



Houston Mobile Stroke Program

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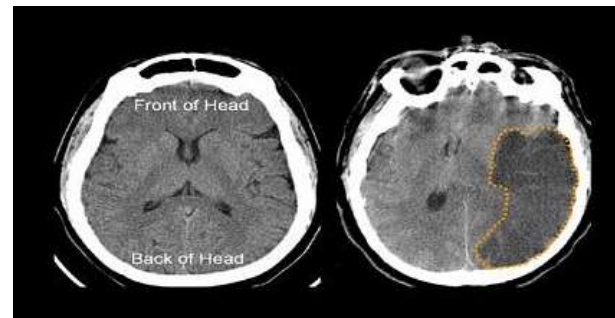
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- Staffing and organizational structure
- Patient outcomes and results delivered
- Future growth and expansion

Summary of Houston Mobile Stroke Unit



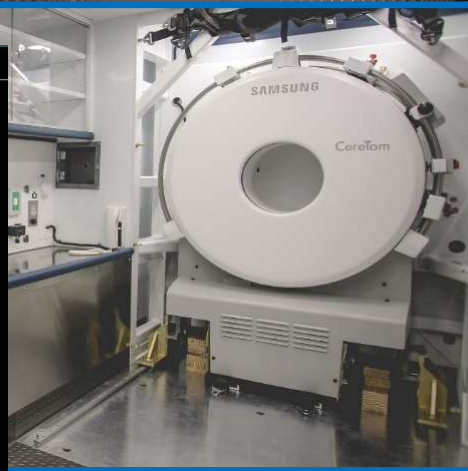
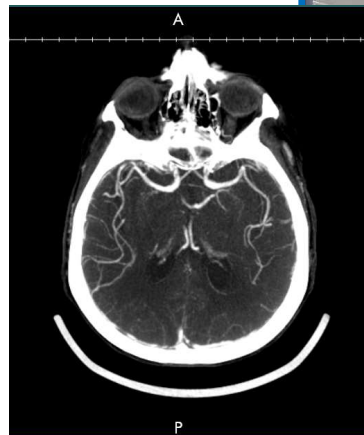
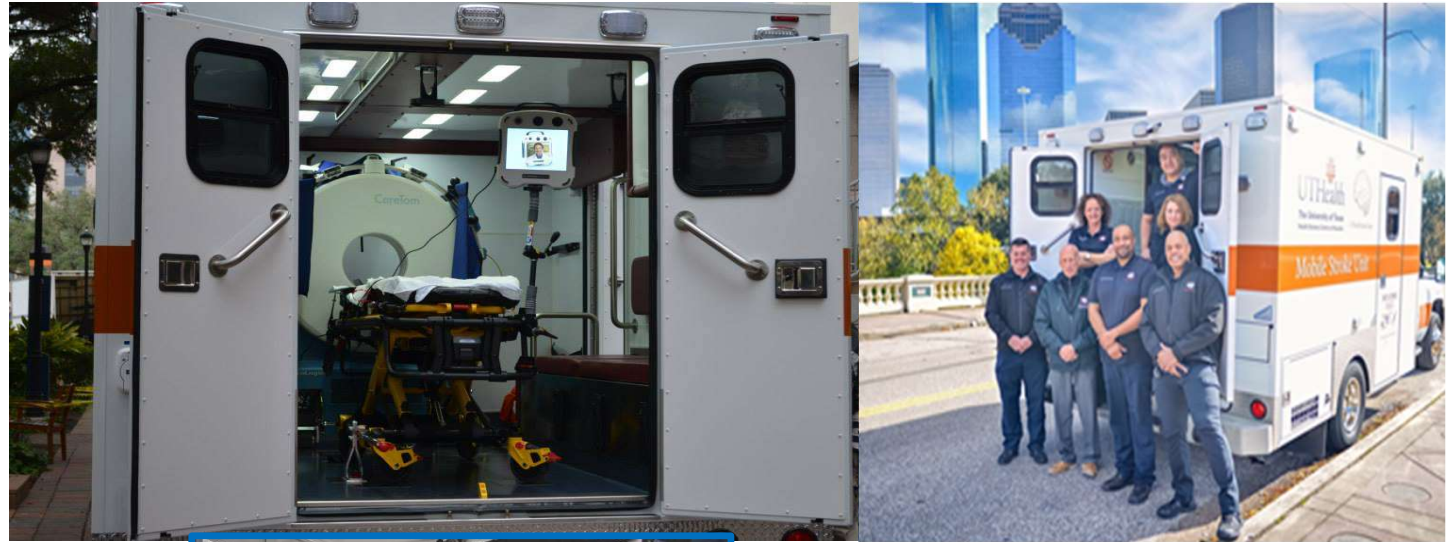
UTHealth Mobile Stroke Unit

- Mobile Stroke Unit (MSU) is a modified ambulance equipped with CT scanner, stroke-specific medications, point-of-care laboratory testing, and other supplies and capabilities needed to treat ischemic stroke patients
 - For patients suffering from ischemic stroke, important to provide effective treatment (i.e., tPA) as quickly as possible to minimize disability and mortality
 - MSU allows patients to be more quickly triaged and treated for stroke (i.e., examination by a neurologist, CT scan w/ or w/o contrast, administration of tPA) than would otherwise be possible by providing these services prior to transport to the nearest acute stroke care facility rather than after arrival to the hospital
- MSU is dispatched via EMS to patients with stroke-like symptoms, or it may rendezvous with ambulances that may be transporting a patient suffering from stroke-like symptoms
- MSU is health system agnostic, partnering with all major health systems in Houston for patient routing
- *2 million brain cells are damaged every minute someone is suffering from a stroke



What is a Mobile Stroke Unit

- ✓ Standard 12 foot ambulance
- ✓ Portable CT scanner
- ✓ Point-of-care laboratory
- ✓ Tele-radiology & neurology
- ✓ Nurse
- ✓ CT tech, EMT-B & Paramedic



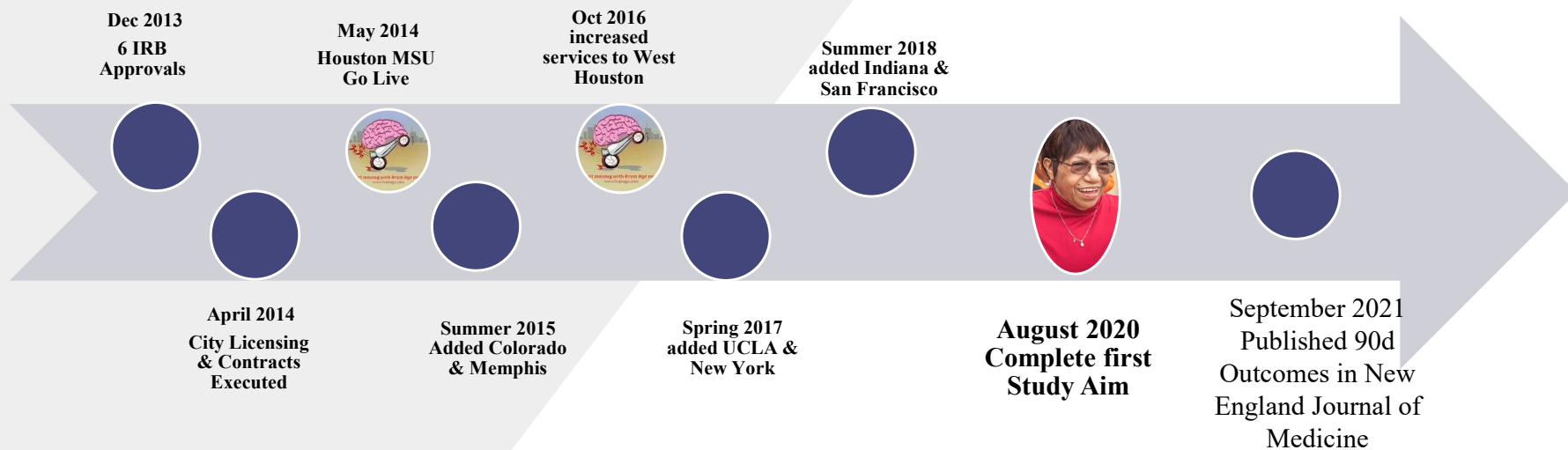
Steps in Establishing the MSU

Collaborative agreements with stakeholders

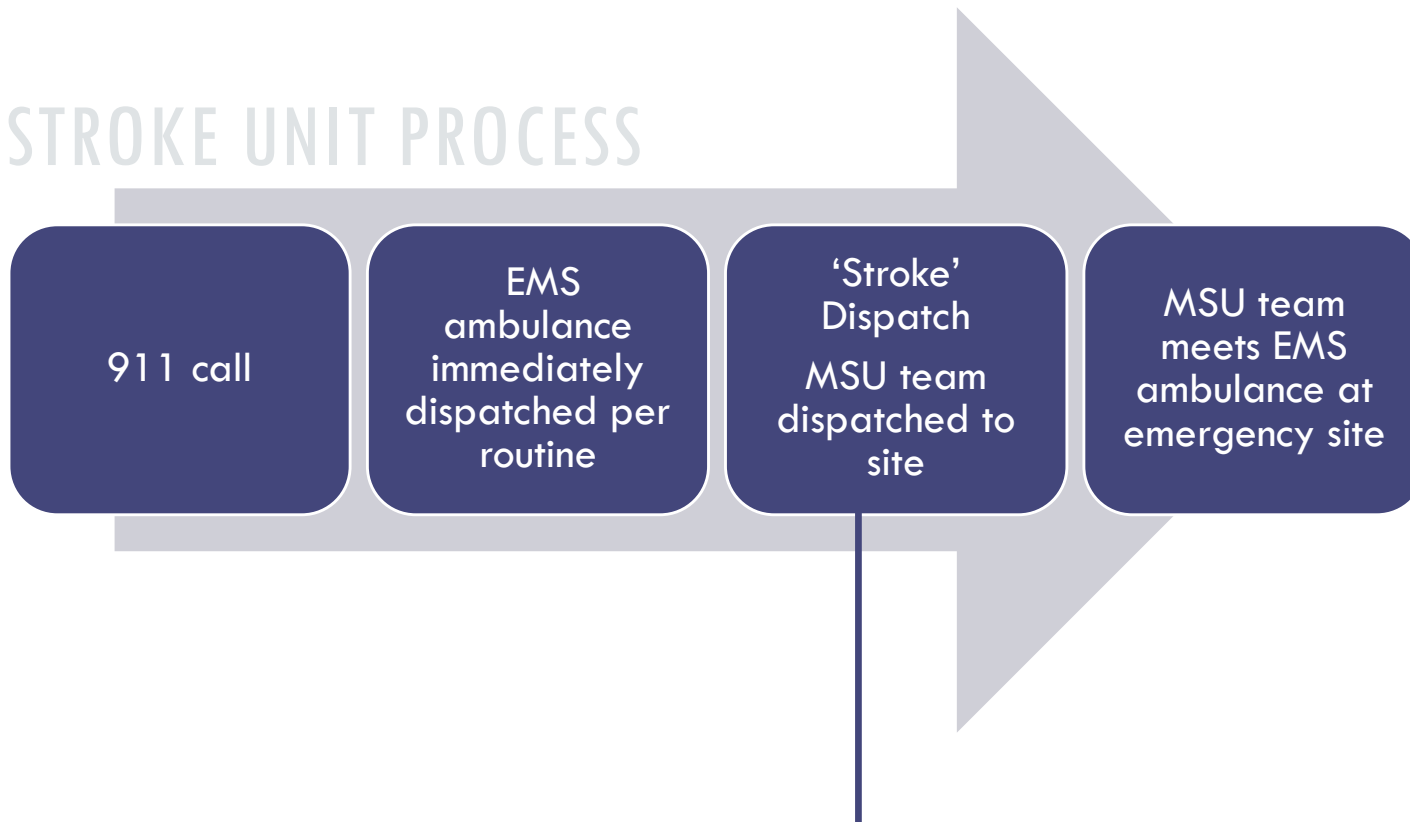
- Support from Local EMS (HFD, WUFD, BFD)
- University of Texas Medical School
- Baylor Medical School
- All Community Health Systems (MH,HH, SLCHI, HCA, HM)



Research Timeline



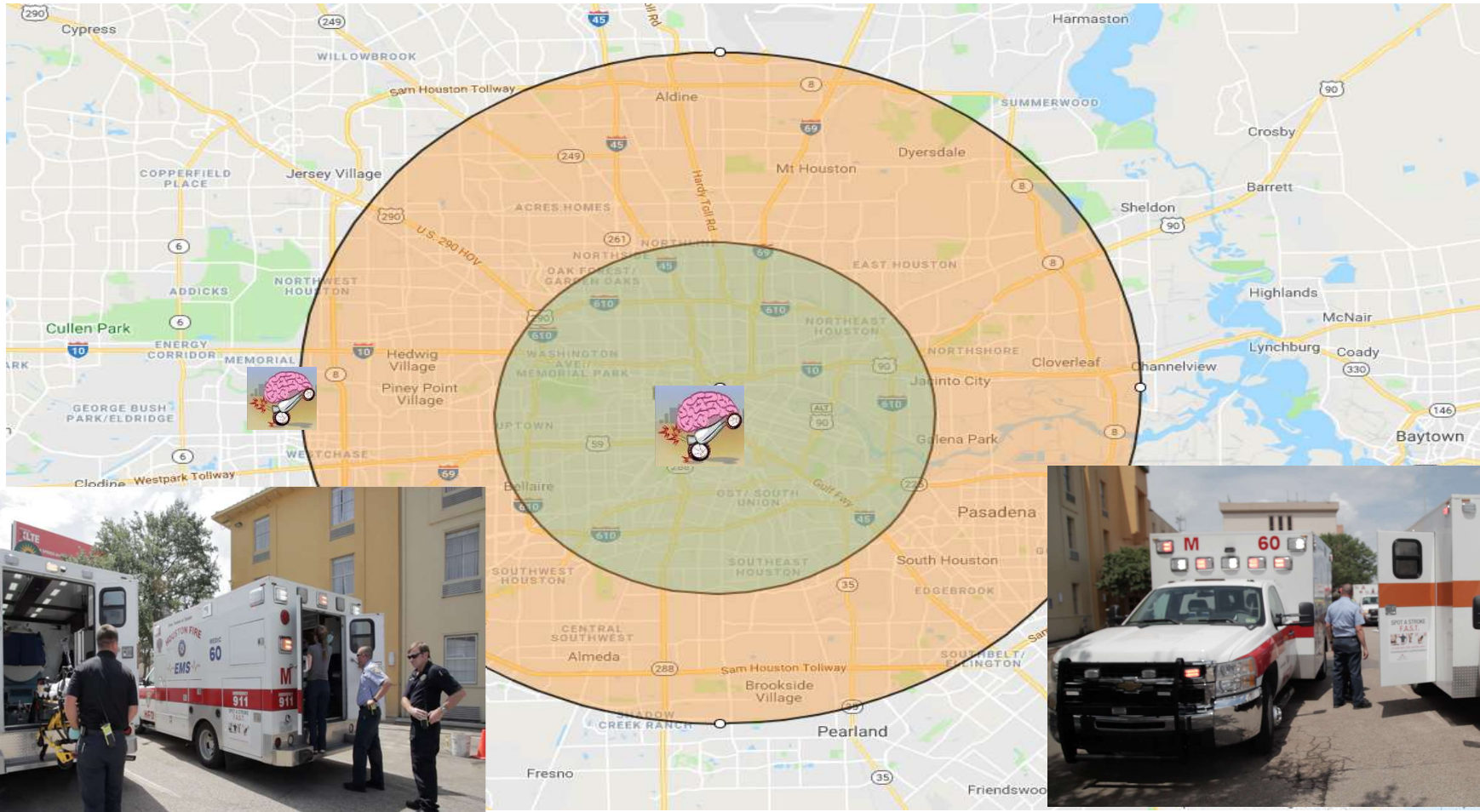
MOBILE STROKE UNIT PROCESS



Alternating weeks 8 am- 6 pm

(non MSU weeks, nurse still gets dispatched without MSU to ensure same data and comparable patients as MSU weeks)

Houston Mobile Stroke Coverage/Rendezvous Area



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Prospective, Multicenter, Controlled Trial of Mobile Stroke Units

J.C. Grotta, J.-M. Yamal, S.A. Parker, S.S. Rajan, N.R. Gonzales, W.J. Jones, A.W. Alexandrov, B.B. Navi, M. Nour, I. Spokoyny, J. Mackey, D. Persse, A.P. Jacob, M. Wang, N. Singh, A.V. Alexandrov, M.E. Fink, J.L. Saver, J. English, N. Barazangi, P.L. Bratina, M. Gonzalez, B.D. Schimpf, K. Ackerson, C. Sherman, M. Lerario, S. Mir, J. Im, J.Z. Willey, D. Chiu, M. Eisshofer, J. Miller, D. Ornelas, J.P. Rhudy, K.M. Brown, B.M. Villareal, M. Gausche-Hill, N. Bosson, G. Gilbert, S.Q. Collins, K. Silnes, J. Volpi, V. Misra, J. McCarthy, T. Flanagan, C.P.V. Rao, J.S. Kass, L. Griffin, N. Rangel-Gutierrez, E. Lechuga, J. Stephenson, K. Phan, Y. Sanders, E.A. Noser, and R. Bowry

Houston Mobile Stroke – BEST MSU Results



Baseline Demographics of tPA Eligible Patients

	SM (n=430)	MSU (n= 617)
Age in years, median [IQR]	65.00 [55.00, 78.00]	67.00 [57.00, 79.00]
Baseline NIHSS, median [IQR]	9.00 [6.00, 16.00]	9.00 [5.00, 16.00]
Baseline NIHSS, n (%)		
0-5	102 (23.7)	159 (25.8)
6-12	174 (40.5)	252 (40.8)
≥13	154 (35.8)	206 (33.4)
Gender		
Female, n (%)	206 (47.9)	324 (52.5)
Male, n (%)	224 (52.1)	293 (47.5)
Ethnicity		
Hispanic or Latino, n (%)	80 (18.6)	97 (15.7)
Race		
Asian, n (%)	20 (4.7)	24 (3.9)
Black or African-American, n (%)	172 (40.0)	241 (39.1)
White, n (%)	224 (52.1)	338 (54.8)
Pre-Stroke modified Rankin Scale		
0, n (%)	288 (67.0)	379 (61.4)
1, n (%)	47 (10.9)	79 (12.8)
2, n (%)	21 (4.9)	57 (9.2)
3, n (%)	58 (13.5)	74 (12.0)
4, n (%)	16 (3.7)	27 (4.4)
5, n (%)	0 (0.0)	1 (0.2)
Site		
Houston, n (%)	333 (77.4)	474 (76.8)
Colorado, n (%)	31 (7.2)	69 (11.2)
Memphis, n (%)	24 (5.6)	30 (4.9)
New York City, n (%)	11 (2.6)	17 (2.8)
Los Angeles, n (%)	17 (4.0)	6 (1.0)
Burlingame, n (%)	9 (2.1)	13 (2.1)
Indianapolis, n (%)	5 (1.2)	8 (1.3)

Compared to standard management, MSU management results in substantially less disability for stroke patients who qualify for tPA

Published data New England Journal of Medicine September 2021

	Measure	MSU	Standard Management
Patient Outcomes	• Patients returned to Normal with Zero Disability	• 36.8% of patients	25.2% of patients
	• Reduction in NIHSS from baseline to 24 hours	• 30% reduction	N/A
Time Measures	• Last known well to tPA treatment (median)	• 72 minutes	108 minutes
	• Percent treated within 60 minutes of last known well	• 33% of patients	3% of patients
Safety Outcomes	• Symptomatic intracerebral hemorrhage	• 2% of patients	2% of patients
	• Mortality at 90 days	• 8.9% of patients	11.9% of patients
	• Number of stroke mimics treated based on final diagnosis after hospital workup was complete	• 9%	9%

*108minutes-72 minutes= 36 minutes saved = **72 million brain cells**
 *Every 15 minutes a patient with stroke symptoms await acute treatment = approximately **1 month of rehab**

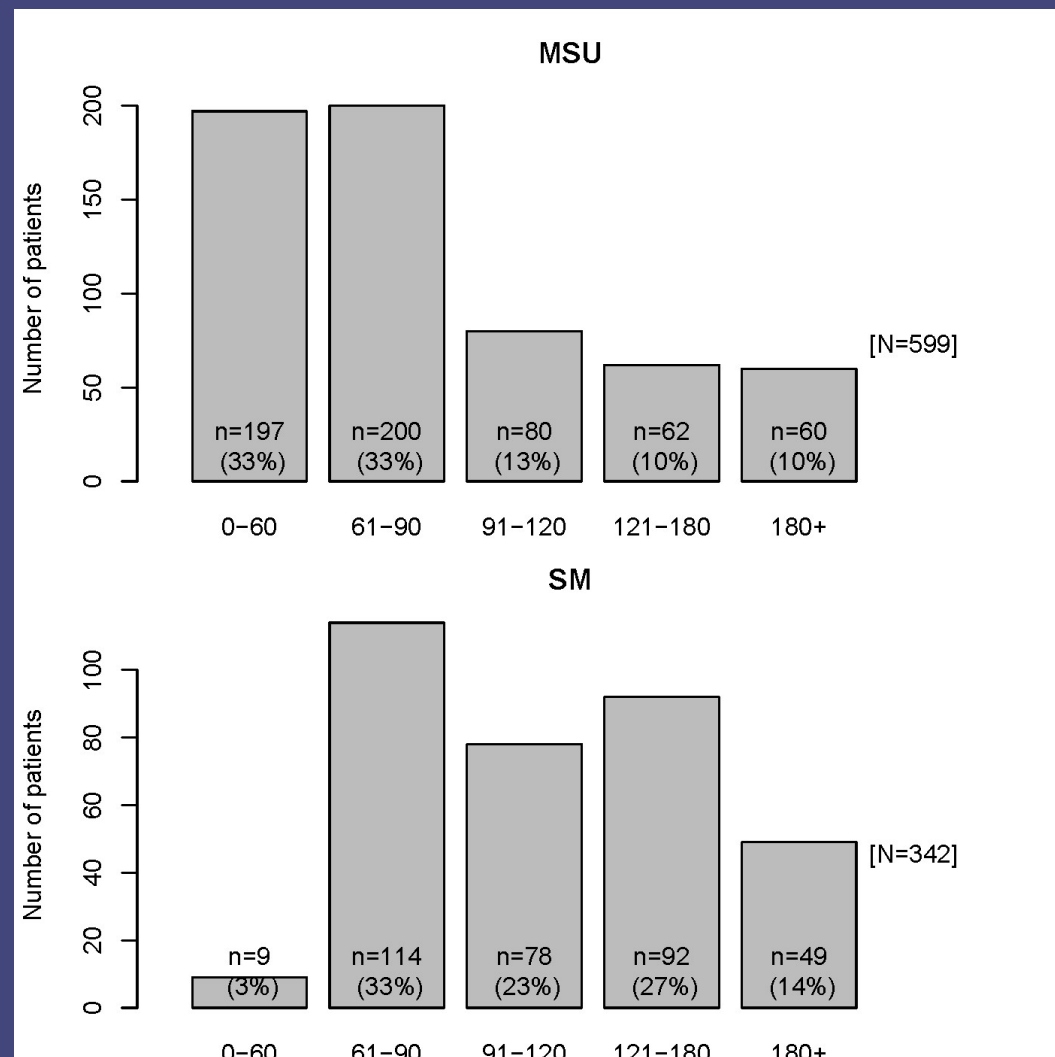
MSU equal to SM

MSU outperforms SM

“Golden hour”

33% Mobile Stroke

3% Standard EMS Management



BEST MSU Conclusions

- ✓ 17% more treated with tPA (97% vs 80%)
- ✓ 30% more treated within first “golden hour” from LKN (33% vs 3%)
- ✓ Significantly improved patient-centered outcome (p=0.002)
- ✓ 10% more patients went home with Zero Disabilities
- ✓ No safety issues...9% mimics and 2% sICH in each group
- ✓ MSU patients LOS is average of 1 hospital day shorter

Perspective

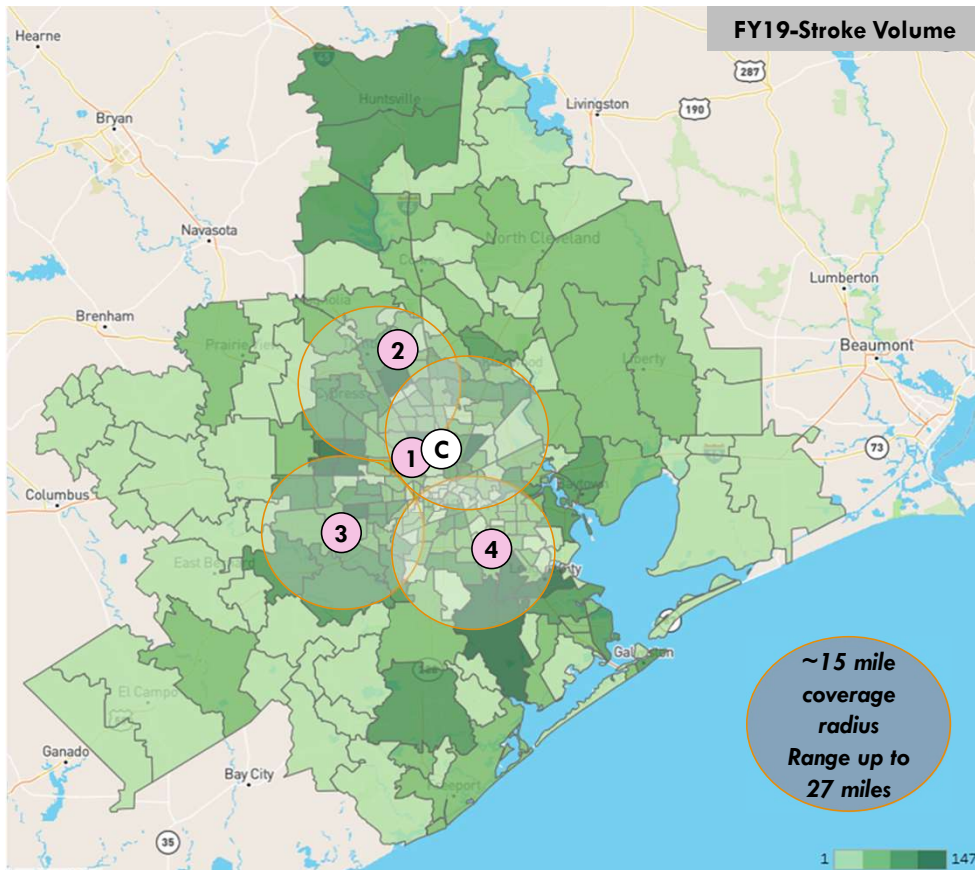
For every 100 patients treated with an MSU rather than SM,

- ✓ 27 will have less final disability,
- ✓ 11 more will be disability-free

Downstream Benefits:

- ✓ Access to acute stroke care pre hospital
- ✓ Allows First Responders to return to service

Future Outlook for Houston Mobile Stroke Program



PLACEMENT OF MSU AMBULANCES

- C** Current placement of MSU, at HFD Station 37 between Bellaire and West University neighborhoods, near the TMC campuses
- 1** Preferred location of first MSU ambulance in future-state, near I-45 North and 610 interchange
- 2** Preferred location of second MSU ambulance in future-state, near Conroe along I-45 North corridor
- 3** Preferred location of third MSU ambulance in future-state, West Beltway 8 corridor in between 59 and I10
- 4** Preferred location of fourth MSU ambulance in future-state, near I-45 South and Beltway 8 interchange

Current Global Mobile Stroke Program Map

Active MSUs

Future MSUs

- Homburg/Saar (Germany)
- Houston, TX , USA
- Berlin (Germany) (3)
- Marburg (Germany)
- Memphis, TN, USA
- Cleveland, OH, USA
- Denver, CO, USA
- Toledo, OH, USA
- Phoenix, AZ, USA
- Chicago, IL, USA (2)
- Trenton, NJ, USA
- Allentown, PA, USA (2)
- New York, NY, USA (3)
- Rochester, NY, USA
- Indianapolis, IN, USA pending 1+
- Los Angeles, CA, USA pending 4+
- Atlanta, GA, USA
- Burlingame, CA, USA
- Edmonton, Alberta, Canada
- Drobak (Norway)
- Southend (UK)
- Buenos Aires (Argentina)
- Melbourne (Australia)
- Coimbatore (Tamil Nadu, India)
- Bangkok (Thailand)
- Columbus, OH, USA
- El Paso, TX

- ▲ TBA, Northeast, USA
- ▲ Leuven (Belgium)
- ▲ Lille (France)
- ▲ Paris (France)
- ▲ Aarau (Switzerland)
- ▲ Doha (Qatar)
- ▲ Helsinki (Finland)
- ▲ Zhengzhou (Henan, China)
- ▲ Austin, Texas (4)



- Houston Mobile Stroke was the First Mobile Stroke Program in the United States
- Second in the World
- Currently there are 23 programs across the US with 6 more cities implementing programs by 2023

- Active MSUs
- ▲ Future MSUs

