An Innovative Technology Profile:

Tele-Stroke Care

Class I

Every year, 795,000 Americans suffer from a stroke resulting in 137,000 deaths, making it the third leading cause of death for all Americans.[1] The most common type of stroke is the ischemic, or closed vessel, variety, occurring in 87 percent of cases.[2]

While ischemic strokes can be deadly and debilitating, the timely use of a clot-busting drug called a tissue plasminogen activator (tPA) can significantly reduce mortality rates and improve long-term speech and motor function. Unfortunately, the use of tPA is not without risk; the drug must be administered within four and a half (recently increased from three) hours of stroke onset and cannot be used for hemorrhagic (open vessel) stroke patients. If used incorrectly, tPA can cause an intracerebral hemorrhage, a serious and sometimes fatal complication. As a result, tPA use is normally limited to stroke centers staffed by specialist stroke neurologists.

Tele-stroke technology works to "virtually" bring the expertise of the stroke centers and provide enhanced stroke care, most notably the administration of the critical tPA, to smaller, rural and community hospitals.

Products on the market include the REACH Telestroke application and InTouch Health's Telestroke Networks.

Use Case

- Tele-stroke technology uses a video-conference link and electronic data sharing to allow specialist neurologists at the stroke center "hub" command center to communicate with "spoke" community hospital emergency departments.
    - Each "spoke" hospital uses a battery powered, portable cart with a PC, monitor, webcam and Internet access in the emergency department to allow the specialist neurologist to conduct a real-time consultation of the patient along with the ED physicians.
    - The specialist neurologists also have access to computed tomography (CT) scans and other tests conducted at the hospital though an electronic data sharing link.
    - Working collaboratively, the specialist and the emergency department staff develop a care plan based on established stroke protocols including, if appropriate, the administration of tPA, which can be undertaken by the hospital staff.

Clinical Benefit

- In certified stroke centers, around 10-20 percent of ischemic stroke patients are treated with tPA. Given that many patients are not appropriate for tPA therapy, a rate of around 20 percent rate is considered the current best practice standard. Outside of centers, the rate of tPA therapy is reported to be around 1-2 percent.
    - Data show that the number of patients receiving tPA therapy increases by approximately 10 fold over previous levels when tele-stroke technology is applied.[3]
- *Time to treatment:* Tele-stroke technology reduces the amount of time required to assess a stroke patient and administer tPA compared to non-stroke center hospitals without tele-stroke technology. This "door-

[1] American Stroke Association (2009). Stroke 101. http://www.stroke.org/site/DocServer/STROKE101_2009.pdf Accessed 1/26/2012
[2] American Stroke Association (2009).
[3] Audebert H et al (2006). Comparison of Tissue Plasminogen Activator Administration Management between Tele-stroke Network Hospitals and Academic Stroke Centers. *Stroke*, Jul; 37(7):1822-7.

to-needle" time for community hospitals using tele-stroke ranges from 106 to 127 minutes, comparable to the performance of stroke centers.[4,5]

- *Mortality:* A retrospective study based on the National Institutes of Health's STRokE DOC trial found that patients treated at hospitals that used tele-stroke technology had similar mortality outcomes as patients in stroke centers, along with good six-month outcomes.[6]
- *Long-term morbidity:* Finally, tele-stroke technology produces better long-term patient outcomes. Long-term progress of 1,938 patients with ischemic or hemorrhagic strokes who were admitted to clinics taking part in the TEMPiS (Telemedicine Pilot Project on Integrated Stroke Care) project between July 2003 and March 2005 were compared to 1,122 patients admitted to nearby hospitals not using tele-stroke during the same period. Among stroke patients admitted to TEMPiS hospitals using telemedicine, the probability of a poor outcome (defined here as death, nursing home admittance or a lasting disability) 12 months after stroke was 35 percent lower than for non-TEMPiS patients. After 30 months, the risk of a poor outcome was still 18 percent lower for other hospital patients than for patients who were treated at hospitals without telemedicine links.[7]

Financial Analysis

- *Infrastructure and Acquisition Costs*: Infrastructure required for tele-stroke includes a high-speed internet connection for videoconferencing, CT or brain image transfer capability, a videoconferencing device that supports standard protocols and encryption, and a desktop computer. Costs for community hospitals are moderate; while a videoconferencing system is needed, only one such device is required. In addition, many hospitals have a PACS image transfer system already in place, reducing startup costs. Hub costs are higher; the videoconferencing device used by the hub hospitals typically costs about $20,000 to $25,000. Other technology acquisition costs for the hub facilities are proprietary information and not available.
- *Operational Costs*: Operations costs, including network fees and training doctors and support staff who interact with stroke patients, vary among networks. The REACH system uses this approach and charges spoke hospitals $3,500-$4,500 per month for a neurologist, and $2,000 to $3,000 per month for technical support, for a total cost to the spoke facility of $69,300 to $93,300 per year. [8]
- *Costs of the Condition*: In 2005, the average hospital stay for ischemic stroke, including both tPA and non-tPA treated patients, was 5.6 days at an average cost of $9,100 per stay.[9]
- *Reimbursement*: Since 2005, Medicare has reimbursed tPA-treated patients at a higher rate than conventionally treated patients (new DRG 559 covers reimbursement for the use of tPA at a rate of $11,540, while DRG 014 covers non-tPA stroke services at a rate of $6,417). As a result of this change, the use of tPA has become more financially viable for many hospitals.
- *Cost Effectiveness*: Recently published research has shown that, while costs are higher on average for tele-stroke patients (driven by technology costs), they tend to have more quality adjusted life years (QALYs), a measure of the improvement in both length and quality of life. The incremental cost-effectiveness ratio for tele-stroke compared to usual care is $2,449 per QALY over the lifetime of the patient, a very favorable result.[10]

Barriers to Adoption

[4] Schwamm LH and Rosenthal ES, et al (2004). Virtual Tele-stroke Support for the Emergency Department Evaluation of Acute Stroke. *Academy of Emergency Medicine*; 11:1193-1197.
[5] Switzer JA et al. (2009). A Web-based Telestroke System Facilitates Rapid Treatment of Acute Ischemic Stroke Patients in Rural Emergency Departments, *The Journal of Emergency Medicine*; 36(1):12-18.
[6] Meyer BC et al. (2010). Assessment of Long-Term Outcomes for the STRokE DOC Telemedicine Trial. J Stroke Cerebrovasc Dis. Sep 18.
[7] Audebert HJ et al. (2006).
[8] Interview with Garfield Jones, Director of the Eastern Region, REACH; Gregory Young, MD, Western Region Medical Director, State of New York; Anna Colello, Director, Regulatory Compliance/OHSM, State of New York. Conducted 2/10/09.
[9] Russo CA and Andrews RM (2008). Hospital Stays for Stroke and Other Cerebrovascular Diseases, 2005. HCUP Statistical Brief #51.
[10] Nelson RE et al. (2011).The cost-effectiveness of telestroke in the treatment of acute ischemic stroke. *Neurology*, 77(17):1590-1598.

- *Stroke Center Regulations*: Some states have implemented regulations that require patients believed to have had an ischemic stroke to be transported to a "stroke center," hospitals with the specialized staff and training to care for stoke patients; non-certified facilities are bypassed. Smaller hospitals in jurisdictions without regulations on stroke centers have less incentive to invest in tele-stroke technology, often the most effective way for these facilities to become certified.
- *Physician Licensure*: Tele-stroke networks that work across state boundaries often are required to meet different physician licensure requirements in each state, adding cost and complexity and reducing staff flexibility.[11]
- *Staff Coordination:* Successful tele-stroke networks require a high level of coordination among a variety of staff in both the community and hub hospital: neurologists, emergency physicians, nurses or physician's assistants, radiology technologists, IT and administrative support staff and administrative assistants, financial analysts, operations managers and research coordinators. Effective coordination among these staff is key to a successful network
- *Reimbursement*: Medicare has significant limitations on reimbursement for telemedicine. While the requirement of a two-way video link (as opposed to store-and-forward technology) is not a concern for tele-stroke, the requirement that the recipient, the spoke hospital, must not be located in a metropolitan statistical area or its location must qualify as a rural health professional shortage area is a significant barrier. However, the Centers for Medicare & Medicaid Services (CMS) have been willing to develop new reimbursement approaches on a case basis: members of the REACH network in New York State have established reimbursement rates for telemedicine services equal to in-person consultations.[12]
    - Reimbursement challenges for tele-stroke in California have been reduced by Assembly Bill 415, which removes some of the most onerous restrictions on telehealth reimbursement for MediCal and private payers. In particular, it stipulates that "any service otherwise covered under standard contract terms (e.g. covered benefit, medically necessary) must be covered whether provided in-person or via telehealth."[13] Given that stroke neurologist consults are covered for in-person circumstances, this modification should allow for their reimbursement via tele-stroke approaches as well.

Next Steps to Implementation

1. *Implement Stroke Center Regulations*: In states where regulations require emergency services to transport patients with a suspected ischemic stroke only to stroke centers, such as Massachusetts, tele-stroke update has been significant. Such regulations, and associated loss of patients and revenue by hospitals, are a major trigger for investing in tele-stroke technology and the creation of tele-stroke networks.
2. *Address Infrastructure Costs*: High upfront costs can be a barrier to the implementation of tele-stroke, especially in safety-net hospitals. However, publicly funded models, such as the Arizona Telemedicine Program, have been created to reduce this burden. In this model, most infrastructure costs, purchased in bulk, are covered by the government, and a relatively small membership fee covers part of the ongoing service costs, with the remainder subsided from state funds.[14] Such public models should be examined in jurisdictions with significant numbers of safety-net facilities.

[11] Center for Telehealth and E-Health Law (2009). Available at: http://www.telehealthlawcenter.org/?c=118
[12] Interview with Garfield Jones, Director of the Eastern Region, REACH; Gregory Young, MD, Western Region Medical Director, State of New York; Anna Colello, Director, Regulatory Compliance/OHSM, State of New York. Conducted 2/10/09.
[13] Newman, M and McMahon, T (2011). Fiscal Impact of AB 415: Potential Cost Savings from Expansion of Telehealth. Available at http://connectedhealthca.org/node/1616
[14] Barker, GP et al (2005). The Arizona Telemedicine business model. *Journal of Telemedicine and Telecare*; 11:397-402.