Timeliness of Intravenous Thrombolysis via Telestroke in Georgia

Askiel Bruno, MD, MS; Katherine M. Lanning, MD; Hartmut Gross, MD; David C. Hess, MD; Fenwick T. Nichols, MD; Jeffrey A. Switzer, DO, MCTS

**Background and Purpose**—Through 2-way live video and audio communication, telestroke enhances urgent treatment of patients with acute stroke in emergency departments (EDs) without immediate access to on-site specialists. To assess for opportunities to shorten the door to thrombolysis time, we measured multiple time intervals in a telestroke system.

**Methods**—We retrospectively analyzed 115 records of consecutive acute stroke patients treated with intravenous thrombolysis during a 20-month period via a statewide telestroke system in 17 EDs in Georgia. On the basis of times documented in the telestroke system, we calculated the time elapsed between the following events: ED arrival, telestroke patient registration, start of specialist consultation, head computed tomography, thrombolysis recommendation, and thrombolysis initiation.

**Results**—The most conspicuous delay was from ED arrival to telestroke patient registration (median, 39 minutes; interquartile range, 21–56). Median time from ED arrival to thrombolysis initiation was 88 minutes, interquartile range 75 to 105. Thrombolysis was initiated within 60 minutes from ED arrival in 13% of patients.

**Conclusions**—The greatest opportunity to expedite acute thrombolysis via telestroke is by shortening the time from ED arrival to telestroke patient registration. (Stroke. 2013;44:00-00.)

**Key Word:** acute stroke ■ intravenous tissue-type plasminogen activator ■ ischemic stroke ■ telemedicine ■ stroke care ■ telestroke ■ thrombolysis

The paper discusses the timeliness of intravenous thrombolysis via telestroke in Georgia. The study retrospectively analyzed 115 records of acute stroke patients treated with intravenous thrombolysis during a 20-month period in 17 EDs in Georgia. The key conclusion is that the greatest opportunity to expedite acute thrombolysis via telestroke is by shortening the time from ED arrival to telestroke patient registration.
One medical student (K.M.L.) supervised by 1 of the specialists (A.B.) reviewed the telestroke records for each patient and calculated and tabulated 6 time intervals: (1) from ED arrival to telestroke registration, (2) from telestroke registration to start of consult, (3) from ED arrival to CT, (4) from start of consult to tPA recommendation, (5) from tPA recommendation to bolus, and (6) the total time from ED arrival to tPA bolus. The time of specialist consultation request by the Emergency Communication Center was not documented in this system. The analysis and reporting of the deidentified saved telestroke data have been approved by the Georgia Regents University institutional review board.

Results
During the 20-month study period, there were 889 telestroke consultations and 115 patients (13%) were treated with tPA. In 12 patients, the ED arrival time was inconsistent with the specialist note and this time was thus excluded from analysis. In 2 patients, the CT was missing. In 24 patients, the tPA bolus time was not documented. The median time from ED arrival to patient registration in the telestroke system was 39 minutes, from ED arrival to CT 18 minutes, from telestroke registration to start of consultation 12 minutes, from start of consultation to tPA recommendation 24 minutes, from tPA recommendation to tPA bolus 12 minutes, and from ED arrival to tPA bolus 88 minutes (Table). CT was done within the American Stroke Association Target; Stroke\(^{2}\) recommended 25 minutes from ED arrival in 69\% (70/101) of patients, and the tPA was started within the recommended 60 minutes in 13\% (11/83) of patients.

Discussion
The novel information about the various time intervals from ED arrival to tPA bolus in acute stroke care via the Remote Evaluation of Acute Ischemic Stroke Health Inc telestroke system in Georgia could be used to implement approaches to reduce treatment delays and thus improve telestroke care. The ED arrival to telestroke registration median time of 39 minutes, from ED arrival to CT 18 minutes, from telestroke registration to start of consultation 12 minutes, from start of consultation to tPA recommendation 24 minutes, from tPA recommendation to tPA bolus 12 minutes, and from ED arrival to tPA bolus 88 minutes (Table). CT was done within the American Stroke Association Target; Stroke\(^{2}\) recommended 25 minutes from ED arrival in 69\% (70/101) of patients, and the tPA was started within the recommended 60 minutes in 13\% (11/83) of patients.

Table. Time Intervals from ED Arrival to Intravenous tPA Bolus in 115 Patients Treated Consecutively Via Telestroke

<table>
<thead>
<tr>
<th>Time Intervals*</th>
<th>Median, Min in This Study (IQR)</th>
<th>Target; Stroke(^{2}) Recommendation, Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED arrival to telestroke registration (n=103)</td>
<td>39 (21–56)</td>
<td>Not stated</td>
</tr>
<tr>
<td>ED arrival to specialist notification</td>
<td>Not captured</td>
<td>≤15</td>
</tr>
<tr>
<td>Telestroke registration to start of consult (n=115)</td>
<td>12 (7–21)</td>
<td>Not stated</td>
</tr>
<tr>
<td>ED arrival to CT (n=101)</td>
<td>18 (8–29)</td>
<td>≤25</td>
</tr>
<tr>
<td>Start of consult to tPA recommendation (n=115)</td>
<td>24 (17–30)</td>
<td>Not stated</td>
</tr>
<tr>
<td>tPA recommendation to bolus (n=91)</td>
<td>12 (8–20)</td>
<td>Not stated</td>
</tr>
<tr>
<td>ED arrival to tPA bolus (n=83)</td>
<td>88 (75–105)</td>
<td>≤60 in ≥50% of patients</td>
</tr>
</tbody>
</table>

CT, computed tomography; ED, emergency department; IQR, interquartile range; and tPA, tissue-type plasminogen activator.

*Some of the times were missing or could not be confirmed.

support stroke diagnosis in uncertain situations and late recognition of stroke in some patients. This delay was potentially the main reason for the relatively low percentage (13\%) of patients treated with tPA within 60 minutes of ED arrival. The median time from ED arrival to specialist notification was not documented but must have been somewhat >39 minutes. The American Stroke Association Target; Stroke\(^{2}\) recommends ≤15 minutes from ED arrival to specialist notification.

Our findings are similar to those using the same telestroke system in South Carolina.\(^{8}\) The median times in Georgia versus South Carolina from the start of consult to tPA recommendation were 24 versus 25 minutes, from tPA recommendation to bolus 12 versus 14 minutes, and from ED arrival to tPA bolus 88 versus 87 minutes. Similar to this study, the main delay in South Carolina was from ED arrival to consultation request (median, 33 minutes). Time from ED arrival to system registration was not reported in the South Carolina study.

One limitation in this study is not having enough information to evaluate the potential reasons for prolongations of the various time intervals. Also, the tPA bolus time was not documented by the consultant or the ED staff in 24 patients (21\%). Shortening the various time intervals during acute stroke assessment should expedite thrombolysis and increase the proportion of patients with ischemic stroke eligible for and receiving thrombolysis. Currently, the greatest opportunity to increase the proportion of tPA-qualified patients with stroke via the Remote Evaluation of Acute Ischemic Stroke telestroke system, in addition to minimizing the stroke onset to ED arrival time, is by shortening the ED arrival to telestroke registration time. For example, hospital prenotification by Emergency Medical Services should improve stroke recognition in the ED and shorten the time to specialist notification. Implementing processes proven effective in reducing the door to tPA times in montelestroke acute stroke settings,\(^{3,4}\) should also expedite thrombolysis via telestroke.

Disclosures
Drs Gross, Hess, and Nichols have founder’s equity in Remote Evaluation of Acute Ischemic Stroke (REACH) Health Inc; Dr Hess is on the Board of Directors of REACH Health Inc; Georgia Regents University (employer) has equity in REACH Health Inc. The other authors report no conflict.

References


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