

# The State of Telestroke

A discussion on current telestroke guidelines, challenges in implementing them, and how they affect treatment of large vessel occlusions.

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**The American Heart Association (AHA) and American Stroke Association (ASA) recently released a review statement on telemedicine quality and outcomes for stroke.<sup>1</sup> How would you summarize the metric outcomes that the AHA/ASA have suggested?**

Telestroke, the use of telemedicine for stroke, aims to overcome the geographic mismatch of stroke providers and patients using video consultation and examination of patients in locations removed from stroke specialist care. The 2009 AHA/ASA policy statement outlined recommendations regarding the implementation of telestroke. Although mounting evidence supports the continued use of telestroke, the limited experience with this modality means that the parameters and potential of this approach remain to be defined. Therefore, the updated 2016 review statement emphasizes the importance of ongoing data collection and monitoring in ensuring optimal clinical care and optimizing the telestroke process. Major points of emphasis include:

- Systematic tracking of time spent in each phase of care to identify opportunities for improvement
- Reconciliation of preliminary diagnosis and discharge diagnosis, primarily to assess for stroke mimics
- Surveillance for technical or security concerns
- Follow-up at 90 days for all patients who undergo thrombolytic therapy
- Consistent and accurate reporting of all adverse events (eg, hemorrhage)
- Monitoring both patient and provider satisfaction

**How do you think the results of this review statement will affect the growth of telemedicine for stroke treatment?**

Positively. The 2016 statement expands on the current contribution of telestroke to acute stroke care. By emphasizing quality metrics, this statement helps both existing and new networks optimize each phase of clinical care. Because stroke certification recommendations also emphasize quality metrics, it is unlikely that endorsing quality metrics in telestroke would further deter expansion. More likely, the ability to systematically analyze workflow, outcomes, and

cost structures will create opportunities for network optimization to accelerate care and potentially reduce system costs. Furthermore, the potential to use telestroke to triage patients to endovascular thrombectomies, recruit patients into clinical trials, and demonstrate network efficacy further incentivizes broader adoption of telestroke.

**What is the extent of additional training required for those treating stroke when starting work through telemedicine?**

Although there are no uniform training requirements, the 2016 AHA/ASA guidelines recommend distinct training goals for different members of the stroke care team. Emergency department (ED) physicians need to be trained on how to quickly initiate a telestroke consult, use the technology platform to communicate with the remote neurologist, and execute a preexisting clinical protocol for acute stroke evaluations. ED nurses and physicians alike will need to be able to perform a rapid National Institutes of Health Stroke Scale (NIHSS) assessment. Consulting neurologists will need to be familiar with the technology platform, the backup system, and the logistics of remote NIHSS assessment, including how to effectively instruct the examiner. The remote stroke neurologist will also need to be familiar with the local hospital's transfer needs and requirements. Finally, a medical director supervising the telestroke network should ideally be a physician familiar with each networked hospital's clinical protocol and transfer arrangements.

**In a recent study of several hospitals using telestroke in the Northwest United States, researchers found that telestroke is least cost-effective for spoke hospitals if those hospitals are responsible for > 50% of the implementation costs.<sup>2</sup> What are some ways spoke hospitals can offset their initial implementation costs?**

Multiple strategies can be utilized to offset implementation costs and encourage wider telestroke adoption. For instance, a public funding strategy was employed in New York State, where the state government aided hospitals to offset the initial implementation costs for a statewide

telestroke program. Other states, such as Massachusetts and Georgia, have indirectly incentivized implementation via reimbursement. By requiring transfer of suspected stroke patients to the nearest stroke-certified hospital and reimbursing those interventions, community hospitals had a financial incentive to invest in a telestroke infrastructure or forgo stroke patients.

Decreasing the implementation costs at a technical level can have an impact on spoke hospitals. New telestroke modalities are leveraging preexisting internet connections with ever-decreasing costs for audiovisual connectivity to provide site-independent connectivity in a cost-effective network. One such example is the REACH system, a private telemedicine software platform, where annual costs range between \$70,000 and \$90,000 to join and maintain telestroke coverage using site-independent, internet-based connectivity.

It should also be noted that cost analyses of telestroke are confounded by inconsistent reimbursement of telestroke due to state-to-state and insurer-to-insurer variability. Physicians should ensure that they apply relevant data to their local environment when assessing telestroke cost analysis research. As telestroke consultations are increasingly reimbursed, we expect cost analyses to continue to favor telestroke expansion as a safe and cost-effective delivery model for acute stroke care.

### **How do hospitals maintain proper infrastructure (ie, internet speed/connectivity) to ensure no interruption of patient care during telemedicine? What role can the doctors and staff play to help these operations run smoothly?**

Telestroke is dependent on the underlying technologic support that makes it possible to communicate with different locations using audiovisual technologies. As with all technology, this is always improving and is therefore becoming faster and more reliable. However, it remains vital that telestroke sites monitor both the quality and reliability of the underlying network. As recommended in the 2016 AHA/ASA statement, physicians are encouraged to partner with their hospital's information technology staff to document technical failures, user error with the technology, lapses in connectivity, reliability of backup systems, and violations related to security protocols. Multidisciplinary, systematic approaches are the most likely way to optimize system quality and reliability.

### **What are the legal and administrative barriers to implementing an effective telestroke system?**

Rules and regulations surrounding health care delivery continue to lag in comparison to the pace of modernization in telestroke, hindering widespread adoption of telestroke.

Legal and administrative barriers are the most commonly cited obstacles to telestroke expansion.<sup>3</sup> Three such barriers highlight the challenges to developing telemedicine systems.

- 1. Physician licensing and credentialing across state lines.** Telestroke consultations frequently cross state lines, and physicians are often expected to obtain multiple state licenses and credentials at each participating telestroke hospital. Supporting efforts such as the Interstate Medical Licensure Compact and reciprocal credentialing can potentially minimize this administrative barrier to telestroke expansion.
- 2. Medicolegal liability.** This remains an open question because there is no common standard between states on which physician assumes legal liability, particularly when crossing state lines.
- 3. Reimbursement for telestroke service.** Currently, financial reimbursement is inconsistent, frequently limited, and hampered by regulations that have not evolved with the pace of telemedicine.

### **How effective is telestroke for the diagnosis of large vessel occlusion (LVO)?**

There are no prospective data that assess this specific question, but a wealth of data have demonstrated the reliability of remotely assessed NIHSS as compared with those obtained by a bedside neurologist. In the absence of angiography, high NIHSS scores are used to predict the presence of LVO. Telestroke is therefore considered to be a sensitive screen for patients who could have LVOs.

In addition, all telestroke-networked hospitals must have a CT scanner available for thrombolysis decision making. Hyperdense vessels can be seen on the initial CT data transmitted to the remote stroke team, further raising concern for LVO. Where CTA is available, telestroke allows picture archiving and communication system (PACS) images to be analyzed by a remote neurologist and neuroradiologist. In this setting, there is no reason to believe there would be any difference in the ability to detect LVOs.

### **How can telestroke systems improve overall outcomes from LVOs treated by mechanical thrombectomy?**

Because remote and underserved communities have limited access to endovascular therapy, telestroke is of critical importance in reaching, identifying, and triaging patients who would otherwise miss out on optimal stroke care. Preexisting transfer protocols within a telestroke network can be used to facilitate rapid transfers, specifically in the following areas: support for collateral circulation in transit, activation of the intervention team, and procurement of consent before arrival, thereby overcoming delays that would otherwise limit the benefit of endovascular therapy.

In instances where the local facility is close enough to the stroke center, telestroke patients could even bypass the stroke center's ED and go directly to the angiography suite to maximize reperfusion speed.

Although the workflow for appropriate triage and telestroke in the endovascular era remains to be optimized, existing data already demonstrate that this can have a meaningful impact for patients. A Spanish study compared 90-day outcomes of thrombectomy-eligible patients who presented to hospitals within a telestroke network versus those who presented to out-of-network hospitals.<sup>4</sup> At 90 days, functional outcomes were comparable between the main stroke center and the in-network telestroke hospitals but were significantly worse in patients who initially presented to out-of-network hospitals. Although further studies remain to be done, we firmly believe that telestroke has the potential to significantly improve outcomes for patients with LVOs.

### As telestroke has improved access to thrombolysis, how might this affect the screening of candidates for mechanical thrombectomy?

In the era of endovascular therapy, identification of patients with high NIHSS scores should prompt physicians to start emergent vessel imaging to assess for an intervenable lesion and/or initiate rapid transfer to a thrombectomy-enabled center. Telestroke is already built to meet this challenge. The essential information needed to screen for LVOs are the NIHSS and emergent vessel imaging, both of which are readily available with telestroke. Locally acquired imaging data can be reviewed by the remote interventionist to determine candidacy for therapy (ASPECT score and hyperdense vessel on noncontrast CT; level of occlusion, collateral vasculature, and tortuosity on CTA; or core and mismatch data on a CT perfusion imaging).

Furthermore, telestroke can be leveraged to discuss intervention plans with the family at the local facility through a video interface, allowing interventionists to help in decision making for severe strokes. This will allow more effective triage of patients for thrombectomy from the point of presentation and, ideally, enrich the sample of patients treated at the hub hospital, minimizing futile spoke-to-hub transfers.

### How does telestroke fit into the future of mechanical thrombectomy?

Telestroke has the potential to expand the reach of endovascular therapy in multiple phases of clinical care. Now that we know mechanical thrombectomy improves outcomes for patients who would otherwise do poorly, the challenge is to ensure that all eligible patients can undergo emergent intervention, regardless of where they initially present.

By leveraging modern telecommunication networks, telestroke can help extend the reach of endovascular

therapy to patients in rural and underserved locations. In fact, telestroke is actively being studied as a way to triage patients in the prehospital phase. Using telestroke-equipped ambulances, two different trials of prehospital telestroke are already underway in the United States to treat appropriate patients with thrombolysis in the field and triage them to appropriate stroke centers.<sup>5,6</sup> This may decrease treatment and transfer times for patients who require thrombectomy and directly triage thrombectomy candidates to endovascular-capable centers.

In the acute care phase, telestroke is increasingly being used to screen and arrange transfer for thrombectomy candidates. Finally, as we seek to further define the selection criteria for endovascular therapy, telestroke has the potential to significantly increase recruitment into ongoing clinical trials and create broad databases for retrospective studies. The future of telestroke is bright, and we see it as a critical component in realizing the full potential of thrombectomy to improve outcomes for stroke patients. ■

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We'll have expanded coverage of current telestroke capabilities in our April 2017 issue.

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