

Pre-hospital Stroke Identification in Georgia

Findings from GCASR and GEMISIS data

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- Background
- Measures of diagnostic accuracy
- Results of data analyses
 - Georgia Coverdell Acute Stroke Registry (GCASR)-
Georgia EMS Information System (GEMSIS)
- Discussion point

Benefits of EMS Activation

- Treatment begins immediately
- Activation of receiving hospitals
 - diversion
- Efficient use of time



Benefits of EMS Activation

- Hospital arrival is faster
 - Median onset-to-hospital arrival time (minutes)
 - EMS Transported **125** (IQR: 60, 388)
 - Private Transport **215** (IQR: 77, 562)
- Shortens time for in-hospital care processes
 - Median door-to-imaging time (minutes)
 - EMS Transported **30** (IQR: 12, 75)
 - Private Transport **58** (IQR: 25, 114)

AHA's Guideline for Early Management Acute Ischemic Stroke

- Class I - Level of Evidence B
 - EMS should use prehospital stroke assessment tools
 - EMS should begin the initial management of stroke in the field
 - EMS should provide prehospital notification to the receiving hospital

Stroke. 2013;44:870–947

Stroke.
2013;44:870–947

Class of Recommendation

	Class I Benefit >>> Risk	Class IIa Benefit >> Risk	Class IIb Benefit ≥ Risk	Class III No Benefit or Harm
	Procedure/treatment should be performed/ administered.	Additional studies with focused objectives needed. It is reasonable to perform procedure/ administer treatment.	Additional studies with broad objectives needed; additional registry data would be helpful. Procedure/treatment may be considered.	No additional studies needed. Procedure/treatment should not be performed/ administered since it is not helpful and may be harmful.
Level A Multiple population risk strata evaluated* General consistency of direction and magnitude of effect	Recommendation that procedure or treatment is useful/effective Sufficient evidence from multiple randomized trials or meta-analyses	Recommendation in favor of treatment or procedure being useful/ effective Some conflicting evidence from multiple randomized trials or meta-analyses	Recommendation's usefulness/efficacy less well established Greater conflicting evidence from multiple randomized trials or meta-analyses	Recommendation that procedure or treatment is not useful/effective and may be harmful Sufficient evidence from multiple randomized trials or meta-analyses
Level B Limited population risk strata evaluated*	Recommendation that procedure or treatment is useful/effective Limited evidence from single randomized trial or nonrandomized studies	Recommendation in favor of treatment or procedure being useful/ effective Some conflicting evidence from single randomized trial or nonrandomized studies	Recommendation's usefulness/efficacy less well established Greater conflicting evidence from single randomized trial or nonrandomized studies	Recommendation that procedure or treatment is not useful/effective and may be harmful Limited evidence from single randomized trial or nonrandomized studies
Level C Very limited population risk strata evaluated*	Recommendation that procedure or treatment is useful/effective Only expert opinion, case studies, or standard of care	Recommendation in favor of treatment or procedure being useful/ effective Only diverging expert opinion, case studies, or standard of care	Recommendation's usefulness/efficacy less well established Only diverging expert opinion, case studies, or standard of care	Recommendation that procedure or treatment is not useful/effective and may be harmful Only expert opinion, case studies, or standard of care

Level of Evidence

Measures of Diagnostic Accuracy

		Hospital Diagnosis		
		Stroke	No Stroke	Total
Field Impression	Stroke	A	B	A+B
	No Stroke	C	D	C+D
	Total	A+C	B+D	A+B+C+D

Sensitivity = A/A + C

Specificity = D/B + D

PPV = A/A + B

NPV = D/C + D

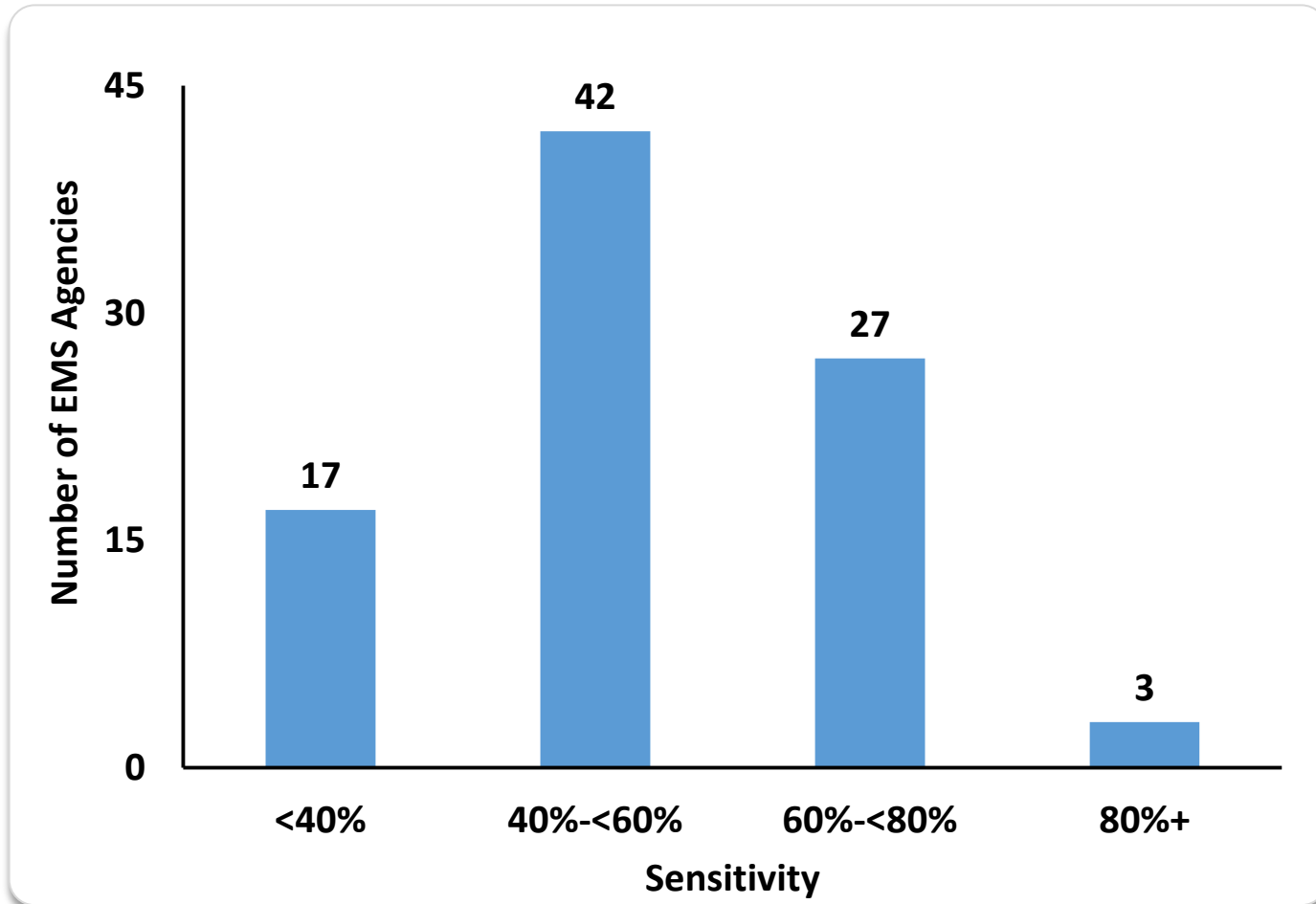
PPV: Positive Predictive Value

NPV: Negative Predictive Value

EMS Sensitivity in Detecting and Documenting Acute Stroke or Transient Ischemic Attack

- The GCASR and the GEMISIS 2016 data were linked.
 - ➔ 6,631 (73%) out of 9,094 records
- Sensitivity in identifying & documenting acute stroke
 - Medics - 48.6%
 - EMDs - 40.1%

Distribution of EMS Agencies by Level of Medics' Sensitivity, Georgia 2016



Sensitivity of Medics by Patient and EMS Agency Characteristics, Georgia 2016

Characteristics	Number and percent of patients identified by medics	P-value
Age group		
85+ yrs.	537 (49.1%)	0.59
65-84 yrs.	1,506 (48.8%)	
45-64 yrs.	1,016 (48.5%)	
<45 yrs.	139 (44.8%)	
Gender		
Female	1,644 (47.4%)	0.04
Male	1,554 (49.9%)	
Race		
Others	1,272 (44.6%)	<.0001
Whites	1,926 (51.7%)	

Sensitivity of Medics by Patient and EMS Agency Characteristics, Georgia 2016

Characteristics	Number and percent of patients identified by medics	P-value
Stroke type		
Ischemic Stroke	2,465 (50.5%)	<.0001
Intracerebral Hemorrhage	334 (46.4%)	
Subarachnoid Hemorrhage	26 (19.0%)	
Stroke not otherwise specified	49 (54.4%)	
Transient Ischemic Attack	324 (42.7%)	
Aphasia on admission		
Yes	1,752 (64.7%)	<.0001
No	1,446 (37.3%)	
Altered level of consciousness on admission		
Yes	604 (41.9%)	<.0001
No	2,594 (50.4%)	
Arm weakness on admission		
Yes	2,211 (57.8%)	<.0001
No	987 (35.8%)	

Sensitivity of Medics by Patient and EMS Agency Characteristics, Georgia 2016

Characteristics	Number and percent of patients identified by Medics	P-value
NIH stroke severity scale score		
15+	736 (65.5%)	<.0001
5-14	1,174 (61.2%)	
<5	1,079 (41.1%)	
Identified by EMD as Stroke/CVA		
Yes	1,870 (71.0%)	<.0001
No	1,325 (33.6%)	
EMS Agency participates in GCASR		
Yes	1,169 (50.8%)	0.008
No	2,029 (47.4%)	

Multivariable Analysis of Sensitivity of Medics in Identifying and Documenting Ischemic Stroke Diagnosis, Georgia 2016

Characteristics	Odds Ratio	95% CL
Race		
Others	0.78	0.66, 0.93
Whites	Referent	Referent
Clinical findings on admission		
Aphasia	2.38	2.03, 2.79
Body weakness (arm, leg, face or any body part)	1.59	1.35, 1.88
Altered level of consciousness	0.58	0.47, 0.71
NIH stroke severity scale score		
15+	4.12	3.27, 5.18
5-14	2.14	1.80, 2.53
<5	Referent	Referent
EMD complaint report		
Stroke/CVA	4.65	3.94, 5.48
No Stroke/CVAs	Referent	Referent

First Provider Impressions Among Ischemic Stroke Patients Not-identified by Medics, Georgia 2016

First Provider Impression	Frequency	Percent
AMS/ALOC/Unconscious	634	27.0
Weakness	609	25.9
Other Illness/Injury	213	9.1
General Malaise	96	4.1
Pain	76	3.2
Hypertension	67	2.9
Syncope/Fainting	66	2.8
Traumatic Injury	61	2.6
Nausea/Vomiting (Unknown Etiology)	58	2.5
Headache	53	2.3

SAMPLE ANALYSES

Stroke-related Symptoms Reported in the Narrative by Medics, Georgia 2016

Symptom	Ischemic Stroke Patients	
	Identified by EMS (N=100)	Not Identified by EMS (N=100)
Arm or leg weakness/Walking difficulty/Falling accident	49%	29%
Face drooping	20%	6%
Speaking difficulty	40%	12%
Numbness	6%	11%
Stroke mentioned by EMD or patient/bystander	61%	22%

Stroke-related Signs Reported in the Narrative by Medics, Georgia 2016

Objective finding	Ischemic Stroke Patients	
	Identified by EMS (N=100)	Not Identified by EMS (N=100)
Conscious, alert and oriented to place, person and time	50%	41%
Weak or paralytic arm or leg	64%	23%
Aphasia or slurred speech	53%	22%
Face drooping	56%	16%
Calculated PCSS score		
0	12%	65%
1	27%	19%
2	41%	9%
3	20%	7%
Stroke screening mentioned	38%	19%

Example - Case 1

- A 55 yrs. old female with **sudden paralysis or facial droop** (one side).
- Patient experienced a headache, and **numbness in her right arm**, hand and foot and she noticed something was wrong.
- **Family noticed that patient's right side of face started to droop** yesterday around lunch and **noticed slurred speech**
- Med Hx: Hypertension, Seizure disorder, but patient is not taking any of her medication and the last seizure episode was two months ago
- Found patient sitting, alert and oriented, and GCS = 15.
- Vital signs monitored: bradycardia and hypertensive.
- Cincinnati pre-hospital stroke assessment:
 - Smile: **Right side of face doesn't move as well**
 - Arms: **Right arm does not move or drifts down**
 - Speech: . . .

Dispatch Complaint: Stroke/CVA

1st Impression: Not Applicable

2nd. Impression: Not Applicable

Door-to-Imaging time = **131** minutes

Example - Case 2

- A 62 yrs. old AA male patient had **syncope with LOC that lasted for 5 minutes**.
- Bystander reported that Pt was waiting in line for food and collapsed suddenly.
- Has history of HPT, Stroke/CVA
- Pt is **confused unable to follow commands** with GCS score of 14 (Eyes=4; Motor=6; Verbal=4).
- Vital signs: BP=**177/121**; PR=105; RR=22 with 98% SPO2 saturation
- **Inability to communicate verbally, left side extremity weakness, face drooping**
- Blood glucose=85mg/dl and Sinus tachycardia on EKG

Dispatch Complaint: Syncopal Episode/Fainting
2nd. Impression: Not Recorded

1st Impression: Stroke/CVA

Door-to-Imaging time = **15** minutes

Example - Case 3

- An 80 y/o male patient complaining of **generalized weakness**, slightly **more** than normal **on the lower extremities**
- Patient has a history of hypertension and stomach cancer.
- Patient is CA&Ox4, stable vitals
- Has slight **facial droop to the right side**, Cincinnati stroke scale *otherwise unremarkable*

Dispatch Complaint: Other

1st Impression: Weakness

2nd. Impression: Not Applicable

Door-to-Imaging time = **68** minutes

Example - Case 4

- An 86Y/0 M c/o Poss. CVA.
- Family member found the Pt acting strangely, and states the Pt is typically able to walk and talk w/o issue.
- PT currently has a **shuffling gait** and is **unable to answer questions**.
- Pt has prior Hx of CVA, but he has no existing deficits.
- On arrival Pt was standing in hallway alert but not oriented. Pt's airway is patent and self-maintained.
- **Mend exam** reveals: equal grip strength, + **face droop, AMS** and is **unable to complete verbal**. Other than stated head to toe is unremarkable.

Dispatch Complaint: Stroke/CVA

1st Impression: Stroke/CVA

2nd. Impression: Other

Door-to-Imaging time = **8** minutes

Impact of Pre-hospital Stroke Identification and Documentation on In-patient Care Process, Georgia 2016

- Door-to-imaging time < 25 minutes
 - Identified Patients (=2,111) **69.1%**
 - Not-identified patients (n= 909) **28.9%**
- Median (IQR) door-to-imaging time (*minutes*)
 - Identified Patients (=2,111) **13 (6, 31)**
 - Not-identified patients (n= 909) **51 (22, 102)**

Impact of Pre-hospital Stroke Identification and Documentation on In-patient Care Process, Georgia 2016

Ischemic stroke patients identified and documented as having stroke by medics had

→ **3.78** times higher odds

(95%CI: 3.01-4.75)

of ***receiving imaging within 25 minutes*** of hospital arrival than those who were not documented as having stroke

Discussion

- Adhere to AHA guideline
 - Use prehospital stroke assessment tools
 - CPSS > 0 → ~ 72% sensitivity*
- Interpret stroke scale score properly
 - Increases sensitivity from 50.5% to 67.8%
- Improve documentation
 - Stroke screening
 - Provider impression

* *Ann Emerg Med. 1999;33(4):373-8.*

Discussion

- If you think it is stroke,
then **call it STROKE**
- Priority in provider impression?
 - AMS or Weakness
vs.
Stroke