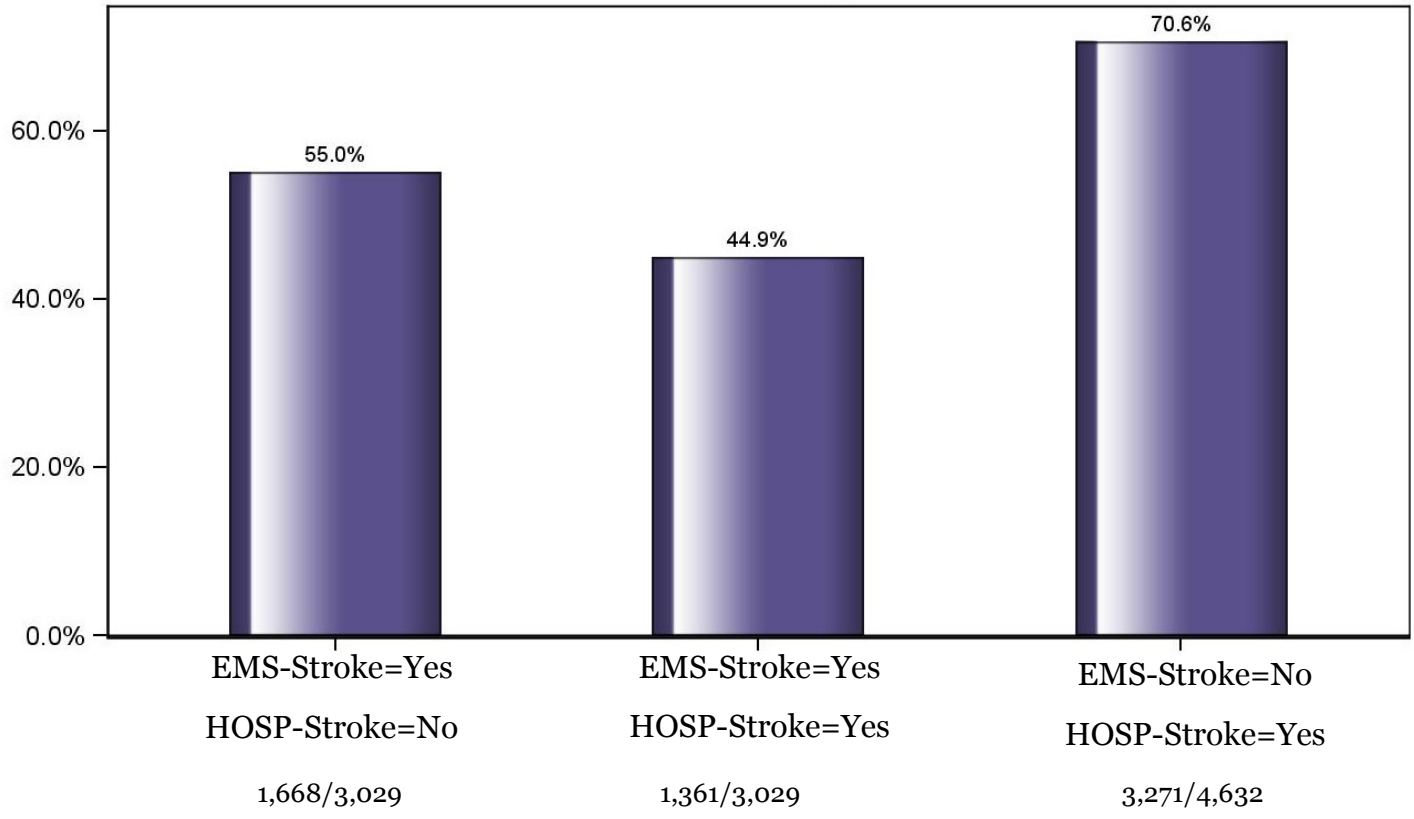


Table 2: Demographics for stroke patients in AZ-PIERS

Demographics	N	%
Confirmed Hospital Stroke Cases	4,632	100%
Age (years)		
Missing	4	0%
<45	178	3.8%
45-54	341	7.3%
55-64	517	11.1%
65-74	1,093	23.5%
75-84	1,356	29.2%
≥ 85	1,143	24.6%
Gender		
Missing	89	1.9%
Female	2,404	51.8%
Male	2,139	46.1%
Race		
Missing	1,860	40.1%
American Indian or Alaska Native	41	0.8%
Asian	33	0.7%
Black or African American	79	1.7%
Native Hawaiian or Other Pacific Islander	2	0.0%
White	2,380	51.3%
Other Race	237	5.1%

A total of 4,632 patients were confirmed stroke cases by the hospital.

Males made up 46% of suspected strokes. The largest proportion of strokes occurred in patients over 65 years of age (77%).

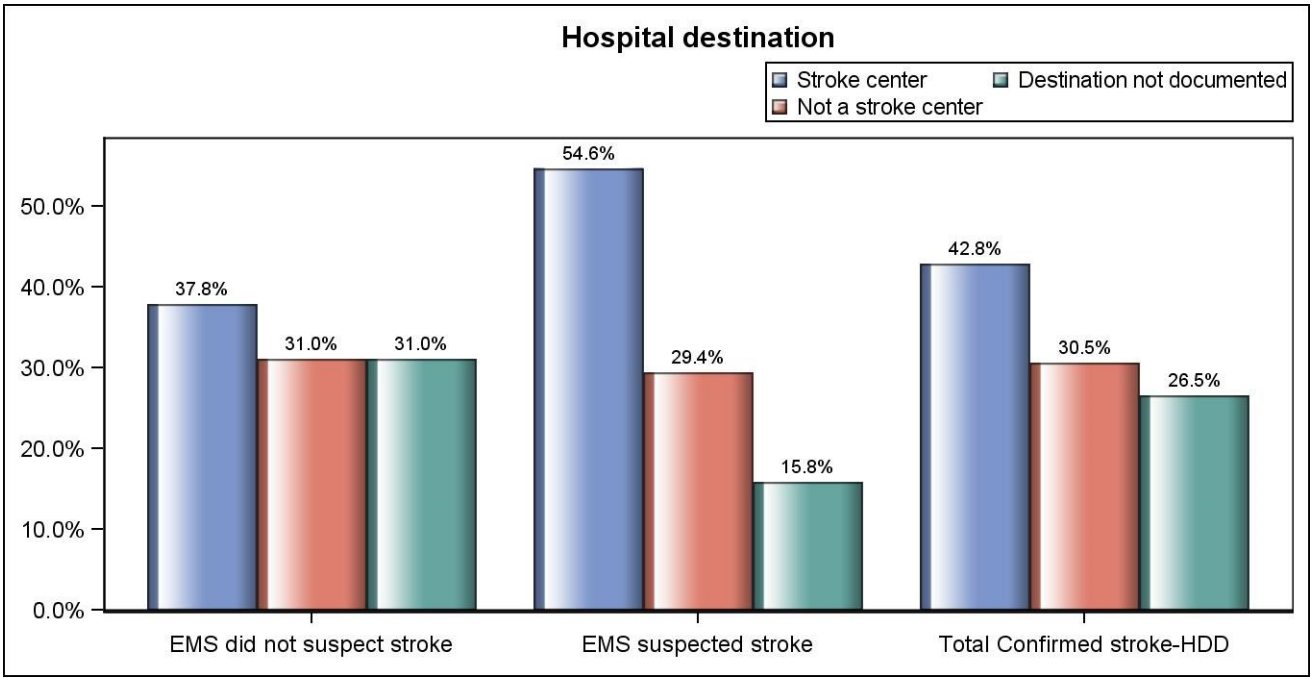
The documentation of *Race* (E06_12) by field providers is slowly improving. However, this variable is still missing in many cases (40%).

Resources are available online to help providers and EMS agencies feel comfortable when collecting race and ethnicity:

- http://www.hretdisparities.org/Howt-4176.php
- http://www.hretdisparities.org/uploads/ResponseMatrix.ppt
- http://www.azdhs.gov/documents/preparedness/emergency-medical-services-trauma-system/data/the-importance-of-demographic-data.pdf

Performance Measure 1: Frequency of transport to a stroke center based upon EMS evaluation

Graph 2: Hospital destination for stroke patients (n=4,632)



Of the 4,632 confirmed strokes, some patients went to a stroke center (40%) while others did not (34%). EMS destination was missing in over one-quarter of stroke cases (27%).

A higher proportion of EMS suspected strokes arrived at a stroke center. Interestingly, the same proportion of non-suspected and suspected stroke patients arrived at a non-stroke center (33%).

A complete list of stroke centers can be found in the resources page following this report.

Table 3: Hospital destination for stroke patients (n=4,632)

Hospital destination	All HDD confirmed stroke		EMS suspected stroke			
			No		Yes	
	N	%	N	%	N	%
Destination not documented	1,232	26.5%	1,016	31%	216	15.8%
Stroke center	1,835	39.6%	1,147	35%	688	50.5%
Not a stroke center	1,565	33.7%	1,108	33.8%	457	33.5%
Total cases	4,632	100%	3,271	100%	1,361	100%

Performance Measure 2: Documentation of symptom onset time

Table 4: Documentation of incident date/time for stroke patients (n=4,632)

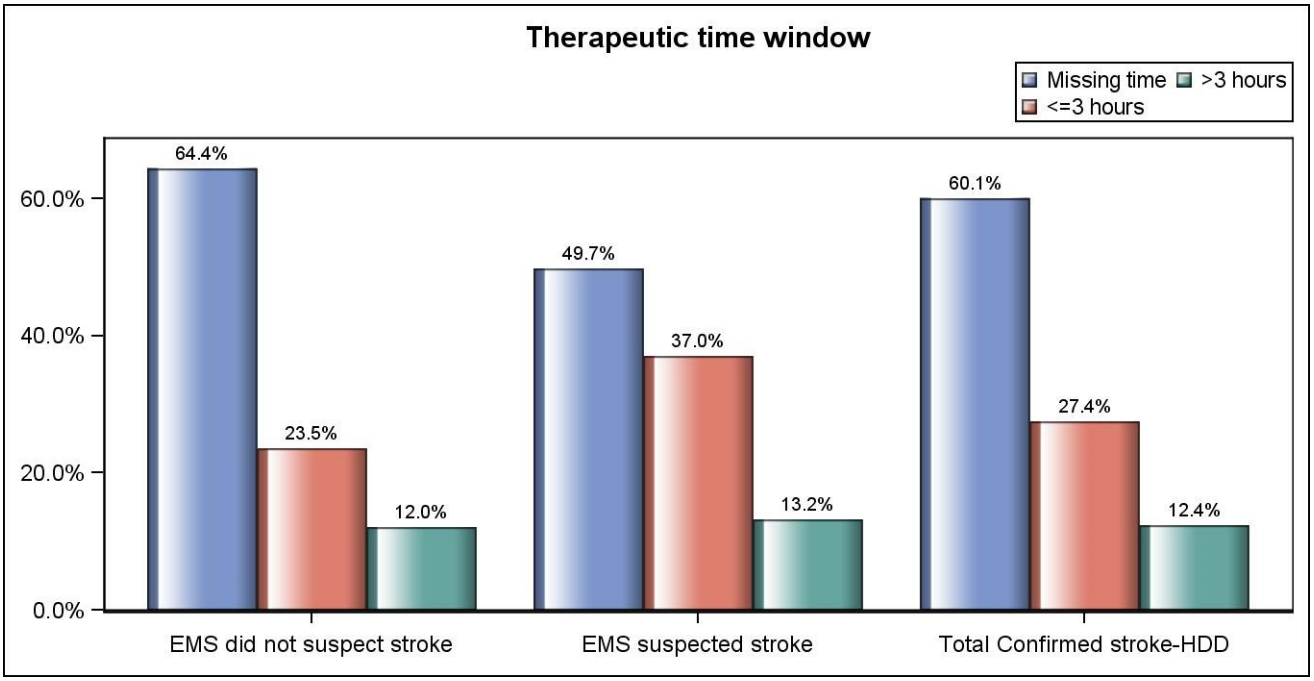
Therapeutic time window	All HDD confirmed stroke		EMS suspected stroke			
			No		Yes	
	N	%	N	%	N	%
Missing time	2,784	60.1%	2,107	64.4%	677	49.7%
≤ 3 hours	1,273	27.4%	769	23.5%	504	37.0%
> 3 hours	575	12.4%	395	12.0%	180	13.2%
Total cases	4,632	100%	3,271	100%	1,361	100%

Stroke interventions are based on a specific time window of 3 hours. A quick identification by EMS and prenotification to the receiving hospital may reduce potential time delays.

Most stroke patients had missing times (64%); however, even with these limitations, when EMS suspected a stroke, more patients arrived at the hospital within 3 hours [(total n=468 (34%)].

Unfortunately, there is no current way to determine how many of these patients were TPA-eligible.

Graph 3: Documentation of incident date/time for stroke patients (n=4,632)



Performance Measure 2: Documentation of symptom onset time

Table 5: Documentation of pre-notification time for stroke patients (n=4,632)

Facility notification time	All HDD confirmed stroke		EMS suspected stroke			
			No		Yes	
	N	%	N	%	N	%
Not documented	4,340	93.6%	3,091	94.4%	1,249	91.7%
Documented	292	6.3%	180	5.5%	112	8.2%
Total cases	4,632	100%	3,271	100%	1,361	100%

The therapeutic time window was calculated through *Chief Complaint Duration* (E09_06) or *Incident Onset Date/Time* (E05_01) and *Patient Arrived at Destination Time* (E05_10).

A large proportion of confirmed stroke cases had a missing *Chief Complaint Duration* (E09_06) or *Incident Onset Date/Time* (E05_01) (60%). As stroke is a time sensitive condition, proper documentation in the field allows hospitals to tailor their treatment for the best possible outcome for the patient.

Facility notification time is calculated from *Receiving Hospital Contacted Date/Time* (IT5_71) and was missing in 93.6% of confirmed stroke cases.

There are three possibilities as to why documentation is missing or null for a specific data element:

- The ePCR vendor failed to properly map the data element,
- The provider failed to document the procedure,
- The provider failed to perform the procedure.

Performance Measure 3: Documentation of stroke patient assessment

Graph 4: Documentation of blood glucose for stroke patients (n=4,632)

Oftentimes, stroke symptoms are hard to differentiate from diabetic issues. For that reason, providers are asked to test a patient's blood glucose level. There was a documentation of blood glucose levels in 76% of patients that tested positive for a stroke scale.

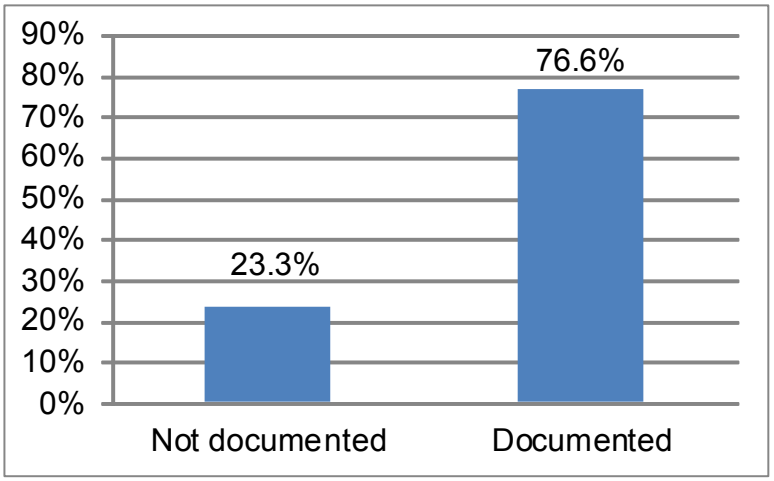


Table 6: Documentation of blood glucose for stroke patients

	N	%
Documented	3,550	76.6%
Not documented	1,082	23.3%
Total confirmed stroke cases	4,632	100%

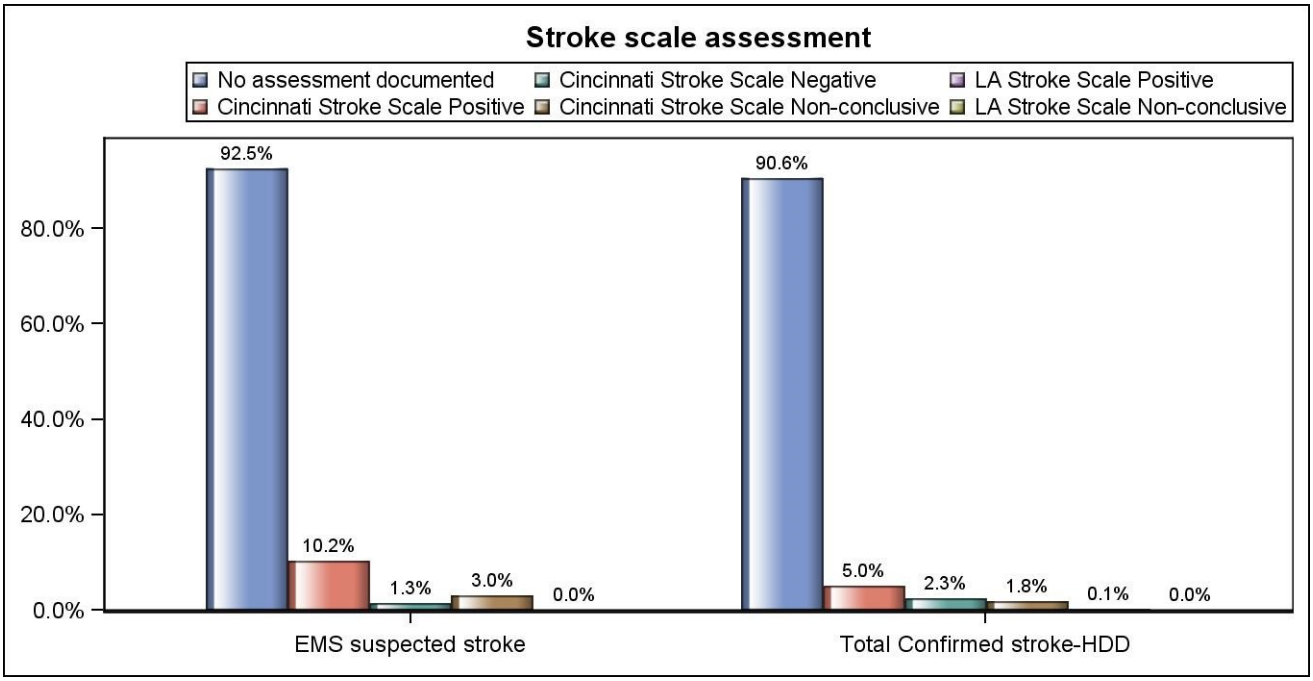
Blood glucose was measured through *Blood Glucose Level* (E14_14). There are three possibilities that can occur in reporting a "No/Not Documented" for data elements:

- The ePCR vendor failed to properly map the data element,
- The provider failed to document the procedure,
- The provider failed to perform the procedure.

Agencies can access the quality of their data by logging into AZ-PIERS, clicking on Data Exchange, Data Posting, and Data Posting Report. Patient records that fail to meet the data structure requirements, or schema, will be shown under the "Failed" tab.

Performance Measure 3: Documentation of stroke patient assessment

Graph 5: Documentation of assessments for stroke patients (n=4,632)



Of the 4,632 confirmed strokes, a large proportion of providers failed to document a stroke scale (90.6%) in *Stroke Scale* (E14_24). Only 5.1% of confirmed stroke patients had a documented positive stroke scale.

Table 7: Documentation of stroke assessments

Stroke scale assessment	All HDD confirmed stroke		EMS suspected stroke			
			No		Yes	
	N	%	N	%	N	%
No assessment documented	4,197	90.6%	3,038	92.8%	1,159	85.1%
Cincinnati Stroke Scale Positive	232	5.0%	92	2.8%	140	10.2%
Cincinnati Stroke Scale Negative	109	2.3%	90	2.7%	19	1.3%
Cincinnati Stroke Scale Non-conclusive	85	1.8%	43	1.3%	42	3%
LA Stroke Scale Positive	6	0.1%	5	0.1%	1	0%
LA Stroke Scale Non-conclusive	3	0%	3	0%	0	0
Total cases	4,632	100%	3,271	100%	1,361	100%

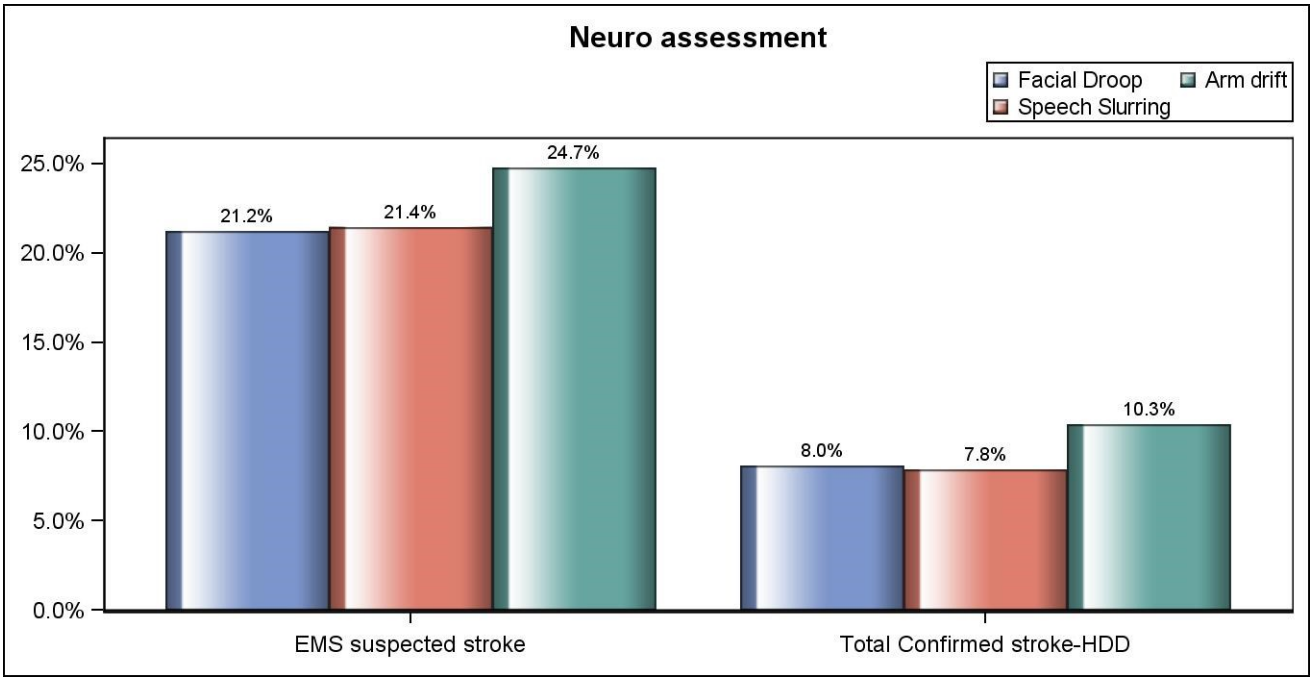
Performance Measure 3: Documentation of stroke patient assessment

Table 8: Results of neurological assessments for patients (n=4,632)

Neurological assessment			EMS did not suspect stroke		EMS suspected stroke	
	N	%	N	%	N	%
Facial Droop	374	8.0%	85	2.5%	289	21.2%
Speech Slurring	364	7.8%	72	2.2%	292	21.4%
Arm drift	481	10.3%	144	4.4%	337	24.7%
Total Cases	4,632	NA	3,271	NA	1,361	NA

In the 4,632 confirmed strokes, the most commonly selected positive indicator was an arm drift (10.3%). It is important to note that any positive indicator may have occurred by itself or in conjunction with any others. The data collection format of the variable makes it difficult to analyze whether the neurological assessment was documented or missing.

Graph 6: Results of neurological assessments for patients (n=4,632)

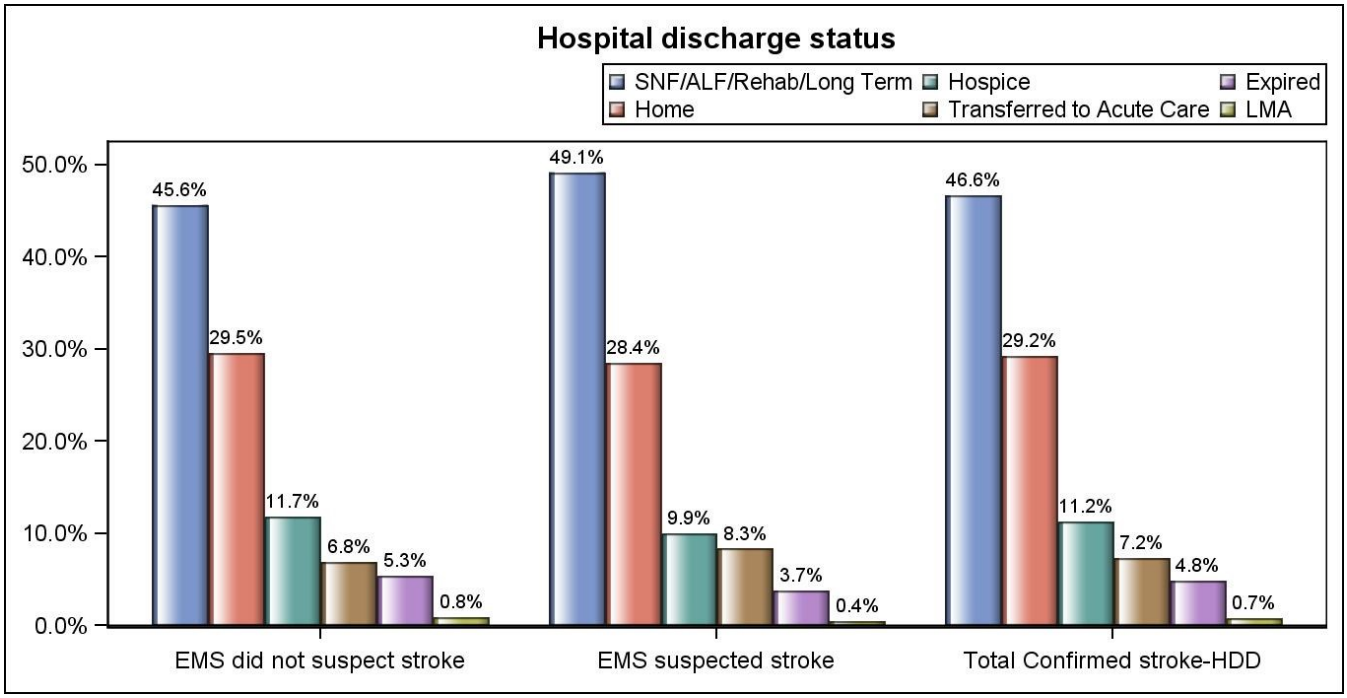


Outcomes for stroke patients in the state EMS system

Table 9: Discharge disposition of stroke patients (n=4,632)

Hospital discharge status	All HDD confirmed stroke		EMS suspected stroke			
			No		Yes	
	N	%	N	%	N	%
Skilled Nursing Facility/ Assisted Living Facility/ Rehab/Long Term Care	2,162	46.6%	1,493	45.6%	669	49.1%
Home	1,355	29.2%	968	29.5%	387	28.4%
Hospice	519	11.2%	384	11.7%	135	9.9%
Transferred to Acute Care	337	7.2%	224	6.8%	113	8.3%
Expired	225	4.8%	174	5.3%	51	3.7%
Left against medical advice	34	0.7%	28	0.8%	6	0.4%
Total cases	4,632	100%	3,271	100%	1,361	100%

Graph 7: Discharge disposition of stroke patients (n=4,632)



Outcomes for stroke patients in the state EMS system

Table 10: Stroke patients by identification (n=4,632)

	Home		Transferred to Acute Care		SNF/ALF/Rehab/ Long Term		Left Against Medical Advice		Expired		Hospice	
	N	%	N	%	N	%	N	%	N	%	N	%
Potentially identifiable	857	31.6%	207	7.6%	1,303	48%	22	0.8%	90	3.3%	232	8.5%
Unidentifiable	166	21%	54	6.8%	322	41%	2	0.2%	90	11.3%	156	19.7%
Not documented	332	29.3%	76	6.7%	537	47%	10	0.8%	45	3.9%	131	11.5%

The unidentifiable stroke category includes a Provider's Primary Impression of altered level of consciousness, unconscious, respiratory arrest, cardiac arrest, respiratory distress, cardiac arrest – asystole.

The potentially identifiable categories includes all others. Some examples include weakness, other CNS problem, headache, and pain.

Not Documented includes all the reported null values.

Additional Resources and training

National Resources

Center for Disease Control and Prevention—Facts about Stroke: http://www.cdc.gov/stroke/docs/consumered_stroke.pdf

Stroke Education for EMS: http://www.strokeassociation.org/idc/groups/stroke-public/@wcm/@hcm/@sta/documents/downloadable/ucm_456069.pdf

State Resources

An Introduction to EMS Agency Performance Improvement: http://www.azdhs.gov/documents/preparedness/emergency-medical-services-trauma-system/data/users/ems-performance-improvement-plan.pdf

Designated stroke centers:

(source: Joint Commission* and Arizona Stroke Coalition):

Abrazo Arrowhead Campus*	Banner Baywood Medical Center*
Banner Boswell Medical Center*	Banner Del E. Webb Medical Center*
Banner Desert Medical Center*	Banner Estrella Medical Center*
Banner University Medical Center—Phoenix Campus*	Banner Thunderbird Medical Center*
Carondelet St. Mary's Hospital—Tucson*	Carondelet St. Joseph's Hospital—Tucson *
Chandler Regional Hospital*	St. Joseph's Hospital & Medical Center*
Abrazo West Campus*	Abrazo Maryvale Campus*
Mayo Clinic Hospital—Phoenix *	Mercy Gilbert & Medical Center*
Northwest Medical Center—Tucson*	Oro Valley Hospital*
Banner University Medical Center—Tucson Campus*	Abrazo Central Campus
HonorHealth Scottsdale Osborn Medical Center	Abrazo Scottsdale Campus
HonorHealth John C. Lincoln Medical Center	HonorHealth Deer Valley Medical Center
Flagstaff Medical Center	Tucson Medical Center