

Making Telestroke Work for our Patients

The World is “Flat”: A Brief Future of Telestroke

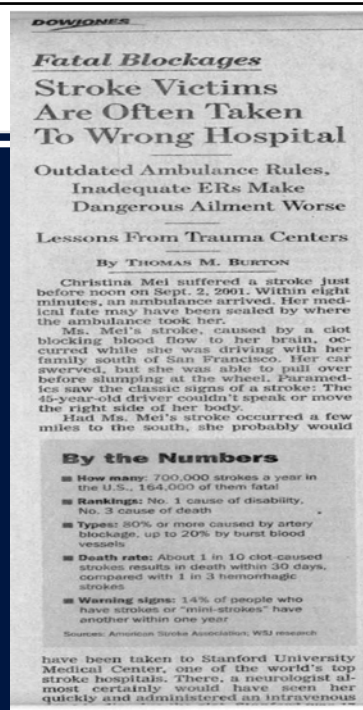
David C. Hess M.D.
Professor and Chairman
Co-Director, Brain and Behavior Discovery Institute
Department of Neurology
Medical College of Georgia
Georgia Regents University

Disclosures

- Co-Founder REACH Health Inc, Board of Directors

Front page of Wall Street Journal

Tragic case of young stroke victim taken to the "wrong hospital"



Many/Most US Hospitals NOT treating stroke patients with IV tPA

- MEDPAR database revealed that **64%** of US hospitals did not treat a single Medicare patient with tPA over a 2 year period

Bed size, region, and population density associated with low tPA usage

	Univariate Mean RE-PA Treatment Rate (95% CI)*	Multivariable Regression	
		χ^2	P Value
Bed size		397.9	<0.001
# of beds/hospital			
<50	0.3% (0.2% to 0.4%)		
50-200	1.1% (1.0% to 1.2%)		
>200	2.6% (2.4% to 2.9%)		
Region of United States		53.2	<0.001
Midwest	2.0% (1.7% to 2.2%)		
Northeast	2.7% (2.3% to 3.1%)		
South	1.8% (1.6% to 2.1%)		
West	2.5% (2.1% to 2.9%)		
Population density (persons/sq. mile)		21.3	<0.001
<50	0.9% (0.7% to 1.1%)		
50-500	1.7% (1.6% to 1.9%)		
>500	2.7% (2.5% to 3.0%)		

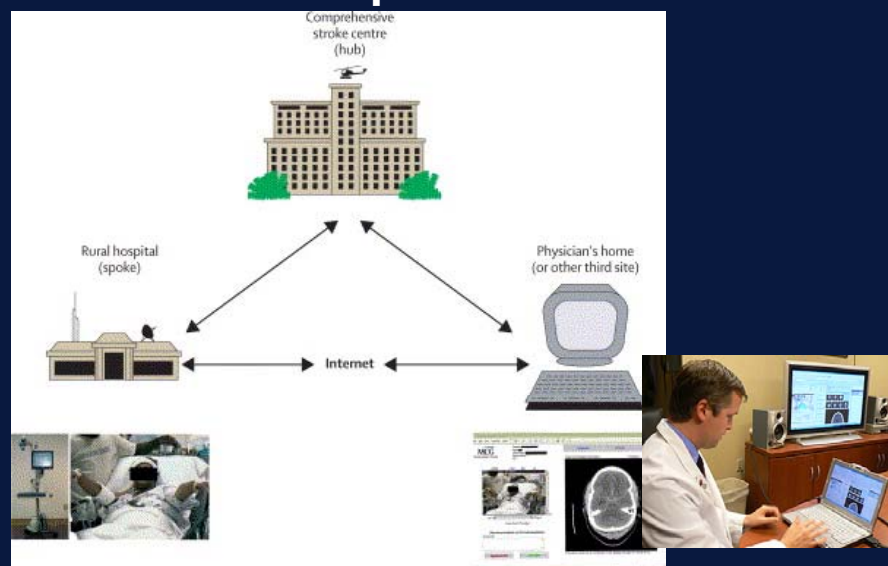
*Means are weighted by the total No. of stroke admissions to the hospital during the study period.

Kleindorfer D, et al. *Stroke*. 2009;40(11):3580-4

The Geographic Penalty

- The quality of stroke care is dependent upon the hospital you go to
- If you live in a rural area or “underserved acute stroke care” area you will NEVER receive tPA
- Of the 5779 US hospitals, 2003 are “rural”
- There is a GEOGRAPHIC penalty for stroke

REACH Hub & Spoke Telestroke Model

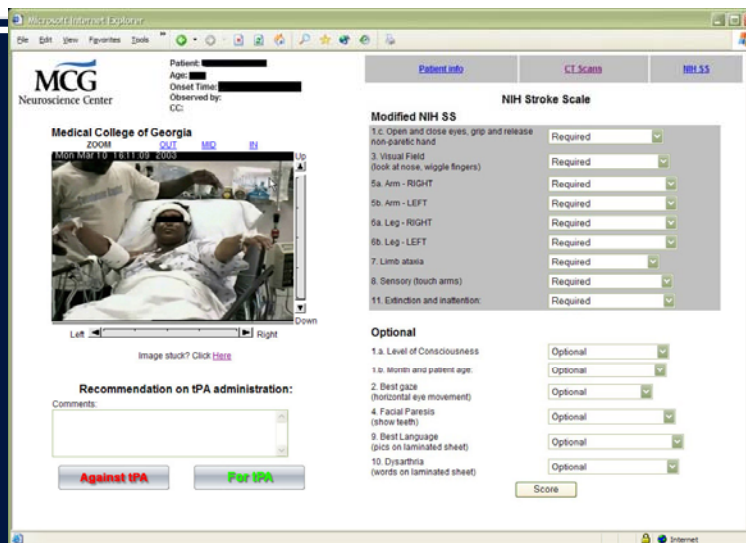


Hess DC, et al. *Lancet Neurol.* 2006;36:5:275-8

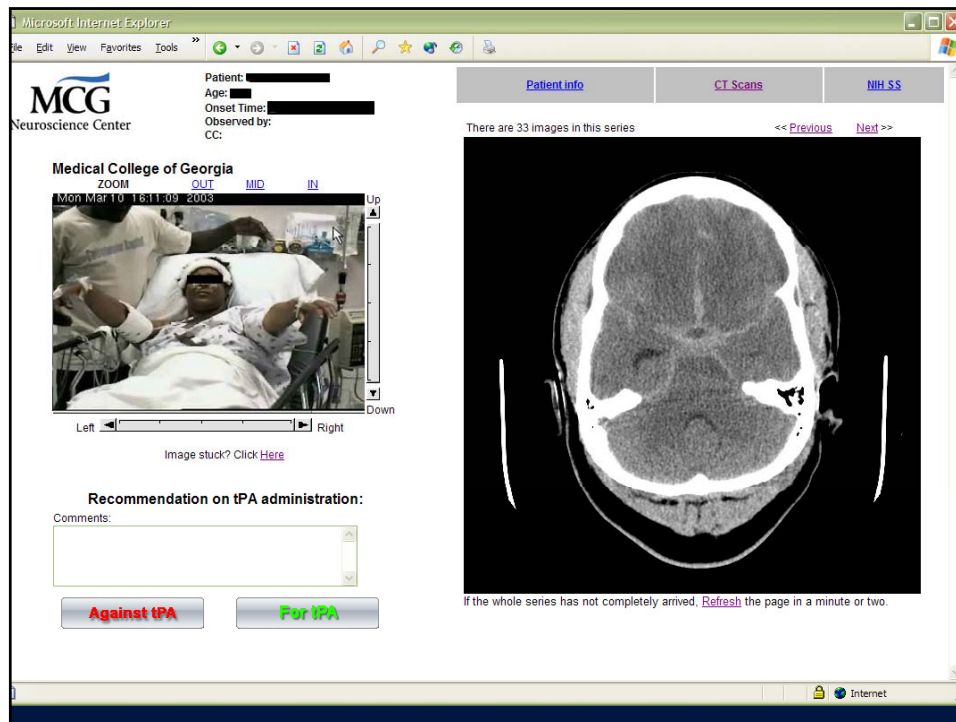
Feasibility and Reliability of NIHSS via Telestroke

	Shafqat S (Stroke, 1999)	Wang S (Stroke, 2003)	Handschu R (Stroke, 2003)	Meyer BC (Neurology, 2005)
System	Point-to-point ISDN lines	Web-based, Mobile consultant	Point-to-point*	Web-based, Mobile consultant
Number of patients	20	20	41 (ED)	25
Reliability	Kappa r=.97	Pearson r=.95	Kappa r=.85 to .99	Kappa r=.94
Time	9.70 min vs 6.55 min	9.11 min vs 6.24 min	11.4 min vs 10.8 min	NR
Comments	Remote vs on site NIH all ≤ 3	Remote vs on site NIH all ≤ 3	Facial paresis least reliable	Modified NIHSS also reliable

Early REACH Prototype (REACH 1.0)



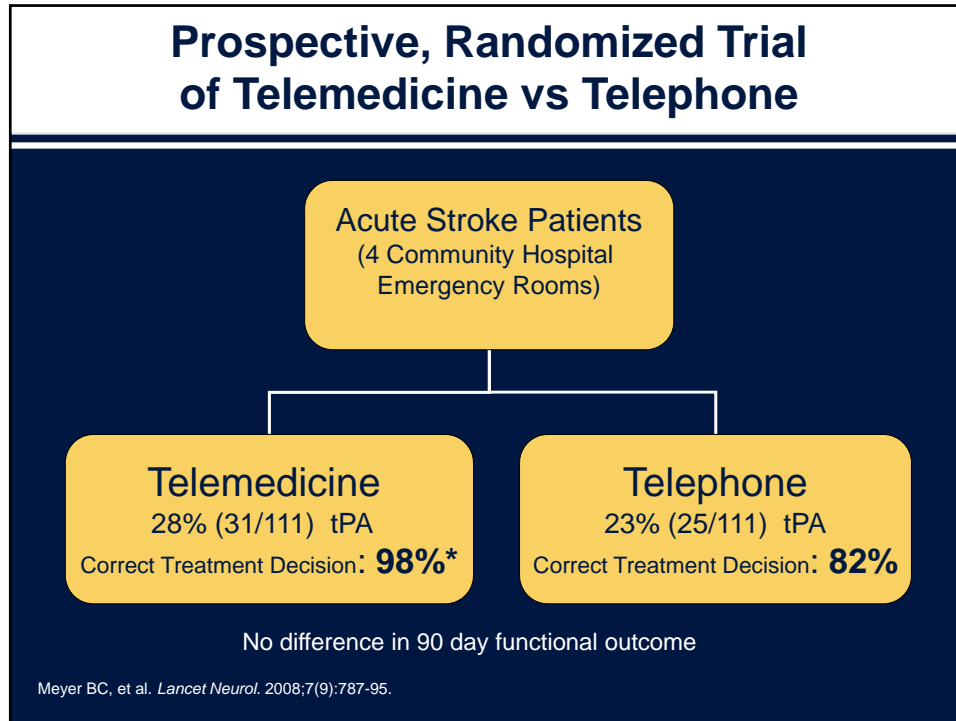
Wang S et al Remote Evaluation of Acute Ischemic Stroke. Reliability of National Institutes of Health Stroke Scale via Telemedicine. Stroke 2003 Sept 18 e pub



ASA Review of Evidence and Guidelines (Stroke, 2009)

- The NIHSS-telestroke examination, when administered by a stroke specialist using HQ-VTC, is recommended when an NIHSS-bedside assessment by a stroke specialist is not immediately available for patients in the acute stroke setting, and this assessment is comparable to an NIHSS-bedside assessment (Class I, Level of Evidence A).

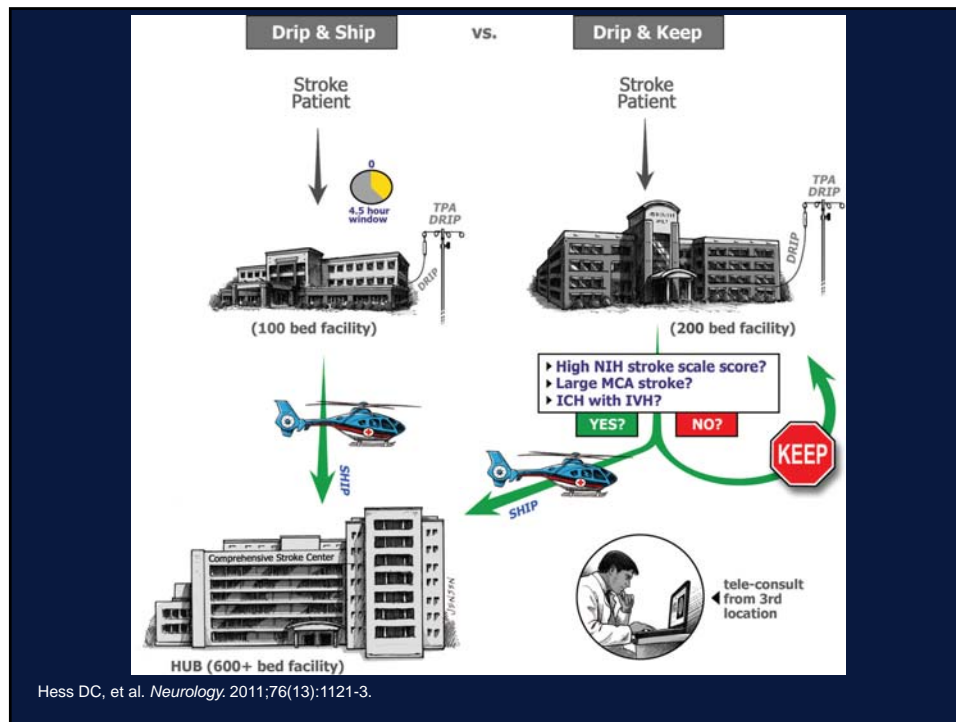
Schwamm L, et al. *Stroke*. 2009;40(7):2616-34.



ASA Review of Evidence and Guidelines (Stroke, 2009)

- It is recommended that a stroke specialist using HQ-VTC provide a medical opinion in favor of or against the use of intravenous tPA in patients with suspected acute ischemic stroke when on-site stroke expertise is not immediately available (Class I, Level of Evidence B)

Schwamm L, et al. *Stroke.* 2009;40(7):2616-34.



Phenomenal Growth of Telestroke in U.S

- Increase in telestroke programs (more than 50 “hub and spoke” in U.S)
- Increase in mean number of spokes per hub from 2007 to 2009 (3.78 to 7.90, $p < .05$)¹
- Most academic and integrated service delivery networks have a telestroke program or considering a program; often driven by “competition” and the health care “marketplace”

¹Silva GS, et al. *Stroke*. 2012;43(8):2078-85

A Tale of Two Spokes

Type A-Rural

- < 100 beds
- ED volume <20,000/yr
- No ICU/limited ICU
- No neurologist on staff

- “Drip and ship” tPA
- Most strokes transferred

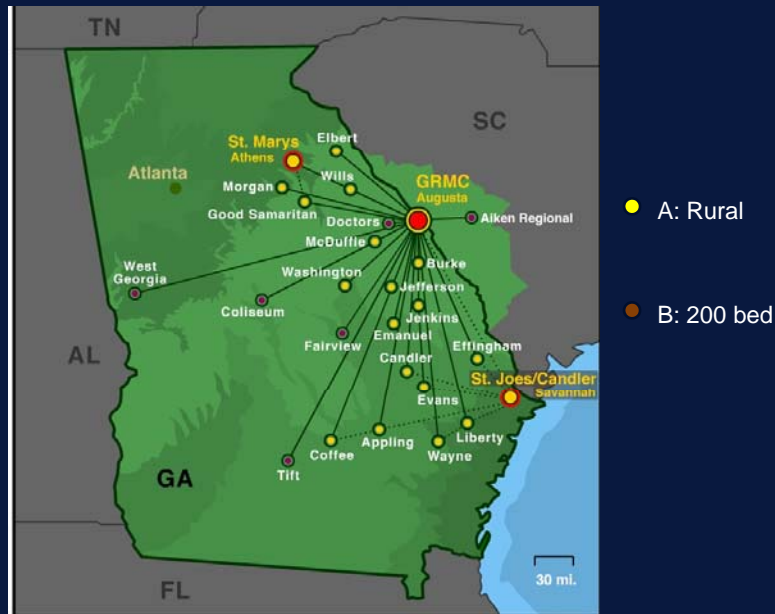
Type B-Suburban/Urban

- > 150 beds
- ED volume >30,000/yr
- ICU
- Neurologist on staff
- RN Stroke Coordinator
- “Drip and keep” tPA
- Most strokes kept
- Transfer ICH and some large ischemic strokes (basilar, NIH >15)



The Underserved Rural Sites

GRU REACH Mega Multi-Hub and Spoke Telestroke Network



Comparison of Onset to Treatment times (OTT) between systems (Switzer et al J Emergency Medicine, 2009)

System	OTT	<90 min (%)	< 2 hr (%)
REACH Telestroke (N=50)	128	24	50
MCG ED (n=26)	146	19	35
Published stroke systems	148	<5-10	28

Telestroke call on Labor Day, 2012

E mail received late afternoon on 9-3-12

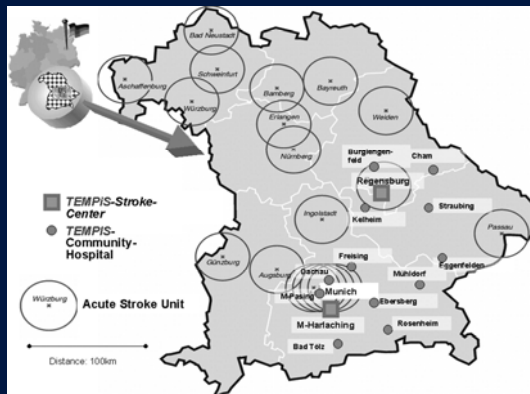
I was the attending at "hospital X" earlier today.

15 minutes after we started the TPA on the patient with the left hemiparesis, her symptoms complete resolved.

Nurses were astonished and amazed. Family was deeply appreciative.

John Rogers MD, FACS, FACEP
Associate ED Medical Director

TEMPiS Telestroke Network in Bavaria



- Open intervention trial of telestroke-directed care in 3122 patients
- 5 community hospitals with telestroke vs 5 control
- Patients in telestroke hospitals had better outcomes; (44% vs 54 % poor outcomes at 3 mos)

Audebert HJ, et al. *Stroke*. 2005;36(2):287-91.
 Audebert HJ, et al. *Lancet Neurol*. 2006;5(9):742-8.

Is “Hub and Spoke” Telestroke Cost-Effective?

- **YES (U.S.)** Nelson RE, et al. *Neurology*. 2011;77(17):1590-8
 - Decision analytic model for 90 day and lifetime horizons with Hub and 8 spokes
 - ICER of \$108, 363/QALY for 90 day and \$2449 for lifetime horizon (societal perspective) (< threshold of \$50,000/QALY)
- **YES (Denmark)** Ehlers L, et al. *CNS Drugs*. 2008;22(1):73-81.
 - ICER about \$50,000/QALY at one year
 - Telestroke “dominant” in quality and cost after 2 years and improved over longer time scale

Is Telestroke Cost Effective from the **Hospital** Perspective (Hub, Spoke, Hub + Spoke)? **YES**

- Decision analytic model using “real data” from Georgia Health Sciences (REACH network) and Mayo Clinic Scottsdale, AZ
- Assumes 1 Hub and 7 Spokes and 5 year horizon
- Each year, network was associated with \$358 435 in cost savings; cost sharing can be arranged so that each hospital could achieve an equal amount of cost savings (\$44 804/y)
- 6.1 more home discharges per year

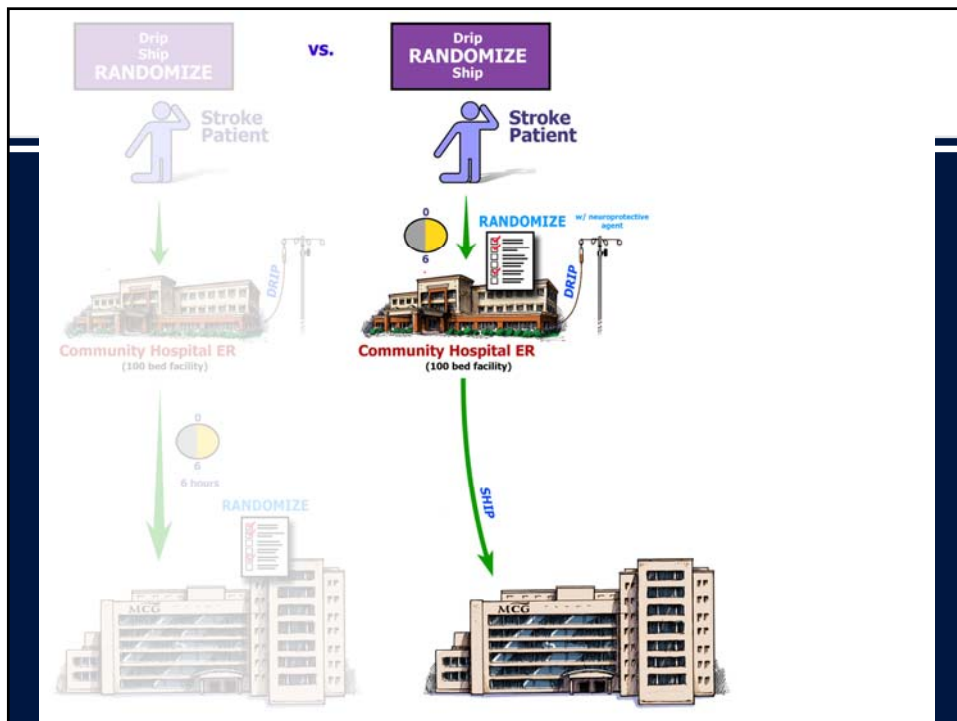
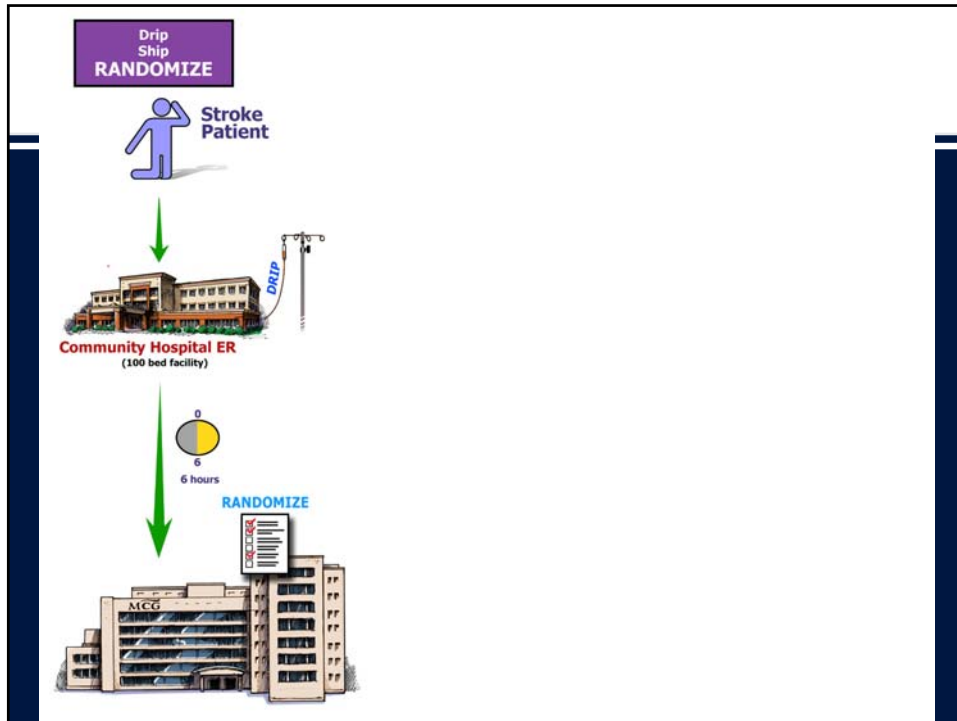
Switzer JA, et al. *Circ Cardiovasc Qual Outcomes*. 2012 Dec 4. [Epub ahead of print]

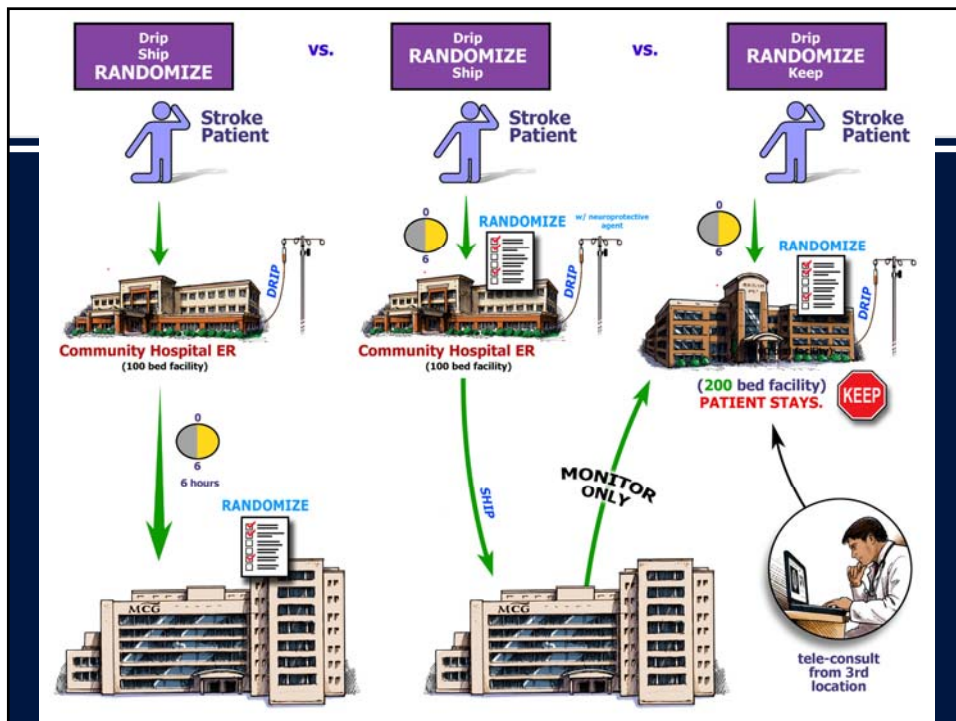
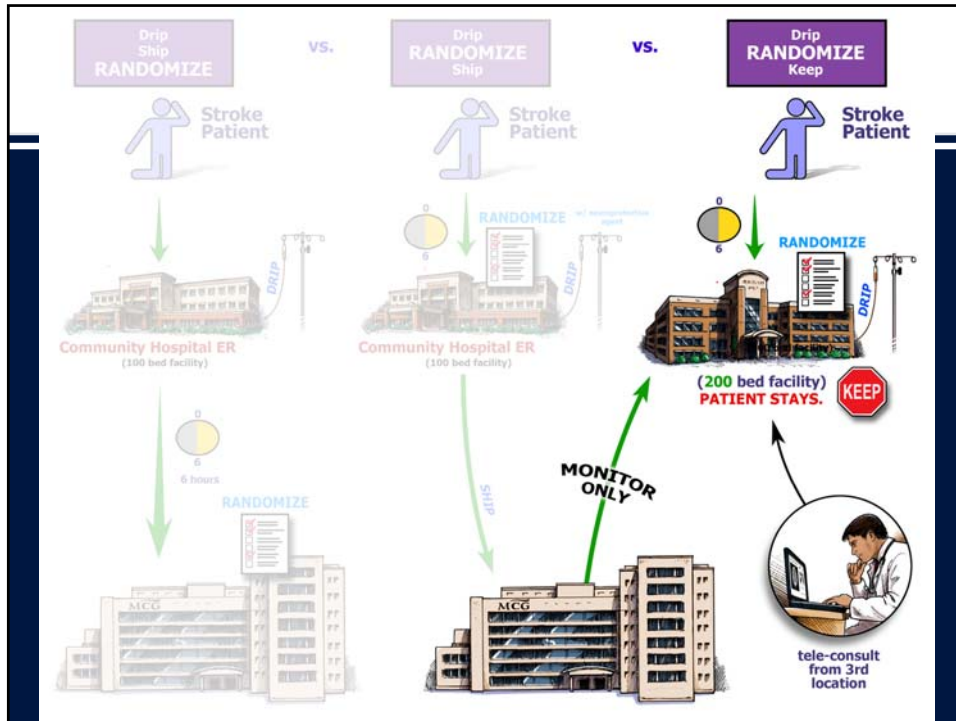
“Telestroke: Beyond tPA”

- “e-Stroke Unit”
- Select patients for IA interventions: “Rescue tPA,” basilar artery occlusions
- Identify high risk patients for malignant MCA edema that may require hemicraniectomy
- ICH: SAH, intraventricular needing EVD
- Identify patients for acute stroke clinical trials

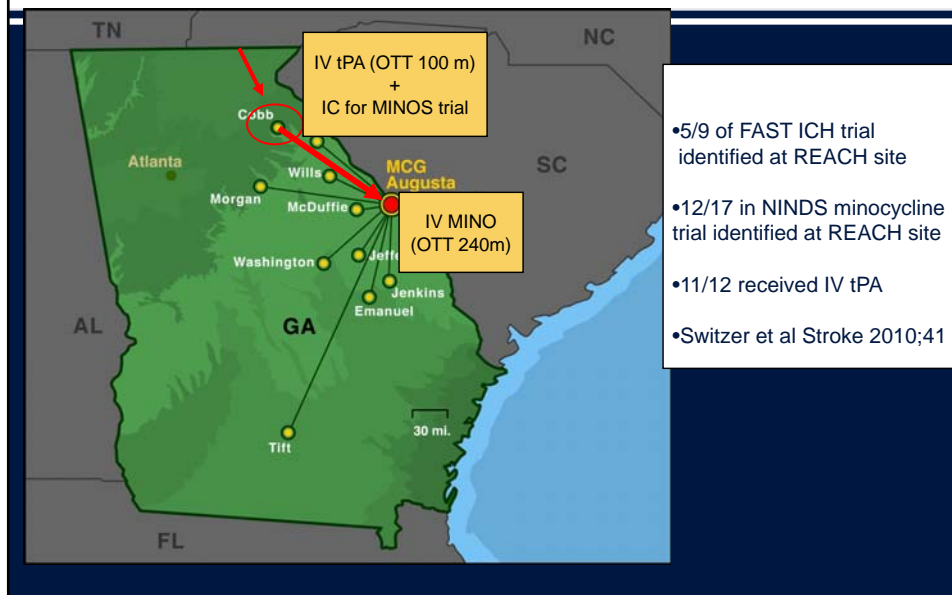
The Next Frontier: Acute stroke clinical trials via telestroke

- Permits the inclusion of patients until now excluded from clinical trials
- Will improve the “generalizability” of clinical trial results
- Will increase numbers of patients in clinical trials





Hub and Spoke Clinical Trial Enrollment



Clinical trial hurdles

- Informed consent issues
 - Powerpoint presentations, video conferencing, recording
- Training of “spoke” staff in clinical research
 - Tele-training by Hub Personnel
- Pharmacy issues (Randomization)
 - Tele-guided by Hub Pharmacy/Pharmacist

Conclusions

- Telestroke can “flatten” stroke care and bring a stroke specialist to ANY rural, community hospital IMMEDIATELY regardless of geography
- **Human factors** – “local spoke champions” and education critical to success
- Next frontier is using telestroke for acute stroke and emergency neurology clinical trials
- Academic and Regional Medical Centers should become Hubs (Comprehensive Stroke Centers) and support community hospitals as Spokes

Telestroke is a Team Sport



MCG REACH TEAM