Hospital-Directed Feedback to Emergency Medical Services Improves Prehospital Performance

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Background and Purpose—A potential way to improve prehospital stroke care and patient handoff is hospital-directed feedback for emergency medical service (EMS) providers. We evaluated whether a hospital-directed EMS stroke follow-up tool improved documentation of adherence to the Rhode Island state prehospital stroke protocol for EMS providers.

Methods—A standardized, 10-item feedback tool was developed in 2012 and sent to EMS directors for every transported patient with a discharge diagnosis of ischemic stroke. We reviewed patient charts meeting these criteria between January 2008 and December 2013. Performance on the tool was compared between the preintervention (January 2008 through January 2012) and postintervention (February 2012 through December 2013) periods.

Results—We identified 1176 patients with ischemic stroke who arrived by EMS in the study period: 668 in the preintervention period and 508 in the postintervention period. The overall score for the preintervention group was 5.31 and for the postintervention group 6.42 (P<0.001). Each of the 10 items, except checking blood glucose, showed statistically significant improvement in the postintervention period compared with the preintervention period.

Conclusions—Hospital-directed feedback to EMS was associated with improved overall compliance with state protocols and documentation of 9 out of 10 individual items. Future confirmatory studies in different locales and studies on the impact of this intervention on actual tissue-type plasminogen activator administration rates and EMS personnel knowledge and behavior are needed. (Stroke. 2014;45:00-00.)

Key Words: emergency medical services ■ feedback ■ stroke

The benefits of tissue-type plasminogen activator are inversely proportional to the time elapsed between onset of symptoms and medication administration. Rapid assessment and transportation to a hospital by emergency medical service (EMS) providers become an integral part of the continuum of care for stroke patients. EMS care can affect downstream resource mobilization and clinical decision making, and handoff to hospital staff is subject to multiple pressures and distractions that may cause incomplete or incorrect sign-out.

A potential way to improve prehospital stroke care and patient handoff is hospital-directed feedback for EMS providers, which has been successfully implemented in treatment of ST-elevation myocardial infarction. We evaluated whether a hospital-directed EMS stroke follow-up tool improved documentation of adherence to the Rhode Island state prehospital stroke protocol for EMS providers.

Methods

The study was approved by the institutional review board.

To conduct comparative analysis, we performed retrospective chart reviews on patients, transported by EMS between January 2008 and December 2013, who had a discharge diagnosis of ischemic stroke. For stroke patients transported to 2 hospitals in Rhode Island, a designated stroke coordinator (C.G.M., C.A.) completed a feedback form by reviewing the legally mandated EMS run report included in a patient’s medical chart. The stroke coordinators used a standardized feedback form (Figure 1) that was implemented in February 2012 and captured the 5 patient interview items and 5 clinical actions required by the Rhode Island prehospital stroke protocol. Each element captured in the run report earned 1 point toward a total score of 10 points.

For patients who presented between January 2008 and January 2012 (preintervention period), charts were sampled. For patients who presented between February 2012 and December 2013 (postintervention period), all charts were reviewed. In the postintervention period, a copy of the feedback form was electronically sent to the EMS director of the appropriate agency.

Bivariate analyses using the Student t test were conducted to identify any significant differences between the pre- and postintervention groups with respect to overall score, age, sex, documented interview items, and interventions performed. STATA 12 software was used for all analyses in the study.

Results

We identified 1176 patients with acute ischemic stroke who arrived by EMS between January 2008 and February 2013: 668 in the preintervention period and 508 in the postintervention period. Fifty-three of 59 ambulance services in the state received feedback reports. Among these were 44 municipal, 9 commercial, 30 urban, and 14 rural services. Mean age and
sex proportions were not significantly different during the 2 time periods (Table 1).

The overall score for the preintervention group was 5.31 and for the postintervention group 6.42 ($P<0.001$). Each of the 10 items, except checking blood glucose, showed statistically significant improvement in the postintervention period compared with the preintervention period (Table 1).

Urban and rural EMS systems showed statistically significant increases in overall score in the postintervention period; however, rural EMS systems showed significant improvement in the postintervention period compared with the preintervention period (Table 1).
in 4 out of 10 items compared with 9 out of 10 for urban systems (Table 2).

**Discussion**

Hospital-directed feedback to EMS was associated with improved overall compliance with state protocols. Urban systems improved more than rural systems. For all systems, there was a significant increase in hospital prenotification, which has been shown to improve door-to-imaging times, door-to-treatment times, and onset of symptom-to-treatment times in patients with ischemic stroke.[10,11]

The study had several limitations. First, we were unable to determine if the feedback form was transmitted from the EMS director to the provider or how the provider interpreted the results. Second, there may have been other variables, not measured by the current study, which led to improvement in performance over time. A randomized trial of feedback might better ascertain whether the tool is definitively associated with improved performance. Third, patient outcomes were not collected for the current study; therefore, we cannot determine whether improved performance on the tool was associated with faster treatment times or improved clinical outcomes. Future studies should include data on patient outcomes to assess the impact feedback to EMS has on patient outcomes.

**Disclosures**

Dr. Silver received consulting fees for medicolegal expert testimony and adjudication for Women’s Health Initiative outcomes and honoraria for authorship in Medlink, Medscape, and Oakstone Publishing. The other authors report no conflicts.

**Table 1. Overall Performance on Rhode Island State Protocol EMS Measures in the Pre- and Postintervention Periods**

<table>
<thead>
<tr>
<th></th>
<th>Preintervention (n=668)</th>
<th>Postintervention (n=508)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y) ± SD</td>
<td>74.8±14.6</td>
<td>75.3±14.2</td>
<td>0.51</td>
</tr>
<tr>
<td>Female, %</td>
<td>57.3</td>
<td>55.9</td>
<td>0.62</td>
</tr>
<tr>
<td>Overall score (maximum of 10)</td>
<td>5.31</td>
<td>6.42</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Table 2. Comparison of Urban vs Rural EMS Performance on Rhode Island State Protocol EMS Measures in the Pre- and Postintervention Periods (n=1176)**

<table>
<thead>
<tr>
<th></th>
<th>Urban Preintervention (n=512)</th>
<th>Urban Postintervention (n=411)</th>
<th>P Value</th>
<th>Rural Preintervention (n=68)</th>
<th>Rural Postintervention (n=48)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y) ± SD</td>
<td>74.5±14.6</td>
<td>75.0±14.5</td>
<td>0.6</td>
<td>71.1±13.8</td>
<td>74.8±12.6</td>
<td>0.14</td>
</tr>
<tr>
<td>Female, %</td>
<td>57.4</td>
<td>54.6</td>
<td>0.39</td>
<td>50</td>
<td>53.2</td>
<td>0.74</td>
</tr>
<tr>
<td>Overall score (maximum of 10)</td>
<td>5.27</td>
<td>6.46</td>
<td>&lt;0.001</td>
<td>5.63</td>
<td>6.89</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Table 1. Overall Performance on Rhode Island State Protocol EMS Measures in the Pre- and Postintervention Periods**

<table>
<thead>
<tr>
<th>Item (% of times completed)</th>
<th>Preintervention (n=508)</th>
<th>Postintervention (n=508)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last known well time documented</td>
<td>37.7</td>
<td>53.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Seizure or head injury documented</td>
<td>14.5</td>
<td>31.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Headache/neck pain documented</td>
<td>24.4</td>
<td>39.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Recent surgery documented</td>
<td>53.0</td>
<td>62.2</td>
<td>0.002</td>
</tr>
<tr>
<td>Medications documented</td>
<td>78.1</td>
<td>83.5</td>
<td>0.023</td>
</tr>
<tr>
<td>Cardiac monitor</td>
<td>69.8</td>
<td>78.2</td>
<td>0.0012</td>
</tr>
<tr>
<td>IV access obtained</td>
<td>76.1</td>
<td>84.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Blood glucose checked</td>
<td>78.3</td>
<td>81.5</td>
<td>0.18</td>
</tr>
<tr>
<td>Stroke scale documented</td>
<td>56.9</td>
<td>71.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Prenotification given</td>
<td>15.7</td>
<td>49.6</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

EMS indicates emergency medical service.
References


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*Stroke.* published online May 29, 2014;
*Stroke* is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0039-2499. Online ISSN: 1524-4628

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http://stroke.ahajournals.org/content/early/2014/05/29/STROKEAHA.114.005679

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