Deterioration and Improvement in the Field: Comparative Detection by LAMS and GCS in Acute, EMS-Transported Stroke Patients

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Disclosures

None

Introduction

- Stroke deficit evolution after hospital arrival is well characterized
- With patient routing to stroke centers and prehospital stroke trials, earlier characterization of stroke deficit evolution becomes essential
- Initial studies of prehospital deficit evolution used serial Glasgow Coma Scale (GCS) assessments:
  - Assesses level of consciousness, not focal deficits
- To further explore prehospital deficit evolution we analyzed the NIH FAST-MAG trial database

FAST-MAG Trial

Placebo-controlled, double-blinded, RCT asses Mg as neuroprotective agent

Multi center, single region
- 59 hospitals, Los Angeles and Orange Counties

4gm Mg in field, 16gm Mg maintenance x24hrs

1700 patients, 1st patient Jan 2005

Primary Endpoint: 90 day Rankin Scale Shift
- Prehospital initiation Mg safe
- Did not improve disability

First prehospital phase III stroke RCT

Methods

Analyzed deficit evolution from 1st paramedic assessment to early post-arrival assessment in ED, using serial scores on:

- GCS
- Los Angeles Motor Scale (LAMS): a prehospital stroke deficit measure
- Paramedic Global Impression of Change (PGIC): 5 point Likert paramedic-clinician score

Analyses to compare scales

- Correlation coefficients over entire scale ranges
- Improvement or worsening, using dichotomized scale thresholds
  - Delta 2 or more for GCS and LAMS
  - Score other than 3 (unchanged) for PGIC

Methods: Glasgow Coma Scale (GCS)

Best Eye Response	Best Verbal Response	Best Motor Response
+4 Spontaneously +3 To command +2 To pain +1 No eye opening	+5 Oriented +4 Confused +3 Inappropriate Words +2 Incomprehensible sounds +1 No verbal response	+6 Obeys commands +5 Localizes to pain +4 Withdrawal from pain +3 Flexion to pain +2 Extension to pain +1 No motor response

Score Range 3-15

Methods: Los Angeles Motor Scale (LAMS)

	Normal	Right	Left
Facial Smile/ Grimace	0	Droop-1	Droop-1
Grip	0	Weak Grip-1 No Grip-2	Weak Grip-1 No Grip-2
Arm Strength	0	Drifts Down- 1 Falls Rapidly- 2	Drifts Down-1 Falls Rapidly-2

Score Range 0-10

Methods: Paramedic Global Impression of Change (PGIC)

Description	Score
Much Improved	1
Mildly Improved	2
Unchanged	3
Mildly Worsened	4
Much Worsened	5

Score Range 1-5

Results: Demographics and Timing

	Acute Neurovascular Disease N= 1632	Acute Cerebral Ischemia N= 1245	Acute Intracranial Hemorrhage N=387
Age, years (SD)	69.6 (13.4)	65.4 (13.4)	70.9 (13.2)
Sex, % Female	42.5	33.3	45.3
Race, % Caucasian Black Latino	 54.9 12.8 23.3	 46 9.6 33.3	 57.8 13.7 20.1
Time from onset to paramedic assessment, min (IQR)	23 (14-42)	24 (14-42)	23 (14-38.5)
Time from onset to early ED assessment, min (IQR)	150 (120-180)	150 (120-180)	148.5 (122-180)

Severity Scores: Prehospital and in ED

	Acute Neurovascular Disease N= 1632	Acute Cerebral Ischemia N= 1245	Acute Intracranial Hemorrhage N=387
GCS Prehospital	15 (14-15)	15 (14-15)	15 (15-15)
GCS ED	15 (14-15)	15 (14-15)	15 (10-15)
LAMS Prehospital	4 (3-5)	4 (3-5)	4 (3-5)
LAMS ED	4 (2-5)	3 (1-5)	5 (4-5)
PGIC	3 (2-3)	3 (2-3)	3 (3-3)
NIHSS ED	9 (3-18)	7 (2.25-15)	16 (9-26)

Correlation between Scales

Population	LAMS change vs GCS change	LAMS change vs PGIC	GCS change vs PGIC
Neurovascular Disease	-0.549	-0.313	0.198
Acute Cerebral Ischemia	-0.375	-0.274	0.077
Intracranial Hemorrhage	-0.669	-0.181	0.220

*Pearson r correlation coefficients

Deficit Evolution by Scale and Stroke Subtype

	% Deteriorated	% Improved	% Unchanged
Neurovascular Disease			
GCS	12	5.7	82.3
LAMS	11.1	24.5	64.4
PGIC	5.6	32.1	62.4
Cerebral Ischemia			
GCS	6.1	6.9	87
LAMS	7.1	30.7	62.2
PGIC	3.2	36.9	59.9
Intracranial Hemorrhage			
GCS	30.8	1.8	67.4
LAMS	24.2	4.5	71.3
PGIC	13	16.4	70.6

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Improvement/Deterioration Agreement LAMS vs GCS, Neurovascular Disease

	% GCS Improved	% GCS Stable	% GCS Deteriorated
% LAMS Improved	2.7	21.6	0.2
% LAMS Stable	2.8	54.6	6.1
% LAMS Deteriorated	0.1	5.5	5.3

Overall Agreement: 62.6%

Improvement/Deterioration Agreement LAMS vs GCS, Acute Cerebral Ischemia

	% GCS Improved	% GCS Stable	% GCS Deteriorated
% LAMS Improved	3.5	26.6	0.3
% LAMS Stable	3.2	54.3	3.9
% LAMS Deteriorated	0.2	5.0	1.8

Overall Agreement: 59.6%

Improvement/Deterioration Agreement LAMS vs GCS, Acute Intracranial Hemorrhage

	% GCS Improved	% GCS Stable	% GCS Deteriorated
% LAMS Improved	0.3	4.1	0
% LAMS Stable	1.6	55.0	13.4
% LAMS Deteriorated	0	7.0	16.5

Overall Agreement: 71.8%

Conclusions

Clinical deficit evolution occurs in more than one third of acute stroke patients during ambulance transport and early ED course.

- Improvement more common in acute cerebral ischemia
- Deterioration more common in acute intracranial hemorrhage

Focal deficit scales substantially more sensitive in detecting improvement than GCS

- GCS ceiling effect
- GCS unable detect change in lateralized motor deficits

Further studies of association with initial imaging findings and final outcomes will help determine best scale for prehospital trials and for stroke regional systems of care.

Thank you.

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