THE UNIVERSITY of TENNESSEE HEALTH SCIENCE CENTER

Mobile Stroke Units

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Editorial Board
Stroke, Cerebrovasc Dis, Intl J Stroke, Brain and Behavior
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American Society of Neuroimaging
Board Member
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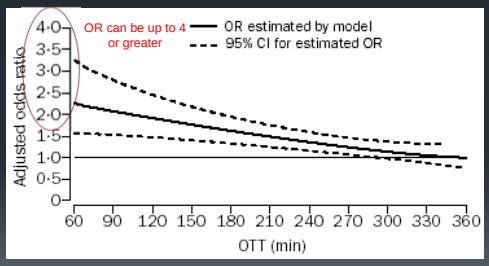
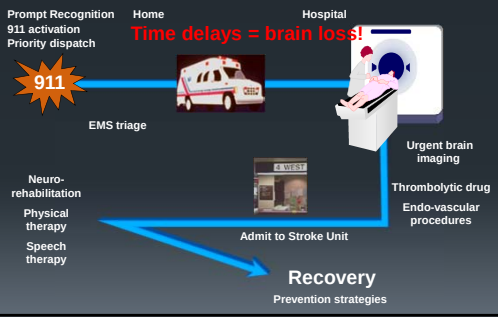
Inventor, US Patent # 6733450

What if We Treat Under 60 min?



ATLANTIS, ECASS, and NINDS-rt-PA Stroke Study. Lancet 2004;363:768-774.

Current Stroke Treatment



Current EMS Ambulance

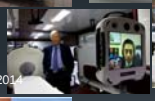
Breakthrough: CT in EMS = Mobile Stroke Unit

MOBILE STROKE UNITS IN THE UNITED STATES

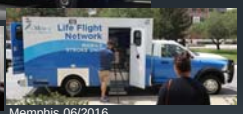
Houston 02/2014

Denver 01/2016

Toledo 02/2016



Cleveland 07/2014



Memphis 06/2016

... and upcoming in Chicago Phoenix LA Providence Summit, NJ etc

Respond, Evaluate, Cure, Heal: Mobile Stroke Unit

REACH – MOST

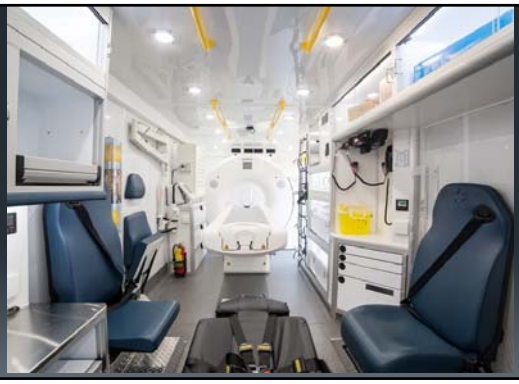
University of Tennessee
Memphis

Building MSTU in Memphis

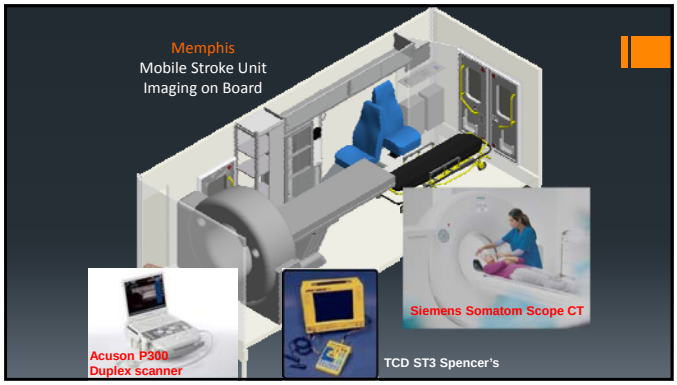
- **Obtain philanthropic funding/IRB approval**
- **Propose a non-denominational model**
- **Hire EMS executive to direct MSTU**
- **Integrate with Fire Department**
- **Install angiography capable CT scanner**
- **Partner with competing institutions**
- **Explore different practice models (MD, ACNP, telemedicine)**
- **Deliver sustainable product to the city**

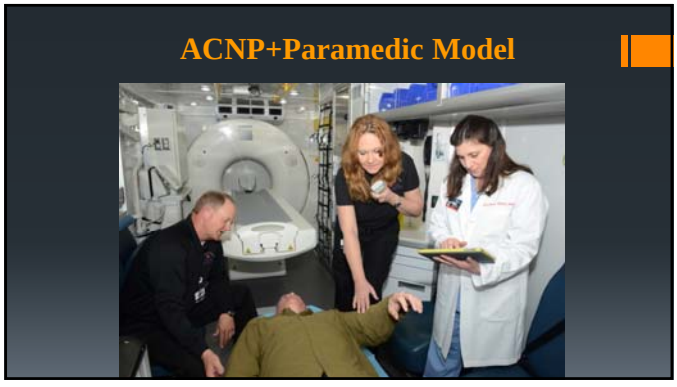
Building Consensus

- Memphis “non-denominational” model:
  - MSTU is operated under hospital-independent physician practice and Memphis Fire Department
  - MSTU is able to deliver patients to competing institutions
  - MSTU can deliver patients to their hospital of choice
  - MSTU imaging capabilities allow bypass of PSCs and ER for ELVO or OR patients




Memphis
Mobile Stroke Unit
First to have CTA
SOMATOM Scope
Small footprint
Low power requirements
16 slices
Flying Focal Spot
UCF / Ultra Fast Ceramic Detector
Automated setup
Saved Customized Protocol
Real time imaging
3s acquisition
10s reconstruction
Dose Modulation (Care Dose 4D)
Iterative Reconstruction (Iris)


Memphis
Mobile Stroke Unit
Imaging on Board
Siemens Somatom Scope CT
Acuson P300
Duplex scanner
TCD ST3 Spencer's


ACNP+Paramedic Model

Nurse Practitioners

- Vascular Neurology Fellowship Training for NPs is essential! (www.learnstroke.com)
  - Clinical localization
  - Imaging interpretation
  - Pathogenic mechanism
  - Advanced diabetes management; strong internal medicine underpinnings
- Board certification for fellowship trained advanced practice providers:
  - ANVP-BC offered by Association of Neurovascular Clinicians (www.anvc.org)
- Likely faster than telemedicine:
  - No connection delays or repeat exams
  - No waiting on imaging interpretation

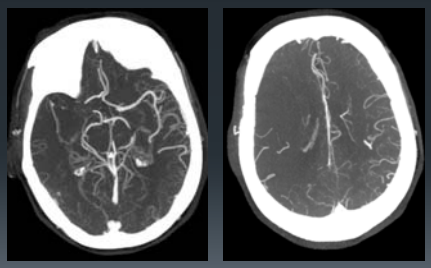
Most Important Personnel Consideration

- Can they work in a chaotic, out of control, unpredictable environment?
- Must be prepared for anything and everything

Memphis Mobile Stroke Unit Myths Managed

1. *"Truck is SOOOO huge that it can't fit down most streets"*
   - We have never met a street we couldn't drive down
2. *"Technology (CT and truck) are unreliable and prone to breakdowns"*
   - We have never been out of service, nor have we suffered any CT or truck breakdowns
3. *"There are so many problems with the truck size and technology that Memphis hasn't treated any patients with tPA"*
   - We give tPA almost everyday!

Good or Bad Collaterals?



Multiphase CTA

- Refine CTA
- 3 phases
- One injection
- Relatively easy to standardize and train
- Minimal post processing time

mgoyal@ucalgary.ca

Multiphase CTA

Collateral Scoring on mCTA

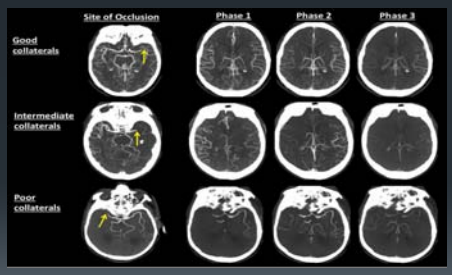
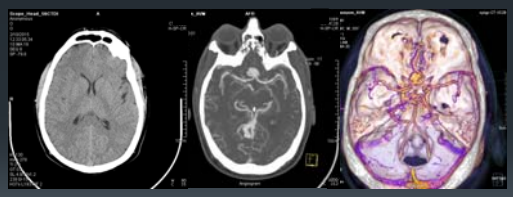
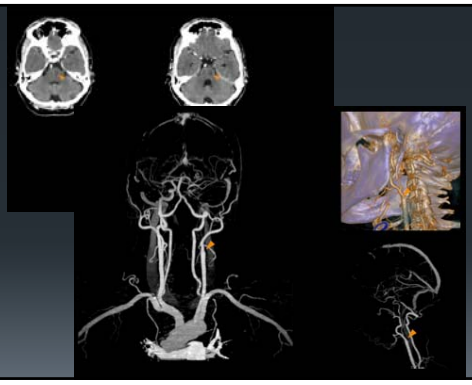


Figure. Upper panel shows a patient with a left M1 MCA occlusion (arrow) and good collaterals (backfilling arteries) on multi-phase CTA. Middle Panel shows a patient with a left M1 MCA occlusion (arrow) and intermediate collaterals. Lower panel shows a patient with a right M1 MCA occlsion (arrow) and poor collaterals (minimal backfilling arteries) on multi-phase CTA.

Superior Multi-Modal CT Imaging



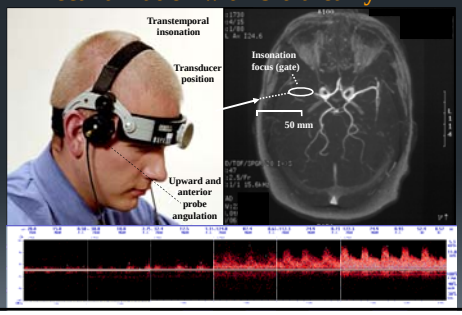


Carotid Occlusion: Acute or Chronic

- Acute: normal vessel diameter, preserved intima-media complex, some distensibility
- Chronic: fibrosis, vessel collapse, lack of vessel wall pulsations

Cerbrovascular Ultrasound in Stroke Prevention and Treatment (2nd Ed)
Oxford: Wiley-Blackwell Publishers. 2011. ISBN 9781405195768

TCD on Board: Recanalization with Ultra-early Rx



Advanced Imaging on MSU

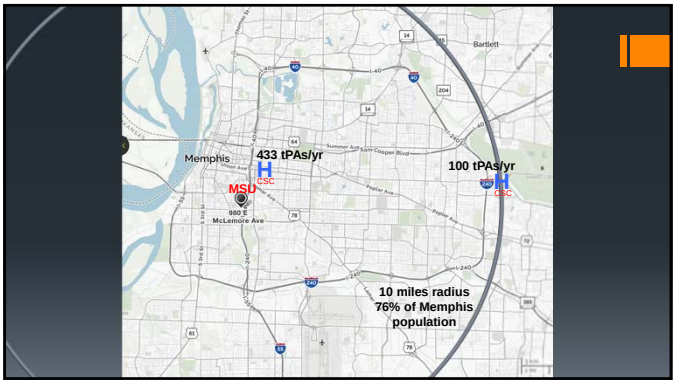
- **Multi-modal CT and ultrasound are feasible**
- **Exciting opportunity for Neuroimagers and Vascular Neurologists**
- **Exploration of parenchymal, vascular imaging and real time hemodynamic monitoring within 60 minutes of cerebral ischemia**
- **Ultra-early detection and treatment of ELVO**
- **Ultra-early imaging and BP management of ICH**

MSU Effectiveness: Initial Evidence

- Faster and more frequent use of Alteplase (tPA)
- 40% received Alteplase within 60 min from symptom onset (Houston)
- 26% treated on MSU vs 14% brought by EMS (Cleveland)
- Patient encounter to Alteplase: 25 min (Houston and Germany)

Additional MSU Benefits

- Patient access to stroke experts at the scene
- Improved pre-hospital triage to appropriate level of care (CSC vs PSC)
- Bypass the Emergency Department: Direct admission to Stroke Units or Cath Labs
- Earlier BP mgmt in intracerebral hemorrhage
- Ability to respond to comorbid problems alongside early stroke diagnosis and treatment



Memphis Performance To Date

- IV alteplase tPA treatment rate = 26%
- sICH post-IV tPA = Zero
- Total spontaneous ICH patients transported = 6%
- Scene arrival to definitive diagnosis time = 7 minutes
- Noncontrast head CT and head/neck CTA time = 3.5-4.0 minutes
- Scene arrival to IV tPA bolus 8-16 minutes
- Aborted by first responder accuracy rate = 98%
- Mimics (diagnosed by NPs and confirmed by vascular neurologists) transported = 2%

THE UNIVERSITY of TENNESSEE
HEALTH SCIENCE CENTER - MEMPHIS
#1 USA STROKE tPA TREATMENT RATE
Catch Us If You Can