See related article, p 2086.

Telestroke Evolution
From Maximization to Optimization

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Stroke is available at http://stroke.ahajournals.org

DOI: 10.1161/STROKEAHA.112.662510

problem. Levine et al² noted many years ago the power of telestroke to improve elements of stroke care including increasing rtPA rates, consults, education, trial enrollments, mentoring, and even data collection. Many of these prognostications have robustly come to fruition.

Prior telestroke work focused on first developing feasible and reliable telemedicine systems and then maximizing their use in rtPA administrations. Clinical trial publications and case series have shown the feasibility and reliability of performing the NIHSS in the nonacute setting³,⁴ and in the acute setting⁵,⁶ with data available on feasibility and comparative reliability during actual stroke consultations as well.⁷-¹⁰

In this article, for the feasible examinations, Liman et al noted excellent reliability of performing the NIHSS through wireless telemedicine with 60% of the items having excellent and 87% of the items having at least good κ scores. This is consistent with the NIHSS reliability literature, which ranges from 31% to 100% of the scores being in the excellent κ range.³,⁴,⁶,⁹,¹¹,¹² The authors show consistency in that the poorer reliability scores were in line with known poorly reliable items such as ataxia, inattention, and sensory items.

Feasibility and reliability reports, by their very nature, tend to improve over time. Shafqat et al.,³ in 1999, reported only 31% of NIHSS questions with excellent κ reliability using Integrated Services Digital Network lines at 384 kbps and 2 preset camera angles. Thirteen years later, robust Internet-enabled camera systems have resulted in improved reliability, excellent Internet data transmission, and robust pan/tilt/zoom camera capabilities.⁴,⁶,⁹ A similar progression is expected in the prehospital wireless setting as well.

Evaluation of video transmission from an ambulance telemedicine system has been reported in only the mobile telemedicine for the Brain Attack Team (TeleBAT) project.⁹,¹⁵ TeleBAT ambulance use was shown to be reliable with 40% to 47% of elements showing excellent κ reliability, although with a low image transfer rate. Increases in wireless data rates are continually improving and will likely improve this issue over time.

Sustainable telestroke networks are now being increasingly developed and are helping to maximize rtPA use for stroke.⁷,⁵,¹⁴,¹⁵ Over time, the growth of telestroke has begun to include the issue of optimization, although maximization has always been at the core of these attempts. STRoKE DOC reported a high degree of telestroke decision-making efficacy.¹⁶ Other studies have focused on optimizing long-term outcomes.¹⁷,¹⁸ Finally, how to optimize telestroke in a stroke systems of care model has also been addressed.¹⁹

The authors point out that both pre- and in-hospital time delays are major concerns in acute stroke management. They address this by facilitating neurological assessments and
some decision-making in the ambulance, thus enabling the potential for decreased “door-to-needle” times and increased treatments. Because only 27% of patients receiving intravenous rtPA have “door-to-needle” times within the 60-minute goal,20 and because telemedicine reports similarly poor “door-to-needle” times,15,16 efforts to creatively improve times such as this should continue to be pursued.

Even if not a single increased patient receives treatment, left-shifting these stroke times is a significant goal. Shaving off even 10 minutes will optimize care by minimizing the tens of millions of neurons lost due to a time delay such as this.21 Currently, the majority of patients still require time once arriving to the hospital to obtain neuroimaging. This allows for stroke specialist examination at the treating facility if one is present in person or through telemedicine. Future growth may change this requirement. Prehospital management is already changing by enabling ambulances to provide acute CT imaging,22 by providing potential neuroprotective therapies,23 or by initiating trial consent in the ambulance.24 Creatively increasing data throughput and even prioritizing wireless data packets for medical use will all help with the telestroke evolution.

The authors correctly point out that these preliminary findings should simply encourage further studies to overcome technical problems with the background goal of providing patients with reliable and optimized access to specialty expertise. With the growth of telestroke, as highlighted by patients with reliable and optimized access to specialty expertise.

Disclosures

Dr Meyer has attended a meeting cosponsored by Genentech, although no honorarium was provided, and has served on an advisory committee for The Medicines’ Company.

References
