Emergency Physician and Stroke Specialist Beliefs and Expectations Regarding Telestroke

Ari Moskowitz, BA; Yu-Feng Yvonne Chan, MD; John Bruns, MD, MPH; Steven R. Levine, MD

Background and Purpose—Telestroke has been effective in the management of acute ischemic stroke. This study characterizes and compares stroke specialist (SS) and emergency physician (EP) perceptions of telestroke and identifies barriers preventing increased implementation.

Methods—A survey was developed and distributed nationwide to 382 SSs through an online survey system and in paper form to 226 EPs attending the 2008 American College of Emergency Physicians national conference.

Results—Stroke specialists perceived themselves to be more knowledgeable about telemedicine and telestroke (P<0.001 and P=0.010, respectively). A large majority of physicians in both specialties either strongly agreed or agreed that telestroke will reduce geographical differences in stroke management and that it is superior to telephone consultation. EPs perceived patient preference (P<0.001), recombinant tissue plasminogen activator side effects (P<0.001), level of technology (P=0.005), and recombinant tissue plasminogen activator not the standard of care (P<0.001) to be more significant obstacles to increased implementation of telestroke than SSs. However, SSs found increased personal work to be a greater barrier than EPs (P<0.001).

Conclusion—SSs and EPs report positive beliefs regarding telestroke; however, perceived obstacles exist to implementation. Differences between barriers perceived by EPs and SSs need to be addressed to enhance acute ischemic stroke treatment. (Stroke. 2010;41:805-809.)

Key Words: acute stroke ■ emergency medicine ■ stroke care ■ telemedicine ■ telestroke

Telesstroke, real-time audio and visual communication between a stroke specialist (SS) and emergency physicians (EPs), has been proposed as a solution to low recombinant tissue plasminogen activator (rtPA) administration rates in acute ischemic stroke (AIS).1,2 The technology is currently used by a number of hospital systems, both within the United States and internationally.3,4 Studies show its advantages over traditional telephone consults.4 Yet, despite its demonstrated safety and effectiveness in increasing rtPA administration rates, the technology has not been implemented in many hospitals that stand to benefit.

We characterize and compare the attitudes, beliefs, and perceived barriers of SSs and EPs regarding the broader implementation of telestroke.

Materials and Methods

A standardized survey was developed based on a literature review and interviews with community and academic SSs and EPs. Because limited research is available regarding physician perceptions of telestroke, literature focusing on telemedicine generally was reviewed.5,6

The survey was piloted at our institution and subsequently distributed nationwide through an online system to 382 SSs identified through a review of SSs at academic centers. SSs had 4 weeks to respond to the survey with a reminder after 2 weeks. The survey was distributed in paper form at the American College of Emergency Physicians conference (Chicago, Ill; October 27 to 30, 2008) and was available to all physicians attending the conference. Physicians were encouraged to watch a video of an actual telestroke consult to ensure a base level of familiarity with the technology.7 The survey required approximately 20 minutes to complete.

All results and statistics were compiled using SPSS (Version 15.0; SPSS Inc, Chicago, Ill). Nonparametric Mann-Whitney scores were used to compare SSs and EPs to account for the deviations from a normal distribution. Probability values of <0.05 were considered significant.

Results

One hundred thirty-five (35%) of the 382 SSs surveyed and 226 EPs completed the survey. The average age (years) of the SSs and EPs were 47±9 and 41±10 (P<0.001). Fifty-five percent of the EPs were attendings >5 years compared with 82% of SSs (P<0.001). A total of 10.7% of EPs indicated rural practice. Forty-three (31.6%) of the SSs were familiar with telestroke from personal use as compared with 17 (7.5%) of EPs surveyed (P<0.001).

Tables 1 through 3 summarize the data. SSs spent less time using the internet (P=0.008) but indicated more knowledge

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regarding telemedicine and telestroke (P<0.001 and P=0.010, respectively). Of the SSs, most (89.6% and 87.4%, respectively) either strongly agreed or agreed that telestroke will reduce geographical differences in stroke management and that it is superior to telephone consultation. Similarly, the majority of EPs (91.9% and 97.2%, respectively) responded optimistically regarding these items. SSs perceived ambiguity in reimbursement and medical liability as the greatest barriers. EPs reported medical liability and time/cost of installation as the most significant obstacles. EPs perceived patient preference for physical visits (P<0.001), management of rtPA side effects (P<0.001), level of technology (P=0.005), and rtPA not the standard of care for AIS (P<0.001) as more significant obstacles. SSs found increased personal work to be a greater barrier than EPs (P<0.001).

There were no significant differences between EPs indicating rural versus nonrural practices.

**Discussion**

Telemedicine for remote diagnosis and management of AIS is a feasible solution to low rtPA administration rates.8–10 We have shown that telemedicine is viewed favorably by SSs and EPs. However, although SS and EPs agree on the potential of telestroke, concerns regarding

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### Table 1. Technology, Telemedicine, and Telestroke

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Emergency Physician</th>
<th>Stroke Specialist</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD) Scale</td>
<td>Mean(SD)</td>
<td>Mann-Whitney U</td>
</tr>
<tr>
<td>Daily internet use</td>
<td>2.16 (0.94) 1(&lt; 1 hour) to 4 (&gt; 3 hours)</td>
<td>1.90 (0.93)</td>
<td>0.008</td>
</tr>
<tr>
<td>Knowledge of technology</td>
<td>2.27 (0.97) 1 (strongly disagree) to 4 (strongly agree)</td>
<td>2.36 (0.99)</td>
<td>0.365</td>
</tr>
<tr>
<td>First in specialty to adopt</td>
<td>2.44 (0.86) 1 (strongly disagree) to 4 (strongly agree)</td>
<td>2.46 (0.90)</td>
<td>0.967</td>
</tr>
<tr>
<td>technologies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of Telemmedicine</td>
<td>2.64 (0.71) 1 (no knowledge) to 4 (very knowledgeable)</td>
<td>3.08 (0.73)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Knowledge of Telestroke</td>
<td>2.88 (0.78) 1 (no knowledge) to 4 (very knowledgeable)</td>
<td>3.11 (0.72)</td>
<td>0.010</td>
</tr>
</tbody>
</table>

Percentage of respondents (%).
medicolegal guidelines, reimbursement, and time/cost of installation impede implementation.

It is important to note that many of these concerns have been informally recognized by leaders in the telestroke field. Educating potential users with regard to progress in these areas is critical in increasing physician buy-in.

EPs viewed rtPA not being the standard of care in AIS and management of rtPA complications to be more significant obstacles than SSs. With regard to these concerns, studies have shown that EPs are less comfortable with rtPA as the standard of care. This may be driving the differences observed here.

Limitations of this study included the use of an online survey for SS and paper for EPs. A large nonresponse rate from SSs, the inability to calculate the nonresponse rate of EPs, and the use of a convenience sample of EPs at a national conference limit generalizability and may have contributed to a selection bias because those with increased familiarity with telemedicine/telestroke may have been more or less likely to respond. Due to the low percentage of EPs indicating a rural practice in this sample, additional studies regarding this population are warranted. Finally, this survey did not differentiate between web-based and “workstation” models of telestroke.

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Disclosures
None.

References
3. Demaerschalk BM, Miley ML, Kiernan TE, Bobrow BJ, Corday DA, Wellik KE, Aguilar MI, Ingall TJ, Dodick DW, Brazdys K, Koch TC,

Table 3. Perceived Barriers to Telestroke Implementation

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Emergency Physician Mean (SD) 1 (very significant barrier) to 5 (no barrier)</th>
<th>Stroke Specialist Mean (SD)</th>
<th>P-Value</th>
<th>Mann-Whitney U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of technology</td>
<td>2.83 (1.17)</td>
<td>3.13 (0.99)</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Time and cost of installation</td>
<td>2.43 (1.05)</td>
<td>2.36 (1.03)</td>
<td>0.625</td>
<td></td>
</tr>
<tr>
<td>Perception that rtPA not considered “standard of care”</td>
<td>2.90 (1.21)</td>
<td>3.43 (1.10)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Increased personal work</td>
<td>3.11 (1.12)</td>
<td>2.52 (1.17)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Management of rt-PA side-effects</td>
<td>2.50 (1.21)</td>
<td>2.94 (1.10)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Medical liability</td>
<td>2.34 (1.16)</td>
<td>2.26 (1.14)</td>
<td>0.528</td>
<td></td>
</tr>
<tr>
<td>Patients prefer physical visits</td>
<td>3.00 (1.28)</td>
<td>3.55 (1.08)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Safety/Confidentiality of online data</td>
<td>3.53 (1.19)</td>
<td>3.78 (0.99)</td>
<td>0.073</td>
<td></td>
</tr>
<tr>
<td>Adequacy of reimbursement</td>
<td>Not Applicable</td>
<td>1.96 (0.99)</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

| Time taken away from care of patients in the ED | 3.14 (1.18) | NA | N/A |

| Percentage of Respondents (%) | Very Significant Barrier | 2 | 3 | 4 | No barrier |

N/A indicates not applicable.


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