Compliance With the Stroke Education Performance Measure in the Michigan Paul Coverdell National Acute Stroke Registry

Adrienne Nickles, MPH; Jay Fiedler, MPH; Stacey Roberts, BSN; Sarah Lyon-Callo, MA; Rochelle Hurst, RN; Mathew Reeves, PhD

Background and Purpose—Stroke education, 1 of 8 endorsed stroke performance measures, consists of 5 specific subcomponents: risk factors, stroke warning signs, emergency medical service activation, physician follow-up, and discharge medications. We identified predictors of stroke education performance measure compliance in the Michigan Paul Coverdell National Acute Stroke Registry.

Methods—Data were collected on 9609 acute stroke admissions to 20 registry hospitals during 2008 and 2009. Predictors of measure compliance (delivery of all 5 subcomponents) were determined using multivariable logistic regression.

Results—Overall compliance with the stroke education measure was 61.8% (hospital-level compliance ranged between 16% and 93%). Compliance with individual subcomponents were risk factors (65.5%), stroke warning signs (68.9%), emergency medical service activation (66.8%), physician follow-up (92.9%), and discharge medications (91.5%). Age, gender, stroke subtype, prestroke ambulation, discharge destination, and hospital size were all significant independent predictors of compliance. Stroke education was delivered less often to patients who were ≥70 years of age, nonambulatory prestroke, not discharged to home, had transient ischemic attack, or hemorrhagic stroke.

Conclusions—Only 60% of patients received stroke education consistent with the endorsed performance measures. Strategies to increase stroke education, including the impact of incorporating stroke-specific education measures into hospital care protocols, should be explored. (Stroke. 2013;44:00-00.)

Key Words: acute stroke ■ education ■ quality of care ■ registries

Stroke education provided to hospitalized stroke patients and their families is an endorsed stroke performance measure (PM) monitored by all major stroke quality improvement organizations in the United States.1–4 Compliance with the measure requires documentation that stroke patients (or their caregivers) were provided education or materials addressing all 5 subcomponents.5–7 An independent audit of 366 randomly selected charts demonstrated high interrater agreement for the 5 subcomponents: 77.6% for stroke risk factors, 80.1% for stroke warning signs, 80.1% for EMS activation, 88.0% for physician follow-up, and 86.3% for discharge medications.

Compliance with the stroke education PM required documentation that stroke patients (or their caregivers) were provided education or materials addressing all 5 subcomponents.6,7 An independent audit of 366 randomly selected charts demonstrated high interrater agreement for the 5 subcomponents: 77.6% for stroke risk factors, 80.1% for stroke warning signs, 80.1% for EMS activation, 88.0% for physician follow-up, and 86.3% for discharge medications.

Bivariate and multivariable logistic regression models were used to identify statistically significant (P<0.05) independent associations between patient and hospital characteristics and PM compliance (ie, received all 5 subcomponents versus not). Age, race, gender, and stroke type were included in the multivariable model regardless of statistical significance.

Results

The average age of the 9609 admissions was 69.2 years; 31% were nonwhite, 62.3% had ischemic stroke, 10.3% hemorrhagic stroke, 24.1% TIA, and 3.3% stroke not specified.
Overall, 61.8% (n=5937 of 9609) were compliant with the PM. The 2 most frequently delivered subcomponents were physician follow-up (93%) and discharge medications (92%), followed by stroke warning signs (69%), EMS (67%), and stroke risk factors (66%). Hospital-level compliance varied widely (16.2% to 93.2%), with only 1 hospital having >80% compliance (Figure 1). There was a significant increase (P<0.0001) in compliance between 2008 and 2009 (Figure 2).

Patients who were older (≥70 years), white, female, had hemorrhagic stroke, TIA, or stroke not specified, nonambulatory prestroke, or not discharged to home, were less likely to receive stroke education (Table). Compared with large-sized hospitals, medium hospitals (100–300 beds) were more likely, and small hospitals (<100 beds) less likely, to provide stroke education. After adjustment, age, prestroke ambulation status, discharge destination, year, and hospital size remained statistically significantly associated with PM compliance (Table).

Discussion
Approximately 60% of cases admitted to 20 hospitals participating in the Michigan Coverdell Stroke Registry from 2008 to 2009 received all 5 subcomponents of the stroke education PM. More than 90% of cases received education on physician follow-up and discharge medications, whereas about two thirds received education on stroke risk factors, stroke warning signs, and EMS activation. Our findings are similar to previous reports; data from 4 PCNASR states (Georgia, Illinois, Massachusetts, and North Carolina) found that 59% of stroke admissions received stroke education,5 whereas 69% received stroke education in the GWTG-Stroke program.8 A major motivation for the stroke education measure is the observation that stroke survivors and at-risk populations have poor knowledge of stroke symptoms, risk factors, and the need for urgent action when symptoms are first recognized.9,10 Although studies of stroke survivors find a broad array of ongoing educational needs and challenges after...
hospital discharge, evidence for a strong effect of stroke education on patient outcomes is lacking. Although identifying the most effective and efficient methods for delivering stroke education remains a challenge, a variety of quality improvement-based approaches are available to assist hospitals to improve their compliance, for example, feedback reports, toolkits, and electronic orders sets designed to invoke and document the delivery of stroke education.

Our data have some limitations. Our sites were mostly larger, teaching hospitals and primary stroke centers, which may limit generalizability. The registry does not collect information on outcomes after discharge and cannot identify which hospitals incorporated stroke education into their care protocols. Also, in some instances, stroke education may have been delivered but not documented. We also note that the PCNASR definition of the stroke education PM used in this analysis includes all stroke subtypes, whereas the definition used by The Joint Commission and National Quality Forum is limited to ischemic and hemorrhagic stroke. Inclusion of TIA cases decreased the overall level of compliance because conformity among TIA admissions (57.3%) was lower than in ischemic stroke admissions (66.9%).

Our data illustrate that substantial opportunities exist for hospitals to improve delivery of stroke education to patients and their families. Since 2010, the stroke education PM has been limited to only patients discharged home. Although we found that compliance was slightly higher in this group (65%), there remains substantial room for improvement. However, given the lack of evidence that stroke education impacts patient outcomes, further research not only needs to identify best practices for the efficient delivery of stroke education in the inpatient setting, but also needs to examine the efficacy and cost-effectiveness of these efforts to produce meaningful changes in patient outcomes.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>Compliance, %</th>
<th>Unadjusted OR (95% CI)</th>
<th>Adjusted* OR (95% CI)</th>
<th>Type 3 χ², P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50</td>
<td>999</td>
<td>66.9</td>
<td>0.99 (0.90–1.10)</td>
<td>0.97 (0.88–1.07)</td>
<td>11.2, 0.02</td>
</tr>
<tr>
<td>50–59</td>
<td>1509</td>
<td>65.8</td>
<td>Ref</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>60–69</td>
<td>2022</td>
<td>65.4</td>
<td>1.00 (0.87–1.15)</td>
<td>0.96 (0.85–1.10)</td>
<td></td>
</tr>
<tr>
<td>70–79</td>
<td>2320</td>
<td>60.6</td>
<td>0.86 (0.74–1.01)</td>
<td>0.88 (0.79–0.98)</td>
<td></td>
</tr>
<tr>
<td>&gt;80</td>
<td>2757</td>
<td>56.1</td>
<td>0.75 (0.65–0.87)</td>
<td>0.81 (0.73–0.89)</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not white</td>
<td>6632</td>
<td>59.2</td>
<td>Ref</td>
<td>...</td>
<td>0.10, 0.75</td>
</tr>
<tr>
<td>White</td>
<td>2975</td>
<td>67.6</td>
<td>0.93 (0.80–1.07)</td>
<td>0.98 (0.85–1.13)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4614</td>
<td>63.2</td>
<td>Ref</td>
<td>...</td>
<td>0.05, 0.82</td>
</tr>
<tr>
<td>Female</td>
<td>4992</td>
<td>60.4</td>
<td>0.94 (0.87–1.00)</td>
<td>1.01 (0.94–1.09)</td>
<td></td>
</tr>
<tr>
<td>Stroke type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischemic</td>
<td>5984</td>
<td>66.9</td>
<td>Ref</td>
<td>...</td>
<td>6.6, 0.09</td>
</tr>
<tr>
<td>Hemorrhagic</td>
<td>989</td>
<td>42.7</td>
<td>0.35 (0.22–0.55)</td>
<td>0.35 (0.22–0.58)</td>
<td></td>
</tr>
<tr>
<td>TIA</td>
<td>2313</td>
<td>57.3</td>
<td>0.65 (0.52–0.83)</td>
<td>0.59 (0.48–0.72)</td>
<td></td>
</tr>
<tr>
<td>SNS</td>
<td>321</td>
<td>57.9</td>
<td>0.68 (0.46–0.99)</td>
<td>0.76 (0.49–1.20)</td>
<td></td>
</tr>
<tr>
<td>Prestroke ambulatory status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Able</td>
<td>8744</td>
<td>63.1</td>
<td>Ref</td>
<td>...</td>
<td>5.4, 0.02</td>
</tr>
<tr>
<td>Unable†</td>
<td>863</td>
<td>48.9</td>
<td>0.53 (0.44–0.65)</td>
<td>0.58 (0.51–0.67)</td>
<td></td>
</tr>
<tr>
<td>Discharge destination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>6317</td>
<td>65.5</td>
<td>Ref</td>
<td>...</td>
<td>5.7, 0.02</td>
</tr>
<tr>
<td>Other‡</td>
<td>3290</td>
<td>54.7</td>
<td>0.65 (0.48–0.88)</td>
<td>0.67 (0.49–0.93)</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>4609</td>
<td>56.0</td>
<td>Ref</td>
<td>...</td>
<td>5.9, 0.02</td>
</tr>
<tr>
<td>2009</td>
<td>4998</td>
<td>67.2</td>
<td>1.56 (1.11–2.19)</td>
<td>1.58 (1.08–2.29)</td>
<td></td>
</tr>
<tr>
<td>Hospital size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large &gt;300</td>
<td>7700</td>
<td>60.5</td>
<td>Ref</td>
<td>...</td>
<td>7.3, 0.03</td>
</tr>
<tr>
<td>Med 100–300</td>
<td>1586</td>
<td>73.9</td>
<td>2.20 (1.16–4.17)</td>
<td>2.31 (0.80–6.69)</td>
<td></td>
</tr>
<tr>
<td>Small &lt;100</td>
<td>321</td>
<td>31.5</td>
<td>0.36 (0.19–0.71)</td>
<td>0.53 (0.17–1.59)</td>
<td></td>
</tr>
</tbody>
</table>

CI indicates confidence interval; OR, odds ratio; SNS, stroke not specified; and TIA, transient ischemic attack.

*Multivariable model included all variables.

†Unable to ambulate without person’s assistance or status not documented.

‡All other destinations (nursing home, rehabilitation facility, long-term care hospital).
Sources of Funding
This work was supported by the Michigan Department of Community Health and the CDC (Grant #U58 DP000854-01).

Disclosures
None.

References
Compliance With the Stroke Education Performance Measure in the Michigan Paul Coverdell National Acute Stroke Registry

Adrienne Nickles, Jay Fiedler, Stacey Roberts, Sarah Lyon-Callo, Rochelle Hurst and Mathew Reeves

Stroke. published online March 21, 2013;

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/early/2013/03/21/STROKEAHA.111.000763

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Stroke can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Stroke is online at:
http://stroke.ahajournals.org//subscriptions/