



# INTRODUCTION OF ENHANCED PREHOSPITAL STROKE TOOL IMPROVES DELIVERY OF ACUTE STROKE CARE

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## INTRODUCTION

Participation by EMS plays a crucial role in achieving excellent acute stroke care. In order to raise the level of acute stroke recognition, we have moved from the concept of a simple scale (e.g. Cincinnati Stroke Scale) to something more complex, incorporating education and participation in our hospital's stroke program by EMS.

## GOALS

- Improved prehospital stroke identification and assessment of severity for all stroke cases
- Expedited acute stroke care treatment and process times
- Standardization of stroke care in the field
- Improved communication processes prehospital, between EMS and ER

## MATERIALS AND METHODS

For this study we have worked with a single EMS group over a 15-month period, providing them with a stroke assessment tool (Figure 1) containing an abbreviated NIHSS, time of onset and assessment, glucose, Coumadin® use, epilepsy and surgical and trauma history. EMS actively contributed to the development of the abbreviated NIHSS tool.

EMS obtained NIHSS certification, attended scheduled educational programs, stroke committee and Joint Commission meetings, community presentations, and helped develop the hospital's stroke DVD.

The ETC was included in this program, and asked to respond positively to calls from EMS reporting their assessment tool results (Figure 2).

Figure 1

**STROKE ALERT / POSSIBLE TPA CANDIDATE**

- SARS EMS Report Received
- Notify Charge Nurse of Pending Arrival & Location
  - X 7350 (400 Section)
  - X 7370 (500 & 600 Section)
- Charge Nurse notify RN, Physician, CA & AA to expedite triage & registration

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- NIHSS >2 or aphasic -
- Possible Candidate for Thrombolytic Therapies (rt-PA), IA rt-PA or Clot Retrieval Procedures

Patient is a possible candidate for:

- IV rt-PA - 0 to 3 hours since onset of symptoms
- IV rt-PA 3 to 4.5 hours since onset of symptoms
- Neurointerventional therapy such as:
  - Intra-arterial (IA) TPA and/or Clot Retrieval Procedure 0-8 Hours
  - Stroke Clinical Trial (ALIAS) 0-5 Hours

Figure 2

We tracked (Table 1):

- percentage of patients with acute stroke who received IV or IA rt-PA;
- door-to-CT time for all stroke patients;
- door-to-drug time.

NIHSS results presented by EMS were compared to results obtained by the neurologist seeing the patient acutely.

We looked at EMS transport time to see if there were delays related to the use of the stroke tool (Table 1).

Measure	2008-09*	2009-10**	2009-2010*
Percentage of eligible pts. treated	11 (50/450)	20 (14/67)	8 (37/49)
Door to CT (minutes)	19	16 (5-29)	21
Door to drug (minutes)	112	61 (42-75)	72
On scene to transport (av. minutes)	NA	14 (2-28)	13 (2-35)
On scene to door (av. minutes)	NA	22 (5-32)	23 (7-45)

\*All emergency services      \*\*Study EMS service only

Table 1—Results of Intervention

DISORDER	NUMBER	DISORDER	NUMBER
Seizure	11	Subdural hematoma	3
Urinary tract infection	7	Pneumonia	2
Intracerebral hemorrhage	4	Falls	2
Overdose	4	Multiple sclerosis	2
Migraine	4	Hepatic encephalopathy	2
Metabolic encephalopathy	4	Sepsis	2
Syncope	3	Other	20*
Respiratory failure	3		
<b>TOTAL</b>		<b>73</b>	

\*Viral illness, alcohol, diabetic ketoacidosis, weakness, supraventricular tachycardia, cervical stenosis, fever of unknown origin, transient global amnesia, dehydration, vasculitis, cerebral palsy and peripheral neuropathy

Table 2—Stroke Mimics and Hemorrhages



For this study we worked with a single EMS group in our area (the Second Alarmers Rescue Squad of Montgomery County) over a period of 15 months.

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### RESULTS

- 140 patients reported to the ETC with possible acute stroke.
- 73 of these patients were determined to be mimics, a higher figure than usually reported, suggesting that EMS “erred” on the side of inclusion (Table 2).
- Twenty percent of eligible patients were treated with IV or IA rt-PA, nearly double the number of the year before and among the highest figure in the country.
- Symptom-to-drug time averaged 150 minutes.
- Door-to-CT time averaged 16 minutes.
- Door-to-drug time was 61 minutes.

There was no delay, on average, in EMS transport time despite the introduction of the tool.

Abbreviated NIHSS scores for patients receiving rt-PA were very close to the full NIHSS obtained by the neurologist (Table 3; Figure 3), though some patients improved or worsened once they arrived in the ETC.

Examiner	Score (abbreviated)	Score (full scale)
EMS	11.2 (4 to 16)	NA*
Neurologist	12.3 (8 to 16)**	12.9 (4 to 21)

\*EMS only performed a five-item scale (see Prehospital Stroke Scale). The neurologist performed a full scale within 30 minutes of the EMS evaluation, in most cases. The neurologists’ scales were reviewed and a separate score for the five items evaluated by EMS was obtained.

\*\*Unfortunately, this data was only available for seven patients.

Table 3—NIHSS Comparison (Patients Receiving rt-PA)

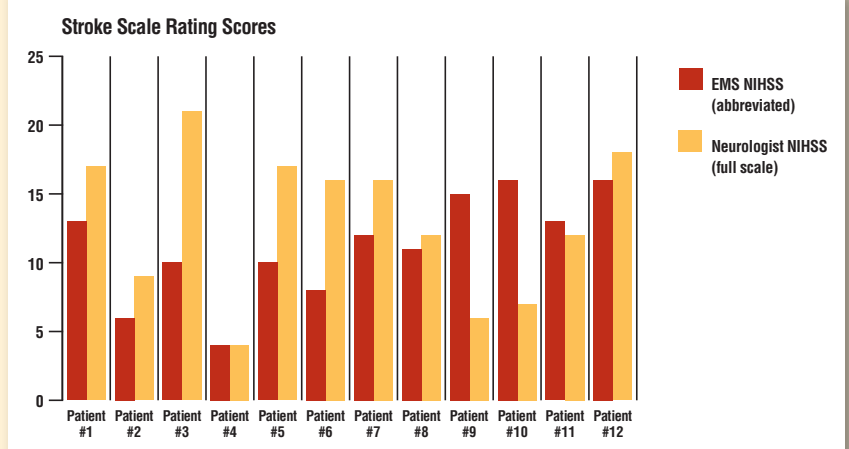


Figure 3—NIHSS Results for Patients Receiving IV rt-PA

### CONCLUSIONS

Alliance with EMS, through the development and utilization of a stroke assessment tool recognized by the ETC, nurses and neurologists combined with educational programs explaining the tool and stroke care standards, and participation by EMS in all aspects of our Stroke Center programs can increase rt-PA administration and improve time to evaluation and treatment. While other factors may have been responsible for some of the improvement noted from 2008 to 2010, indicated by the fact that door-to-drug time decreased for all emergency services, the EMS group with whom we worked appeared to contribute disproportionately to this improvement. Other benefits such

as improved communication and respect between EMS and the ETC, nurses and neurologists cannot be easily measured, but certainly occurred to the delight of all who participated.

### DISCLOSURES

Authors report no disclosures.

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