Delivering Acute Stroke Therapy in the Pre-Hospital Environment in Houston, Texas, U.S.A.

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Gray Matters
Houston Mobile Stroke Unit

Mobile Stroke Unit

- Standard 12 foot ambulance
- Diagnostic Equipment
  - ✓ Portable CT scanner (CereTom)
  - ✓ Point-of-care laboratory
  - ✓ Teleradiology/Teleneurology connection
- All management is S. O. C.

Steps in Establishing the MSU

March 2013-Feb 2014

- Full time Medical Director and Project Manager take ownership
- Funding
- Purchase and buildout
- Collaborative agreements with stakeholders (UT, MHH, other CSCs, EMS)
- Policies, Guidelines and Procedures; System for accountability
- State and City inspection and licensing
- Radiation safety inspection and certification
- Insurance on vehicle and personnel
- Staffing
- Supplies and equipment
- Secure location, power, office
- EMS education
- EMS communication pathway
- HIPPA compliant grid for CT transmission
- Study protocol developed; CRFs and MOP. Grant funding sought
- IRB approval

Steps in Establishing the MSU

Full time Medical Director and Project Manager to take ownership

"This is a major project of utmost importance, but it has no budget, no guidelines, no support staff, and it's due in 15 minutes. At last, here's your chance to really impress everyone!"

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Steps in Establishing the MSU

Funding

From March 2013– May 2014

-Successfully raised $1.8 million from community businesses and leaders

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Steps in Establishing the MSU

Purchase and Buildout

Steps in Establishing the MSU

Collaborative agreements with stakeholders

- Support from Local EMS
- University of Texas Medical School
- All Comprehensive Stroke Centers (MHH, TMH, BSLCHI, HH)
- Houston Mobile Stroke Unit Consortium

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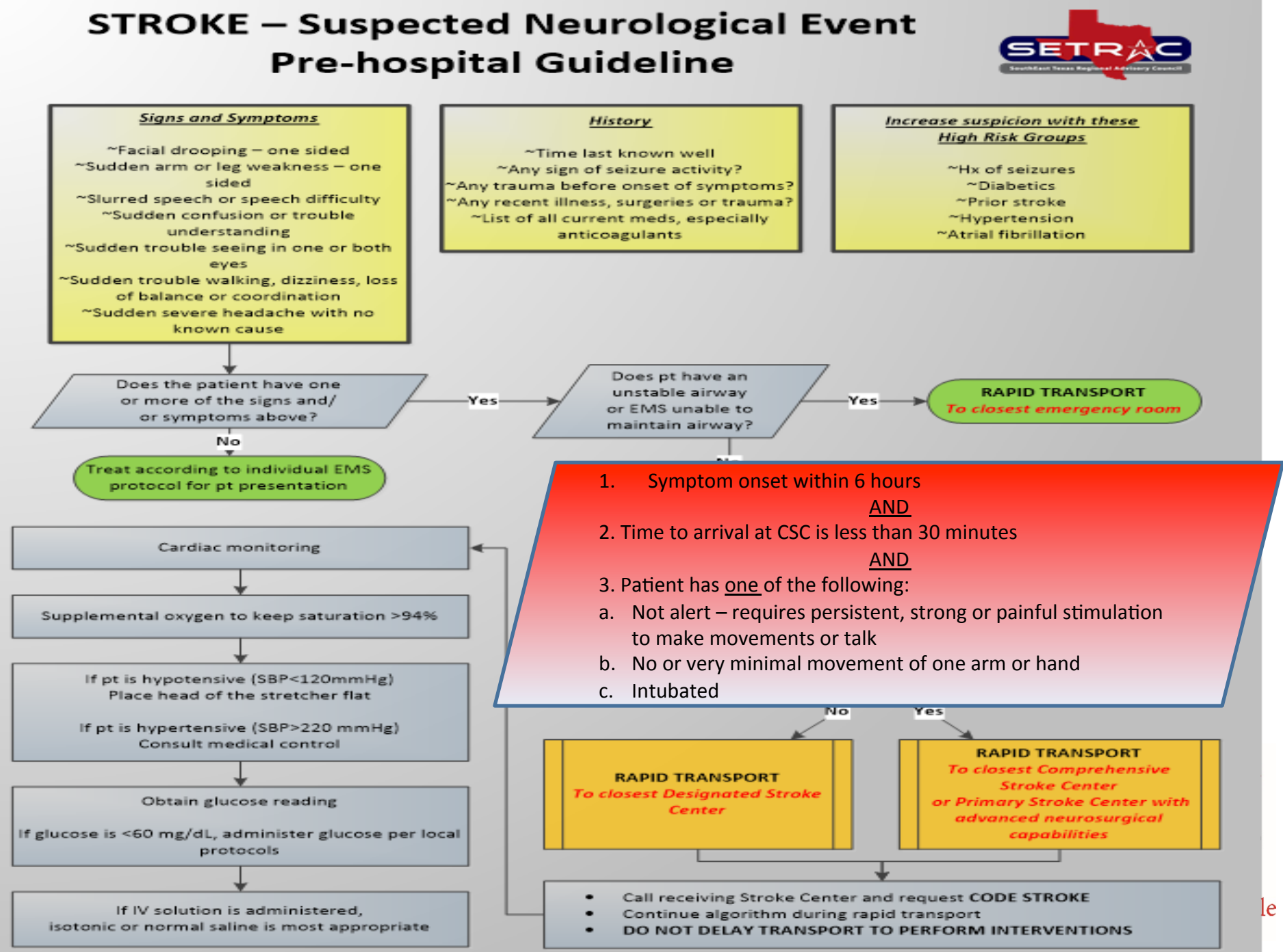
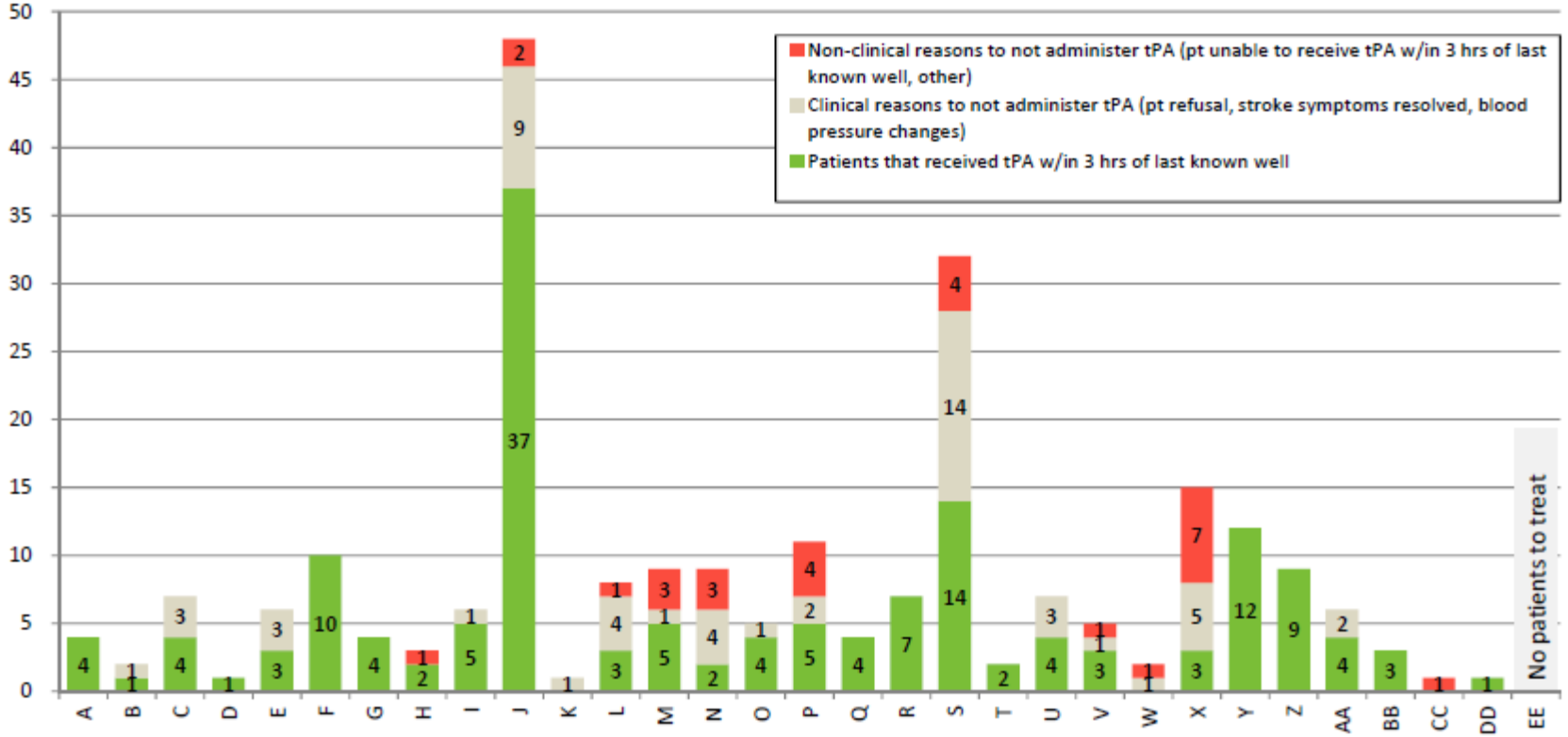
STROKE – Suspected Neurological Event
Pre-hospital Guideline



CEO REPORT

SETRAC Ischemic Stroke Data - Quarter 1 2014

Eligible Patients Treated With tPA Within 3 Hours of Last Known Well



Regional Data		
Total number of stroke (infarct) patients	1,987	
Total number of ischemic strokes	1,665	83.8%
Total number of tPA eligible patients presenting to ED w/in 2 hours of last known well	240	14.4%
Total number of patients receiving intravenous tPA w/in 3 hours of last known well	156	65.0%
Total number of patients not receiving tPA	84	35.0%
- Pt refusal	10	11.9%
- Stroke symptoms resolved	44	52.4%
- Blood pressure changes	1	1.2%
- Pt unable to receive tPA w/in 3 hrs of last known well	6	7.1%
- Other	22	26.2%

Steps in Establishing the MSU

Develop Accountability System

- Write and implement physician standing orders/protocols
- Adult ALS protocols (SZ, MI, airway)
- Develop guidelines for staff expectations including QA, QI for all equipment, maintenance & certifications.

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Steps in Establishing the MSU

Licensing and Inspections

TEXAS Department of State Health Services

- Ambulance Provider License

- Ambulance Provider License
- Ambulance Driving Permit

TEXAS Department of State Health Services

- Radiation Safety Protocols, Application & Certification
- Radiation Safety Inspection

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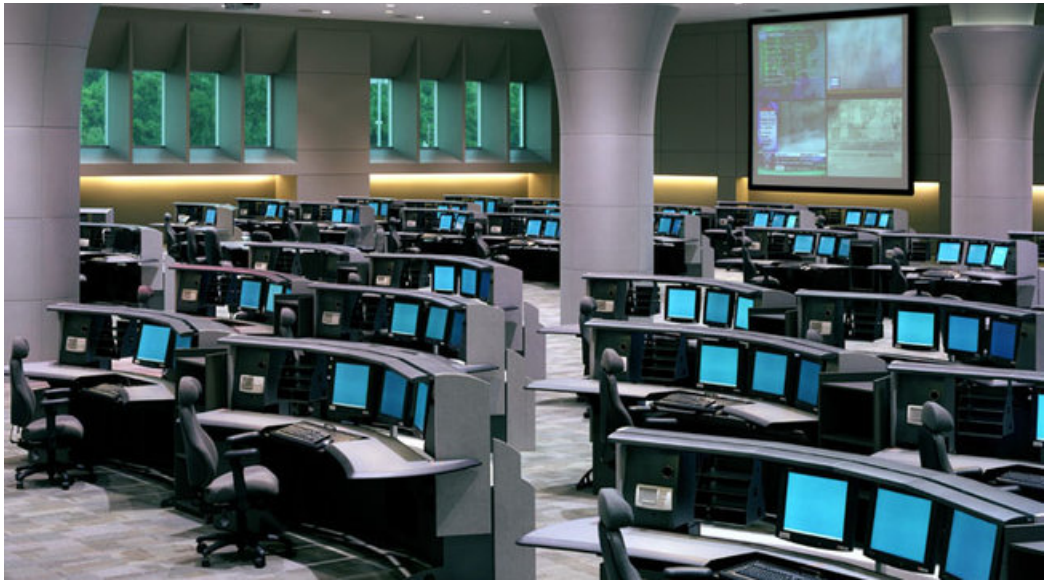
Steps in Establishing the MSU

Communication and Technology Systems

- ✓ Dispatch Pathway Development with 3 different cities
- ✓ Houston Fire Dept. Radios and Pagers
- ✓ Dispatch numbers and phones
- ✓ Mobile Data Terminal – to track location and times
- ✓ HIPPA compliant DICOM Sharing grid for sharing CT images



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Mobile
Unit

Steps in Establishing the MSU

MSU Training

- ACLS training of MSU staff
- Stroke Teams at 3 CSC Facilities (ER, Research, Stroke Coordinators)
- 2200/4000 Houston Fire (FR, Paramedics, Dispatch and Call Receivers
- All incoming Houston Fire Cadets
- West University Dispatch and Fire/EMS
- Bellaire Dispatch and Fire/EMS
- Southeast Texas Advisory Council (SETRAC)

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Steps in Establishing the MSU

Staffing

Who is inside?

- Licensed Vascular Neurologist with an ACLS Certification
- Critical Care/ER trained Registered Nurse with ACLS certification
- Licensed Paramedic with ACLS certification
- Licensed CT radiology technician with BLS certification
- Telemedicine Doc!!

BEST-MSU Study

Benefits of **S**troke **T**reatment Delivered Using a **M**obile **S**troke **U**nit Compared to Standard Management by Emergency Medical Services

AIMS

1. Determine the logistics and clinical outcomes of MSU vs SM in the U.S.—speed, #, first hour.

2. Can MD be replaced by Telemedicine?

3. What is the Cost-Effectiveness ?

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How Reliable is TM in a Mobile Stroke Unit?

Telemedicine Reliability??: Wu et al—PURSUIT study, Stroke 45:2014

A: Remote vascular neurologist performing stroke evaluation; B: RP-Xpress mounted on stretcher in ambulance; C: Remote assessment In ambulance with EMS assistance; D: Remote assessment on-scene in patient home with EMS.

Table 1: Data Analysis		
	Live Assessments (n = 34)	Recorded Assessments (n=33)
RELIABILITY		
Intra-class correlation (95% CI) for NIHSS	0.997 (0.992-0.999)	0.993 (0.975-0.999)
VALIDITY		
Matched Scripted NIHSS ± 2 points	88%	70%
Clinical Data points Obtained (12 items)	96%	96%

Cost Projection

Cost of CT Scanner	$ 375,000
Ambulance Retrofit	$ 60,000
TM equipment	$ 30,000
Cost of added paramedic and TM coverage X 5 yrs	$1,000,000
Total fixed and continuing costs for 1 MSU X 5 yrs	$1,465,000

vs

Less than the cost to sustain an endovascular program!

Lifetime cost per stroke: $ 200,000

Therefore, cost neutral if:

1 MSU results in 7 more patients completely recovering over 5 yrs

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Dispatch by:

- Dispatch center: only if stroke pathway.

OR

- On-scene EMT (identify possible stroke → rendezvous)

OR

- We monitor EMS radio and add ourselves on

About 2-4 runs/day
1 rt-PA treatment per 7 calls

rt-PA Exclusions:

- Time (too long or uncertain),
- Too mild
- Too sick
- Mimics
  - Hypoglycemia
  - Seizure
  - Migraine
  - Psychiatric

BEST-MSU enrollments- First Two Years

- **136** Treated with rt-PA (2.7/wk, 135/yr)
- 67 More Transported (but not treated)
  - ICH
  - Sz
  - Too mild
  - Uncertain onset time
  - Other (tumor, cerv. spond.)
- Avg. on-scene time- **21 min**

- Symptom onset to t-PA treatment
  - **42%** 0-60 min (vs 0% control)
  - **37%** 61-80 min (vs 20% control)
  - 21% 81-270 min (vs 80% control)

Conclusions

- Pre-hospital triage and treatment will be the next quantum leap forward in speeding treatment and improving outcomes
- Before this strategy is widely implemented in the U.S., we need more data on feasibility, outcomes and costs
- These are the Aims of the BEST-MSU study

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Final Thought…

A Stroke is like a GSW to the brain…

except that we can reverse a Stroke!

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