Graduating US Neurology Residents’ Experience With Tissue-Type Plasminogen Activator for Acute Stroke
A 10-Year Comparison

Vera Fridman, MD; Jonathan Raser, MD, PhD; Kate Brizzi, BS; Brett Cucchiara, MD

Background and Purpose—A survey of graduating neurology residents conducted in 2000 showed that many residents had limited experience and comfort treating with tissue-type plasminogen activator (tPA). We examined changes in residents’ experience during the past decade.

Methods—A 12-item survey was sent to US neurology residents in their final year of training. Items examined residents’ experience and confidence with assessment of the acute stroke patient and use of tPA for treatment. Questions were worded identically in the 2000 and 2010 surveys, and responses were compared between the two.

Results—Of 491 residents, 286 (58%) responded. There was a significant increase from 2000 to 2010 in the percentage of residents who felt comfortable independently treating with tPA (73% versus 94%, \(P<0.001\)), who had observed administration of tPA (88% versus 99%, \(P<0.001\)), who had personally treated with tPA (80% versus 95%, \(P<0.001\)), and who had been involved in post-tPA care (89% versus 98%, \(P<0.001\)). There was a substantial increase in residents with formal training in using the National Institutes of Health Stroke Scale (65% versus 92%, \(P<0.001\)) and who had dedicated stroke teams at their institution (84% versus 93%, \(P=0.001\)).

Conclusions—Neurology residents’ experience and comfort treating acute ischemic stroke with tPA increased significantly between 2000 and 2010, as did resident exposure to stroke teams and formal training in the National Institutes of Health Stroke Scale. (Stroke. 2011;42:2963-2965.)

Key Words: tPA • thrombolysis • acute stroke

Intravenous tissue-type plasminogen activator (tPA) has been shown to improve outcomes after acute ischemic stroke and is recommended by current practice guidelines. Despite this, <10% of ischemic stroke patients receive treatment with tPA. Lack of physician experience and confidence with tPA may contribute to underutilization of this therapy. Neurology residents who completed their training in June 2000 were the first cohort to have received their entire 4 years of training after US Food and Drug Administration approval of tPA. A survey of this cohort in 2000 showed that 12% had not treated patients with tPA or observed treatment, and 27% did not feel comfortable independently using tPA. The aim of the present study was to assess whether graduating neurology residents’ experience with tPA had changed during the past decade.

Methods
From the American Medical Association Graduate Medical Education Database (copyright 2009; Chicago, IL), all adult neurology residents expected to complete their final year of training in the United States in June 2010 were identified. A 12-item questionnaire was mailed in March 2010, with follow-up surveys mailed to nonresponders in April, May, and June 2010. All responses were anonymous, but surveys were coded to avoid duplicate responses. A 5-point Likert scale was used to assess residents’ experience with the administration of tPA, their degree of comfort treating patients with tPA, whether they had formal training in using the National Institutes of Health Stroke Scale, and whether they had confidence in identifying hemorrhage and early infarct signs on head computed tomography. The presence or absence of a dedicated stroke team at the residents’ major teaching hospitals and expected career plans were also assessed. These questions were identical to those in the survey conducted in 2000. In addition, residents were asked whether their institution performed endovascular interventions for stroke and whether clinical trials in acute stroke were performed at their institution. This study was approved by our local institutional review board.

Results
Current addresses were available for 491 of 522 graduating neurology residents. Of these, 286 (58%) responded to the survey. Responses are summarized in the Table. Ninety-five percent of residents had personally used tPA to treat a patient who had had a stroke. Of these, 59% had treated a stroke patient with tPA at least once without direct faculty supervision. Four percent of residents had observed ad-
ministration of tPA but had not personally treated a patient. Only 1% had neither treated nor observed treatment. Overall, 94% of residents felt comfortable independently treating stroke patients with tPA. Prior personal experience with tPA was strongly associated with comfort using tPA; 96% of experienced residents felt comfortable compared with 60% of inexperienced residents (odds ratio \( \text{OR} = 17.4; \text{95\% CI}, 5.2 \text{ to } 58.4; P = 0.001 \)). Nearly all residents felt confident in their ability to identify hemorrhage (100%) and early infarct signs (98%) on head computed tomography, and 93% reported formal training in the National Institutes of Health Stroke Scale (65% versus 93%, \( P = 0.005 \)) and formal training in the National Institutes of Health Stroke Scale (67% versus 45%; \( \text{OR} = 2.4; \text{95\% CI}, 1.0 \text{ to } 5.8; P = 0.04 \)).

Compared with the survey responses in 2000, there was a significant increase in the percentage of residents who felt comfortable independently treating with tPA (73% versus 94%, \( P < 0.001 \)), who had observed the administration of tPA (88% versus 99%, \( P < 0.001 \)), who had personally treated with tPA (80% versus 95%, \( P < 0.001 \)), and who had been involved in post-tPA care (89% versus 98%, \( P < 0.001 \)). There was a substantial increase in the percentage of residents who were formally trained in the National Institutes of Health Stroke Scale (65% versus 93%, \( P < 0.001 \)) and who had dedicated stroke teams at their institution (84% versus 93%, \( P = 0.001 \)). As in 2000, the vast majority of residents were confident in their ability to identify hemorrhage (99% to 100%, \( P = \text{NS} \)) and early infarct signs (94% to 98%, \( P = 0.02 \)) on computed tomography.

**Discussion**

Intravenous tPA remains the only US Food and Drug Administration–approved treatment for acute ischemic stroke. It is imperative that neurology residents attain a level of comfort with the use of tPA that will allow them to utilize the medication effectively in their clinical practice and guide other physicians in its use. Not surprisingly, a strong association exists between residents’ personal experience with using tPA and their level of comfort in using tPA independently.

Despite the increased exposure of residents to tPA, there is significant variability in the amount of autonomy given to residents in the care of acute stroke patients. Close supervision of residents may result in better selection of patients for thrombolytic therapy and improve care during and after treatment. On the other hand, giving neurology residents more autonomy in decision making regarding tPA administration may increase their comfort using tPA in practice. This balance between supervision and independence is a fundamental tension throughout medical training. There has been at least one formal assessment of resident-driven tPA administration, which showed that this paradigm can be safe and expeditious when adequate training is ensured.

There are several limitations to our study. First, our survey relied on self-assessment rather than objective evidence of resident competence in using tPA. Second, residents more interested in and comfortable with acute stroke care might be more likely to be trusted with using tPA independently, thus confounding the relation between experience and comfort. Finally, despite a nearly identical number of responses to the current survey compared with the previous 2000 survey, owing to growth in the number of neurology resident positions, the overall response rate was somewhat lower than in 2000. It is possible that residents with less experience with

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**Table. 10-Year Comparison in Resident Survey Responses**

<table>
<thead>
<tr>
<th></th>
<th>2000 Proportion of Residents (n = 287)</th>
<th>2010 Proportion of Residents (n = 286)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed tPA treatment</td>
<td>88%</td>
<td>99%</td>
</tr>
<tr>
<td>Personally treated with tPA</td>
<td>80%</td>
<td>95%</td>
</tr>
<tr>
<td>Only with supervision</td>
<td>59%</td>
<td>35%</td>
</tr>
<tr>
<td>With and without supervision</td>
<td>36%</td>
<td>55%</td>
</tr>
<tr>
<td>Only without supervision</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Provided post-tPA care</td>
<td>89%</td>
<td>98%</td>
</tr>
<tr>
<td>Comfortable independently giving tPA</td>
<td>73%</td>
<td>94%</td>
</tr>
<tr>
<td>NIHSS training</td>
<td>65%</td>
<td>93%</td>
</tr>
<tr>
<td>Confident in ability to identify hemorrhage on head CT</td>
<td>99%</td>
<td>100%</td>
</tr>
<tr>
<td>Confident in ability to identify early infarct signs on CT</td>
<td>94%</td>
<td>98%</td>
</tr>
<tr>
<td>Presence of stroke team</td>
<td>84%</td>
<td>93%</td>
</tr>
<tr>
<td>Institution performs stroke clinical trials</td>
<td>*</td>
<td>86%</td>
</tr>
<tr>
<td>Institution performs endovascular procedures in acute stroke</td>
<td>*</td>
<td>96%</td>
</tr>
<tr>
<td>Postresidency career plans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic</td>
<td>50%</td>
<td>51%</td>
</tr>
<tr>
<td>Private practice</td>
<td>44%</td>
<td>35%</td>
</tr>
<tr>
<td>Other</td>
<td>6%</td>
<td>14%</td>
</tr>
</tbody>
</table>

* tPA indicates tissue-type plasminogen activator; NIHSS, National Institutes of Health Stroke Scale; CT, computed tomography.

*Not included in the 2000 survey.*

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52% only with direct supervision; \( \text{OR} = 3.2; \text{95\% CI}, 1.9 \text{ to } 5.4; P = 0.001 \). The presence of a stroke team (68% versus 37%; \( \text{OR} = 3.7; \text{95\% CI}, 1.4 \text{ to } 9.7; P = 0.005 \)) and formal training in the National Institutes of Health Stroke Scale (67% versus 45%; \( \text{OR} = 2.4; \text{95\% CI}, 1.0 \text{ to } 5.8; P = 0.04 \)) were also associated with strong agreement that a resident is comfortable using tPA independently. There was no significant association between postresidency career plans and comfort in using tPA.
tPA may have been less likely to respond, thus overestimating residents’ experience and confidence with tPA. Nevertheless, the dramatic improvement in both resident experience and comfort with tPA during the last decade is certainly encouraging. Whether this improvement is the result of focused efforts to improve resident training or instead reflects broader trends of increasing penetration and acceptance of tPA use is uncertain. Our results do suggest that allowing residents to have more autonomy when using tPA during their training may improve their comfort using tPA in clinical practice.

Disclosures

None.

References

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