

# Quality of Care for Veterans With In-Hospital Stroke

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Veterans who develop an in-hospital stroke and those who present to the emergency department with stroke symptoms received similar care, but some differences suggest the need to better standardize stroke care regardless of care setting.

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Stroke is a leading cause of death and long-term disability in the US.<sup>1</sup> Quality improvement efforts for acute stroke care delivery have successfully led to increased rates of thrombolytic utilization.<sup>2</sup> Increasing attention is now being paid to additional quality metrics for stroke care, including hospital management and initiation of appropriate secondary stroke prevention measures at discharge. Many organizations, including the Veterans Health Administration (VHA), use these measures to monitor health care quality and certify centers that are committed to excellence in stroke care.<sup>3-6</sup> It is anticipated that collection, evaluation, and feedback from these data may lead to improvements in outcomes after stroke.<sup>7</sup>

Patients who experience onset of stroke symptoms while already admitted to a hospital may be uniquely suited for quality improvement strategies. In-hospital strokes (IHS) are not uncommon and have been associated with higher stroke severity and increased mortality compared with patients with stroke symptoms prior to arriving at the emergency department (ED).<sup>8-10</sup> A potential reason for the higher observed mortality is that patients with IHS may have poorer access to acute stroke resources, such as stroke teams and neuroimaging, as well as increased rates of medical comorbidities.<sup>9,11,12</sup> Furthermore, stroke management protocols are typically created based on ED resources, which may not be equivalent to resources available on inpatient settings.

Although many studies have examined clinical characteristics of patients with IHS, few studies have looked at the quality of stroke care for IHS. Information on stroke quality data is even more limited in VHA

hospitals due to the small number of admitted patients with stroke.<sup>13</sup> VHA released a directive on Acute Stroke Treatment (Directive 2011-03) in 2011 with a recent update in 2018, which aimed to implement quality improvement strategies for stroke care in VHA hospitals.<sup>14</sup> Although focusing primarily on acute stroke care in the ED, this directive has led to increased awareness of areas for improvement, particularly among larger VHA hospitals. Prior to this directive, although national stroke guidelines were well-defined, more variability likely existed in stroke protocols and the manner in which stroke care was delivered across care settings. As efforts to measure and improve stroke care evolve, it is important to ensure that strategies used in ED settings also are implemented for patients already admitted to the hospital. This study seeks to define the quality of care in VHA hospitals between patients having an in-hospital ischemic stroke compared with those presenting to the ED.

## METHODS

As a secondary analysis, we examined stroke care quality data from an 11-site VHA stroke quality improvement study.<sup>15</sup> Sites participating in this study were high stroke volume VHA hospitals from various geographic regions of the US. This study collected data on ICD-9 discharge diagnosis-defined ischemic stroke admissions between January 2009 and June 2012. Patient charts were reviewed by a group of central, trained abstractors who collected information on patient demographics, clinical history, and stroke characteristics. Stroke severity was defined using the National Institutes of Health Stroke Scale (NIHSS), assessed by standardized retrospective review of admission physical

**TABLE 1** Characteristics of Study Patients With Stroke

Variables	In-Hospital (n = 35)	Emergency Department (n = 1788)	P Value
Male sex, No. (%)	32 (91.4)	1723 (96.4)	.14
Age, mean (SD), y	68.1 (11.8)	67.2 (11.0)	.54
Race, No. (%)			
White	21 (60.0)	1070 (59.8)	.99
Black	14 (40)	580 (32.4)	.34
Other	0 (0.0)	138 (7.7)	.11
NIHSS, mean (SD)	11.3 (10.7)	5.1 (5.0)	< .01
Length of stay, mean (SD), d	12.8 (10.0)	7.3 (6.8)	< .01
Discharge to home, No. (%)	12 (34.3)	1141 (63.0)	< .01

Abbreviation: NIHSS, National Institutes of Health Stroke Scale.

examination documentation.<sup>16</sup> A multidisciplinary team defined 11 stroke quality indicators (QIs; the 8 Joint Commission indicators and 3 additional indicators: smoking cessation and dysphagia screening, and NIHSS assessment), and the chart abstractors' data were used to evaluate eligibility and passing rates for each QI.

For our analysis, patients were stratified into 2 categories: patients admitted to the hospital for another diagnosis who developed an IHS, and patients presenting with stroke to the ED. We excluded patients transferred from other facilities. We then compared the demographic and clinical features of the 2 groups as well as eligibility and passing rates for each of the 11 QIs. Patients were recorded as eligible if they did not have any clinical contraindication to receiving the assessment or intervention measured by the quality metric. Passing rates were defined by the presence of clear documentation in the patient record that the quality metric was met or fulfilled. Comparisons were made using nonparametric Mann-Whitney U tests and chi-square tests. All tests were performed at  $\alpha$  .05 level.

## RESULTS

A total of 1823 patients were included in this analysis: 35 IHS and 1788 ED strokes. The 2 groups did not differ with respect to age, race, or sex (Table 1). Patients with IHS had higher stroke severity (mean NIHSS 11.3 vs 5.1,  $P < .01$ ) and longer length of stay than did ED patients with stroke (mean 12.8 vs 7.3 days,  $P < .01$ ). Patients with IHS also

were less likely to be discharged home when compared with ED patients with stroke (34.3% vs 63.8%,  $P < .01$ ).

Table 2 summarizes our findings on eligibility and passing rates for the 11 QIs. For acute care metrics, we found that stroke severity documentation rates did not differ but were low for each patient group (51% vs 48%,  $P = .07$ ). Patients with IHS were more likely to be eligible for IV tissue plasminogen activator (tPA;  $P < .01$ ) although utilization rates did not differ. Only 2% of ED patients met eligibility criteria to receive tPA (36 of 1788), and among these patients only 16 actually received the drug. By comparison, 5 of 6 of eligible patients with IHS received tPA. Rates of dysphagia screening also were low for both groups, and patients with IHS were less likely to receive this screen prior to initiation of oral intake than were ED patients with stroke (27% vs 50%,  $P = .01$ ).

Beyond the acute period, we found that patients with IHS were less likely than were ED patients with stroke to be eligible to receive antithrombotic therapy by 2 days after their initial stroke evaluation (74% vs 96%,  $P < .01$ ), although treatment rates were similar between the 2 groups ( $P = .99$ ). In patients with documented atrial fibrillation, initiation of anticoagulation therapy also did not differ ( $P = .99$ ). The 2 groups were similar with respect to initiation of venous thromboembolism (VTE) prophylaxis ( $P = .596$ ) and evaluation for rehabilitation needs ( $P = .42$ ). Although rates of smoking cessation counseling and stroke education prior to discharge did not differ, overall rates of stroke education were very low for both groups (25% vs 36%,  $P = .55$ ).

Similar to initiation of antithrombotic therapy in the hospital, we found lower rates of eligibility to receive antithrombotic therapy on discharge in the IHS group when compared with the ED group (77% vs 93%,  $P = .04$ ). However, actual treatment initiation rates did not differ ( $P = .12$ ). Use of lipid-lowering agents was similar for the 2 groups ( $P = .12$ ).

## DISCUSSION

Our study found that veterans who develop an IHS received similar quality of care as did those presenting to the ED with stroke symptoms for many QIs, although there were

some notable differences. We were pleased to find that overall rates of secondary stroke prevention initiation (antithrombotic and statin therapy), VTE prophylaxis, rehabilitation evaluations, and smoking cessation counseling were high for both groups, in keeping with evidence-based guidelines.<sup>17</sup> This likely reflected the fact that these metrics typically involve care outside of the acute period and are less likely to be influenced by the location of initial stroke evaluation. Furthermore, efforts to improve smoking cessation and VTE prophylaxis are not exclusive to stroke care and have been the target of several nonstroke quality projects in the VHA. Many aspects of acute stroke care did differ, and present opportunities for quality improvement in the future.

In our sample, patients with IHS had higher IV thrombolytic eligibility, which has not typically been reported in other samples.<sup>10,11,18</sup> In these studies, hospitalized patients have been reported to more often have contraindications to tPA, such as recent surgery or lack of stroke symptom recognition due to delirium or medication effects. Interestingly, patients presenting to VHA EDs had extremely low rates of tPA eligibility (2%), which is lower than many reported estimates of tPA eligibility outside of the VHA.<sup>19,20</sup> This may be due to multiple influences, such as geographic barriers, patient perceptions about stroke symptoms, access to emergency medical services (EMS), EMS routing patterns, and social/cultural factors. Although not statistically significant due to small sample size, tPA use also was twice as high in the IHS group.

Given that a significant proportion of patients with IHS in the VHA system may be eligible for acute thrombolysis, our findings highlight the need for acute stroke protocols to ensure that patients with IHS receive the same rapid stroke assessment and access to thrombolytics as do patients evaluated in the ED. Further investigation is needed to determine whether there are unique features of patients with IHS in VHA hospitals, which may make them more eligible for IV thrombolysis.

Dysphagia is associated with increased risks for aspiration pneumonia in stroke patients.<sup>21</sup> We found that patients with IHS were less likely to receive dysphagia screening compared with that of stroke patients

**TABLE 2** Quality Indicator Eligibility and Passing Rates

Indicators	In-Hospital (n = 35)	Emergency Department (n = 1788)	P Value
tPA utilization, No. (%)			
Eligible	6 (17.1)	36 (2.0)	< .01
Pass	5 (83.3)	16 (44.4)	.18
NIHSS completed, No. (%)			
Eligible	35 (100.0)	1785 (99.9)	.99
Pass	18 (51.4)	852 (47.7)	.67
Dysphagia screening, No. (%)			
Eligible	33 (94.3)	1765 (98.7)	.99
Pass	9 (27.3)	874 (49.5)	.01
VTE prophylaxis by hospital day 2, No. (%)			
Eligible	32 (91.4)	1767 (99.4)	.99
Pass	27 (84.4)	1539 (87.1)	.60
Antithrombotic by hospital day 2, No. (%)			
Eligible	26 (74.3%)	712 (95.7)	< .01
Pass	24 (92.3%)	1571 (91.8)	.99
Antithrombotic at discharge, No. (%)			
Eligible	27 (77.1)	1656 (92.6)	.04
Pass	25 (92.6)	1623 (98.0)	.12
Lipid agent at discharge, No. (%)			
Eligible	25 (71.4)	1389 (77.7)	.38
Pass	21 (84.0)	1284 (92.4)	.12
Anticoagulation for atrial fibrillation, No. (%)			
Eligible	6 (17.1)	213 (11.9)	.30
Pass	5 (83.3)	161 (75.6)	.99
Rehabilitation evaluation, No. (%)			
Eligible	32 (91.4)	1726 (96.5)	.13
Pass	30 (93.8)	1508 (87.4)	.42
Stroke education, No. (%)			
Eligible	12 (34.3)	1173 (65.6)	< .01
Pass	3 (25.0)	424 (36.1)	.55
Smoking cessation, No. (%)			
Eligible	4 (11.4)	665 (37.2)	.02
Pass	4 (100.0)	618 (92.9)	.99

Abbreviations: NIHSS, National Institutes of Health Stroke Scale; tPA, tissue plasminogen activator; VTE, venous thromboembolism.

admitted through the ED. This finding is consistent with the fact that care for patients with IHS is less frequently guided by specific stroke care protocols and algorithms that are more often used in EDs.<sup>8,11</sup> Although attention to swallowing function may lead to improved outcomes in stroke, this can be easily overlooked in patients with IHS.<sup>22</sup> However, low dysphagia screening also was found in patients admitted through the ED, suggesting that low screening rates cannot be solely explained by differences in where the initial stroke evaluation is occurring. These findings

suggest a need for novel approaches to dysphagia screening in VHA stroke patients that can be universally implemented throughout the hospital.

Finally, we also found very low rates of stroke education prior to discharge for both groups. Given the risk of stroke recurrence and the overall poor level of public knowledge about stroke, providing patients with stroke with formal oral and written information on stroke is a critical component of secondary prevention.<sup>23,24</sup> Educational tools, including those that are veteran specific, are now available for use in VHA hospitals and should be incorporated into quality improvement strategies for stroke care in VHA hospitals.

In 2012, the VHA Acute Stroke Treatment Directive was published in an effort to improve stroke care systemwide. Several of the metrics examined in this study are addressed in this directive. The data presented in this study is one of the only samples of stroke quality metrics within the VHA that largely predates the directive and can serve as a baseline comparator for future work examining stroke care after release of the directive. At present, although continuous internal reviews of quality data are ongoing, longitudinal description of stroke care quality since publication of the directive will help to inform future efforts to improve stroke care for veterans.

### Limitations

Despite the strength of being a multicenter sampling of stroke care in high volume VHA hospitals, our study had several limitations. The IHS sample size was small, which limited our ability to evaluate differences between the groups, to evaluate generalizability, and account for estimation error.<sup>13</sup> It is possible that differences existed between the groups that could not be observed in this sample due to small size (type II error) or that patient-specific characteristics not captured by these data could influence these metrics. Assessments of eligibility and passing were based on retrospective chart review and post hoc coding. Our sample assessed only patients who presented to larger VHA hospitals with higher stroke volumes, thus these findings may not be generalizable to smaller VHA hospitals with less systematized stroke care. This sample did not

describe the specialty care services that were received by each patient, which may have influenced their stroke care. Finally, this study is an analysis of use of QIs in stroke care and did not examine how these indicators affect outcomes.

### CONCLUSION

Despite reassuring findings for several inpatient ischemic stroke quality metrics, we found several differences in stroke care between patients with IHS compared with those presenting to the ED, emphasizing the need for standardized approaches to stroke care regardless of care setting. Although patients with IHS may be more likely to be eligible for tPA, these patients received dysphagia screening and less often than did ED patients with stroke. Ongoing quality initiatives should continue to place emphasis on improving all quality metrics (particularly dysphagia screening, stroke severity documentation, and stroke education) for patients with stroke at VHA hospitals across all care settings. Future work will be needed to examine how specific patient characteristics and revisions to stroke protocols may affect stroke quality metrics and outcomes between patients with IHS and those presenting to the ED.

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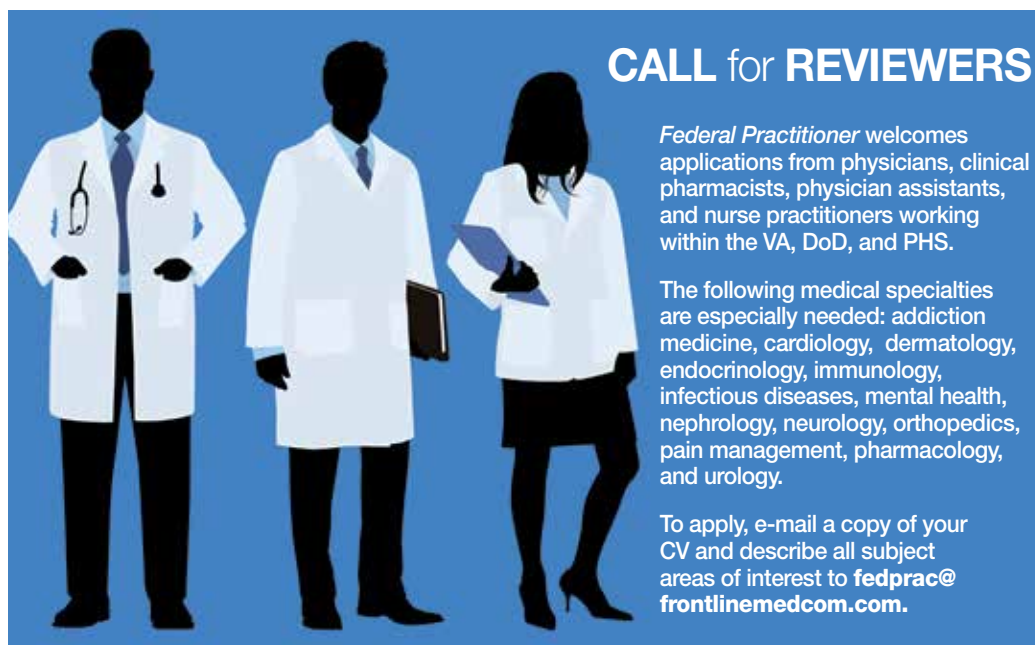
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