

Expanding Telemedicine for Acute Neurology

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U.S. Department
of Veterans Affairs

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Outline

- History of Telemedicine in Neurology
- Models of Care Delivery
- Regional and Societal Benefits
 - Network Efficiency
 - Cost Effectiveness
 - Benefits on Disparities
 - Patient and Provider Perceptions
- UAB Teleneurology Program
 - Acute Stroke Care
 - Acute Neurologic Care
 - Inpatient Care

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History of Telehealth in Acute Stroke Care

History of Telestroke

- In 1996, IV alteplase was approved by the FDA for use in patients experiencing an acute ischemic stroke.
- Complications were more common when alteplase was administered by untrained/inexperienced providers.
- Given the large number of contraindications and risk of hemorrhage, many ED providers were not comfortable making this treatment decision without guidance from a neurologist.

History of Telestroke

- Connecting patients with stroke providers by means of video teleconferencing was first proposed in 1999.
- Telemedicine was intended to be able to assist in stroke diagnosis, determination of secondary prevention, selection of patients for clinical trials, and use of alteplase or other neurovascular interventions.

History of Telestroke

Between 2000-2010, telestroke systems moved from being a theoretical construct to reality as networks started to appear across the country.

Initially, small networks were set up within academic networks but now many systems exist within hospital systems as well as commercial networks.



Heinrich Audebert, Telestroke: effective networking, The Lancet Neurology, Volume 5, Issue 3, 2006,

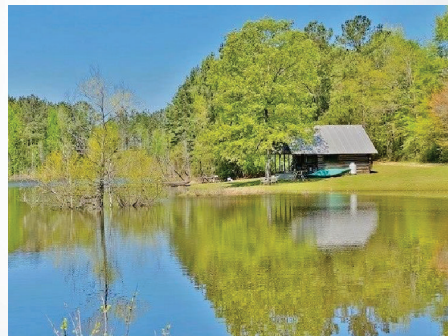
A Case



Mr. S

76 year old resident who lives with his wife on a lake in rural Alabama.

He was working on his property with his son when he suddenly collapsed. His son was unable to get him to stand and then discovered that his father was “talking non-sense.”



Mr. S

The patient's son was able to get him back to their house and 9-1-1 was activated.

The patient was transported to their nearest hospital (a Level III stroke capable hospital).

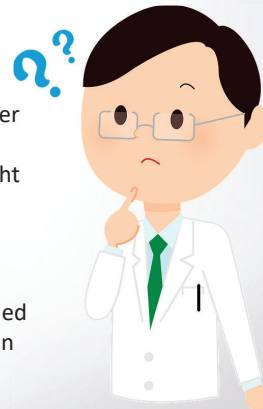


Mr. S

On arrival, the ED physician is concerned that Mr. S is suffering from a stroke.

He discovers that the patient has possible bladder cancer and recently had biopsy. The patient's son arrives and states that his father also has a blood disorder that might make him bleed.

The patient has arrived within the window for thrombolytic treatment but the ED physician is concerned that this would not be a safe option for the patient given his medical history.



What options are available to providers in rural hospitals to help them deliver the best care possible for their patients in an emergency?

Care Delivery Models

Traditional Consultation

- Face to face encounter with the Neurologist
- Direct Examination
- In-person provider to provider communication

Resident Consultation

- Face to face encounter with neurology trainee
 - Direct Examination
 - In-person provider to provider communication
- Frequently associated with 24/7 access to neurologic expertise
- Prolonged treatment time if delays in checking patient out to attending

Telehealth Care Delivery Models

E-Consultation

- Chart review without direct patient interaction
- Expands access to neurologist
- Provides faster care delivery but not for immediate acute care
- Generally not associated with significant provider to provider communication other than a written consult in the chart
- No patient engagement

Telephone Consultation

- No direct interaction with the patient and frequently limited or no access to the patient's chart
- Consultation is provided based solely on provider to provider communication
- Acute treatment decisions may be made via this method
- No patient engagement

Telehealth Care Delivery Models

Video Telehealth

- Rapid video connection with patient
- Direct history taking and ability to guide and observe neurologic examination
- Facilitates communication among care providers and with the patient
- Requires reliable internet connectivity

Video Telehealth With Resident

- Benefits of video telehealth plus additional in-person neurologic expertise
- Facilitates clearer communication about treatment plan with admitting physician
- Direct educational interaction with attending

American Academy of Neurology Telehealth Position Statement

Jaime M Hatcher-Martin, Neil A Busis, Bruce H Cohen, Rebecca A Wolf, Elaine C Jones, Eric R Anderson, Joseph V Fritz, Steven J Shook, Riley M Bove



TELEHEALTH RESOURCES

GUIDE TO PRACTICING TELENEUROLOGY
TELEHEALTH AND THE END OF THE COVID-19 PUBLIC HEALTH EMERGENCY

TELEHEALTH

Telehealth uses digital information and telecommunication technologies to provide health care when participants are separated in space and/or time. Telehealth has been used in various capacities for decades across many fields of medicine.

The AAN believes that telehealth will continue to play an essential role in the care of patients with neurologic conditions and supports efforts to implement and improve the ability for neurologists to provide telehealth services.

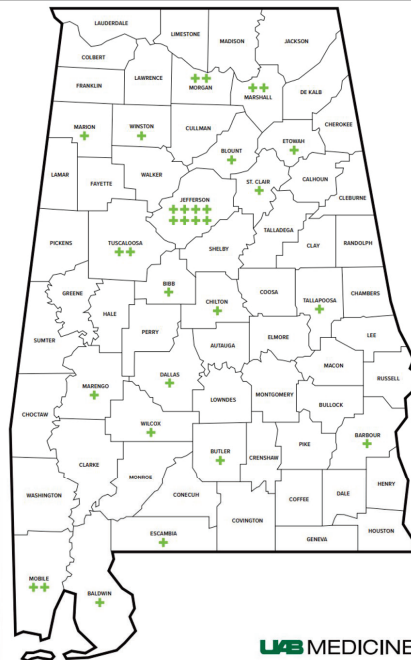
Telestroke Models

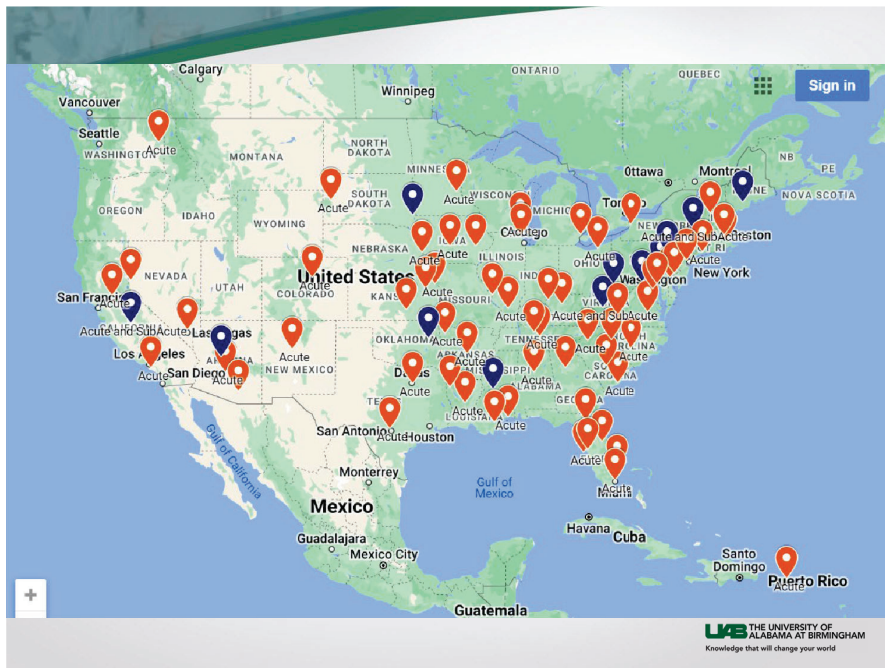
Hub and Spoke

- More common with academic based regional telestroke models
- Built based on local transfer networks and knowledge of local resources
- Facilitates acute treatment decisions and transfer

Distributed Hub

- Used in national telestroke networks
- Physicians are not necessarily based at facilities within the network
- Emphasis is on expanding access to care in underserved regions but is typically not integrated into the regional transfer network



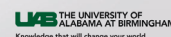


Mr. S

There is no local neurology coverage at the hospital.

The ED physician is informed by the nursing team that a video telehealth platform has recently been set up at the hospital.

The physician decides to use this service over telephone consultation.



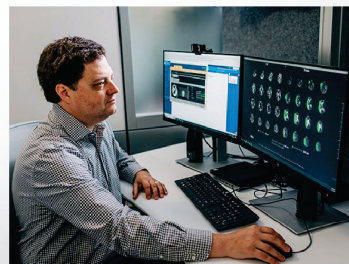
Mr. S

The stroke specialist is able to interact with and examine Mr. S.

He is alert but unable to meaningfully communicate. He is not moving his right arm and unable to hold he right leg off the bed.

His NIH Stroke Scale is 18.

Remote ascertainment of the NIHSS has similar reliability to in person examination



Mr. S

- The telestroke specialist was able to assess Mr. S's eligibility for IV alteplase.
- The recent bladder biopsy was felt to be a minor risk for hemorrhage.
- Given his history of anemia of unknown source, the team obtained a CBC to ensure that his red blood cell levels were not too low or suggestive of active bleeding.

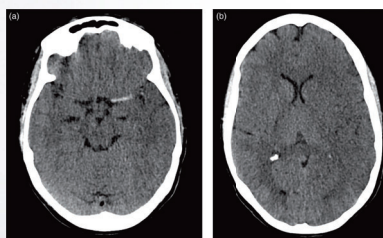
Alteplase Administration

- Telestroke physicians can make recommendations for alteplase and supervise bedside reconstitution
- Compared to patients treated directly at a stroke center, remotely guided administration of alteplase:
 - Is safe
 - Demonstrates improved accuracy of treatment
 - Associated with higher utilization rates
 - Has similar outcomes

Pervez, MA et al. *Stroke*, 2010.
Switzer, J et al. *J Emerg Med*, 2009.
Choi, J.Y., et al., *Jt Comm J Qual Patient Saf*, 2006.
Meyer, B.C., et al. *Lancet Neurol*, 2008.

Patients needing a Higher Level of Care

- Telestroke can also help identify patients needing transfer for thrombectomy or malignant cerebral edema.
- Patients transferred following a telestroke consult have faster door to groin puncture times and better outcomes.



Pedragosa A, et al. *Cerebrovasc Dis*. 2012.
Audebert HJ, et al. *Cerebrovasc Dis*. 2005

Mr. S

- The telestroke physician reviewed alteplase criteria with the patient's family along with risks and benefits
- Alteplase was reconstituted at bedside with the assistance of the telestroke physician and delivered within 3 hours from symptom onset
- Given the severity of his stroke scale, he was transferred to UAB for consideration of endovascular thrombectomy

Regional and Societal Benefits

Network Efficiency

- Aside from improved care for the individual patient, there are benefits to the spoke hospital and network
 - Increased thrombolytic utilization may increase reimbursement to the spoke facility
 - Lower acuity patients may be identified and the provision of recommendations may prevent unnecessary transfers which will further benefit the spoke hospital
 - An efficient telemedicine system requires knowledge of resources at each site and flexibility in recommendations

Network Efficiency

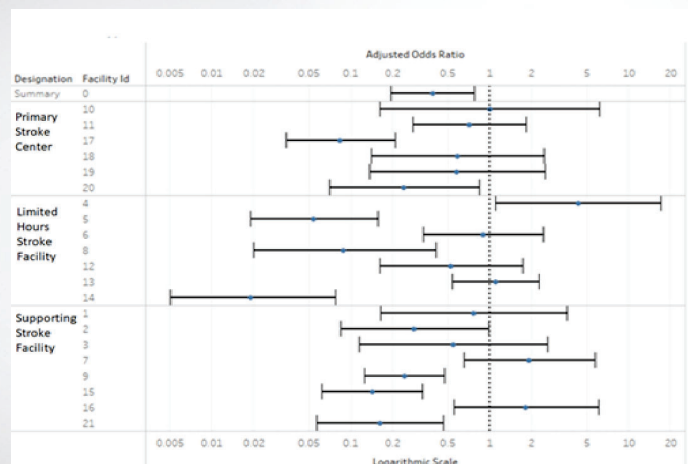
- It is likely that additional quality metrics will play a role in reimbursement in the future.
- Telestroke networks allow for the provision of ongoing education and feedback to sites as well as opportunities to improve local work flow

AHA SCIENTIFIC STATEMENT

Telemedicine Quality and Outcomes in Stroke: A Scientific Statement for Healthcare Professionals From the American Heart Association/American Stroke Association

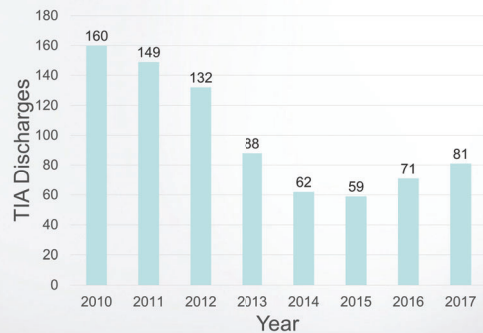
Network Efficiency

- From the Hub perspective, this reduces the transfer rate of lower acuity patients who may not require higher level of care
- There are financial benefits to the hub which likely benefits from higher reimbursement rates of more medically complex patients.



Network Efficiency

- May not always be a good thing from a training

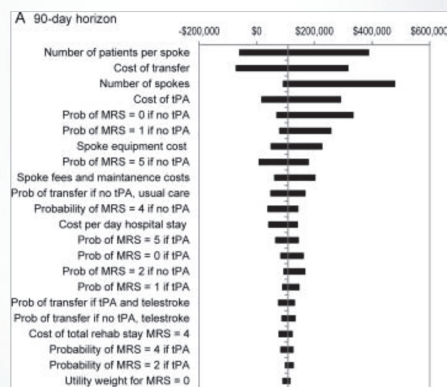


Network Efficiency

- Within a network, telemedicine consultation facilitates matching the right patient with the right level of care
- By reducing unnecessary transfers this may reduce the burden on tertiary hubs and improve diversion status
- This may also alleviate burden on EMS transfer units which are spread very thin

Cost Effectiveness

- Telestroke networks are cost-effective from both a societal and a hospital perspective.
- Facilitates rapid delivery of acute reperfusion therapies and early transfer



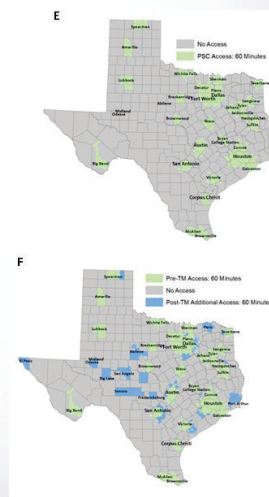
Disparities in Stroke

- Racial disparities have been reported at nearly every level of stroke management, from EMS triage to rehabilitation
- Despite having a higher incidence of stroke, African Americans:
 - have reduced access to stroke care
 - experience longer ED wait times
 - are less likely to receive acute stroke therapies
- Geographic Disparities
 - Rural versus Urban
 - Stroke Belt

Howard VI et al. *Ann Neurol*. 200.
Karve SJ, et al. *Journal of stroke and cerebrovascular diseases*. 2011.
Hsia AW et al. *Stroke*. 2011.

Disparities in Stroke

- Telemedicine has the potential to bridge gaps in acute stroke care
 - Affords timely access to neurologic expertise in disadvantaged regions
 - Overcome geographic obstacles
 - Facilitate appropriate disposition to a higher level of care

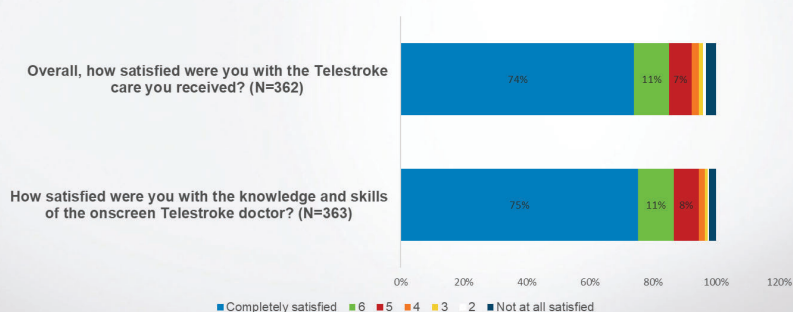


Provider Satisfaction

- Telestroke services generally receive positive feedback from providers
- More satisfaction is seen among ED providers in under-resourced areas
- Less is known about overall satisfaction of telestroke providers
 - They rate the service that they provide as high
 - Unclear if this is valued over other clinical activities.

Predictors of Patient Satisfaction

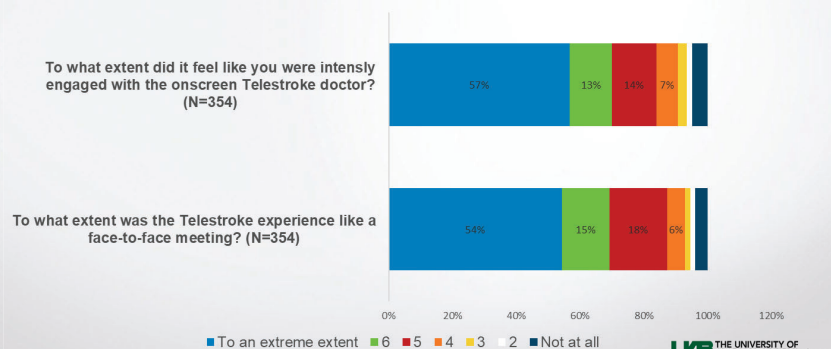
- Analysis of 208 post-telestroke encounter interviews



Lyerly M, Selch G, Martin H, LaPradd M, Ofner S, Graham G, Anderson J, Martini S, Williams LS. Provider Communication and Telepresence Enhance Veteran Satisfaction With Telestroke Consultations. Stroke. 2021 Jan;52(1):253-259

Predictors of Patient Satisfaction

Relatively high telepresence ratings: 69-70% felt the Telestroke encounter was very much like a real encounter and they were intensely engaged (rating of 6 or 7 on a 1-7 scale)



Predictors of Patient Satisfaction

- The emerging theme is that patient satisfaction is driven by:
 - Provider communication
 - Telepresence
- These factors are to some extent modifiable through provider training
- Although important considerations, technological aspects (A/V quality, prior experience with telehealth) had less influence on overall satisfaction

The Patient is the Center of the Consultation

"I didn't have any input...he [Telestroke doctor] was talking to the other doctor."



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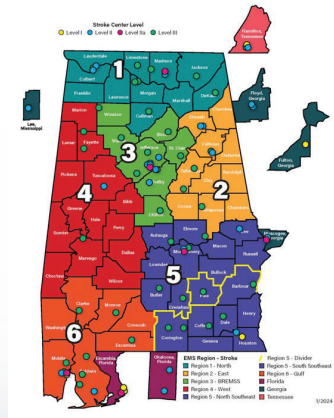
UAB Teleneurology Program

- Started in 2018 with coverage at Bryan Whitfield Hospital
- Has now grown to 34 sites across the state in all 6 EMS regions
- 24/7 access to acute neurologic consultation services
- Patients are typically seen within 10 minutes of consultation request

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UAB Teleneurology: Telestroke

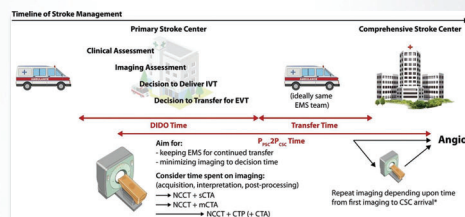
- Emphasis is on Code Strokes but generally any patient with concern for stroke is seen.
- Inpatient code strokes are included in the service
- Works closely with ADPH, TCC, and the state stroke system



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UAB Teleneurology: Telestroke

- Site Onboarding
 - Radiology set up
 - Cart deployment with active monitoring
 - On site training and flow mapping
 - Monthly Feedback
 - Network wide facility calls (Starts October 2024)

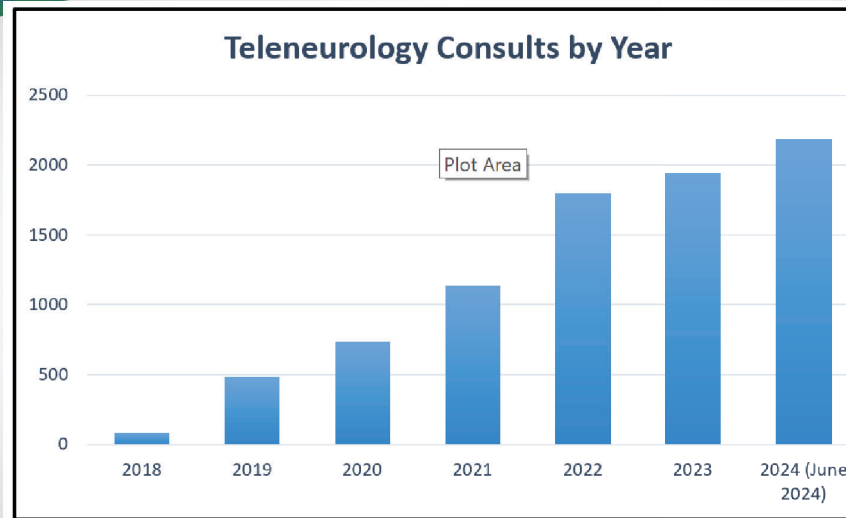


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UAB Teleneurology: Acute General Neurology

- Broader clinical scope than Telestroke
 - Common conditions include but not limited to:
 - Seizures
 - MS exacerbations
 - Refractory migraine and other severe headaches
 - AIDP (Guillain-Barre Syndrome)
 - Abnormal brain imaging NOS
- Due to the broader scope not all conditions equally amenable to telemedicine
 - More difficult to assess spinal cord or peripheral nerve pathology, for example
 - Even so, whether via full consult or phone consult we can help provide recommendations on next steps

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UAB Teleneurology: Inpatient Rounding

- Acute general neuro service available for one-time urgent consults for patients already admitted, but not routine clinical urgency consults
- However we also offer a separate rounding style general neuro consult service
 - For patients with conditions needing more longitudinal care, multiple exams/visits
 - For patients with conditions that are more complicated and require detailed review of local EMR records
 - Generally need a certain minimum monthly volume

Slide courtesy of Brannon Vines, MD

UAB Teleneurology: EEG Interpretation

- Rraditional remote EEG service
 - EEG applied by a trained EEG tech at the bedside
 - EEG is recorded and uploaded to our Natus EEG server
 - EEG is then read and report generated by epilepsy boarded neurologist
- We will soon offer a rapid access EEG service
 - No EEG tech needed
 - Simple nurse deployable set of strips
 - Tracing quality equivalent to professionally applied electrodes by EEG tech
 - Recording then uploaded to Natus and read by epilepsy boarded neurologist

Slide courtesy of Brannon Vines, MD

Conclusions

- Telemedicine for stroke is a well established care model for acute stroke care
- The role of telemedicine will continue to expand over the next 5-10 years
- Care delivered through telemedicine is similar to in-person care and superior to that which can be delivered by telephone alone
- Patient satisfaction is high but ongoing work is needed to optimize the experience for both the provider and patient