



Quality Improvement

# Improvement of Confidence and Knowledge Retention for Stroke Management Among Internal Medicine Trainees During an Institution-Specific, Protocol-Oriented Lecture Based Intervention

Vincent LaBarbera, MD<sup>1</sup>, Daniel Sacchetti, DO<sup>1</sup>

<sup>1</sup> Department of Neurology, Warren Alpert Medical School of Brown University

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## Article Information

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## Abstract

**BACKGROUND:** Acute stroke management is an essential component of neurology residency education. Internal medicine trainees are less likely to receive dedicated training in acute stroke care despite having to care for hospitalized patients with a stroke diagnosis. **OBJECTIVE:** The objectives of this survey-based quality improvement study were to: 1) assess pre-existing confidence and knowledge about acute stroke care among internal medicine trainees and 2) measure change after an institution-specific, protocol-oriented “value added lecture” (intervention). **METHODS:** Pre-intervention survey and knowledge assessment was given to internal medicine physicians, residents, and students, followed by the intervention on acute stroke management, during academic year 2019-2020. Post-intervention assessment was administered immediately post-intervention, and again at end of rotation. A 10-point Likert scale was used to indicate confidence. Statistics were performed using Student’s T-Test. **RESULTS:** Fifty-one respondents participated, out of a possible 162 (31% participation rate); 13 (25%) of the 51 respondents completed the delayed post-intervention survey. Only twenty-six (51%) participants had previously received a lecture on acute stroke management. Respondents’ knowledge and confidence on acute stroke management improved after intervention ( $p < 0.0001$ ), with no change in these scores by end of rotation ( $p = 0.31$ ). Forty-five (88%) respondents agreed or strongly agreed that a targeted stroke didactic was a useful part of internal medicine training. **CONCLUSIONS:** An institution-specific, protocol-oriented lecture improved stroke management knowledge and confidence among internal medicine trainees, particularly among earlier trainees. A dedicated stroke management lecture should be considered as an addition to internal medicine training programs’ curricula.

## INTRODUCTION

Acute ischemic stroke, cited as the fifth leading cause of mortality in the United States and third largest cause of disease burden globally in 2019, continues to be a major health problem facing medical practitioners.<sup>1,2</sup> Neurologists are often sought to be the primary caretakers for these patients while in hospital,<sup>3,4</sup> although the number of patients with inadequate access to neurologists remains elevated, both inpatient and outpatient.<sup>3-6</sup> A large proportion of stroke care falls on internists, family practitioners, cardiologists, and/or geriatricians. A large minority of patients, up to 17%, had symptom onset of stroke during hospitalization, having been admitted for another issue.<sup>7,8</sup> Multiple studies reveal that knowledge and confidence in clinical neurology amongst general medical trainees fared more poorly when compared to other specialties, despite the importance that neurology fared in

their eventual clinical practice.<sup>9-11</sup> These observations may have an origin in “neurophobia,” a concept defined by Dr. Ralph Jozefowicz as “fear of the neural sciences and clinical neurology that is due to the students’ inability to apply their knowledge of basic sciences to clinical situations.”<sup>12</sup>

In this quality improvement initiative, we aimed to identify internal medicine trainees’ comfort levels and pre-existing knowledge about acute stroke care, and to assess their comfort and registration of knowledge after a “value-added lecture,” hereby defined as a lecture that provides practical and institution-specific management protocols in addition to didactic or factoid-based material. We hypothesize that this type of lecture may be successful in increasing clinical knowledge regarding acute stroke management and confronting neurophobia among internal medical trainees in an academic medical setting. This model is differentiated from a traditional lec-

ture, which aims to provide only didactic material without institution-specific or protocol-oriented practical guidelines.

## METHODS

The intervention was prepared by the authors and was administered at a one-hour long morning conference for internal medicine physicians, residents and students rotating at a primary stroke center hospital. This occurred for six consecutive months, during academic year 2019-2020, in the first week of the month-long internal medicine rotation. The lecture concentrated on acute stroke care and management, including discussion on recognition of stroke symptoms, a review of the National Institutes of Health Stroke Scale (NIHSS) and its utilization, and the indications and contraindications for tissue plasminogen activator (t-PA) and mechanical thrombectomy in acute stroke, in addition to institution-specific stroke care goals and protocols and practical tools for non-neurologists. A survey and knowledge assessment, created by the authors, without external validity tools (Supplement 1), was given prior to the lecture, immediately after, and then again at the end of the rotation, on average twenty-two days after the initial lecture (“delayed”). The survey consisted of questions, graded on a 10-point Likert Scale (1 = very uncomfortable, scared; 10 = very comfortable), detailing comfort in responding to an inpatient stroke code, recognizing signs of acute stroke, understanding indications/contraindications for acute stroke interventions, and institution-specific stroke algorithms. A 5-point Likert Scale question assessing the perceived usefulness of this talk to the resident was asked both immediately post-intervention and at the end of the trainees’ rotation. Results of these questions were tabulated and entered into Microsoft Excel (Microsoft Office 2016) in an anonymized fashion, with an internally consistent password to maintain continuity among the participants. Student’s paired, 1-tailed t-test was used to determine significance, with a p-value of <0.05 used. This project was deemed exempt as Human Research by the Brown University Institutional Review Board, under the auspices of Quality Improvement.

## RESULTS

A total of 162 persons were identified as eligible participants for this survey (60 medical students during their internal medicine clerkship, 48 internal medicine interns (post grad year(PGY)1), 30 residents (PGY2 or 3), and 24 attending physicians). Fifty-one respondents (31%) participated in the intervention lecture and completed pre- and post-lecture surveys and quizzes. Of the fifty-one respondents, twenty (39%) were medical students, zero (0%) were interns, eleven (22%) were PGY2 residents, eighteen (35%) were PGY3 residents, and two (4%) were

attending physicians. Of the 51 respondents, 13 (25%) completed the delayed recall survey, on average 22 days after the intervention lecture.

Twenty-six respondents (51%) reported having received a lecture on acute stroke management before. Of those, seven (27%) were medical students, six (23%) were PGY2 residents, eleven (42%) were PGY3 residents, and two (8%) were attending physicians. Conversely, twenty-five (49%) participants either had never had a lecture on acute stroke management (n = 18, 35%), or could not recall ever having received one (n = 7, 14%). Of those who never had, or could not recall receiving, a lecture, thirteen (52%) were medical students, five (20%) were PGY2 residents, and seven (28%) were PGY3 residents; none of this group were attending physicians. Nine (18%) of the survey participants had never responded to an inpatient stroke code, twenty (39%) had responded to between one and five inpatient stroke codes, nineteen (37%) had responded to between six and ten stroke codes, and only three (6%) had responded to more than ten.

With regards to knowledge, the average pre-intervention knowledge score was 56% for all respondents. Medical students on average scored 45%, PGY2 residents scored 63%, PGY3 residents scored 62%, and attending physicians scored 75%. Post-intervention, the average score was 89%, which was statistically different from the pre-intervention score (p<0.0001). For the medical student, PGY2 resident, and PGY3 resident subgroups, average post-intervention scores were 85%, 89%, and 93%, respectively, achieving statistical significance for these groups (p<0.0002, p=0.0013, and p<0.0001, respectively). For the attending subgroup, average post-intervention score was 92%, and this was not significantly different (p=0.25).

With regards to confidence in various aspects of acute stroke care, three questions were asked, as described above in the Methods section. For Question 1 (confidence responding to an inpatient code stroke), the average pre-intervention confidence score was 5.2 (standard deviation SD= 2.3). Medical students on average reported 3.5, PGY2 residents reported 5.8, PGY3 residents reported 6.7, and attending physicians reported 6. Post-intervention, the average reported confidence was 6.4, which was statistically different from the pre-intervention score (p=0.0007). For the medical student and PGY2 resident subgroups, the average reported confidence was 5.3 and 7, respectively; statistical significance was obtained for these groups (p<0.0001 and p=0.04, respectively). For the PGY3 and attending subgroups, average post-intervention reported confidence was 7.2 and 7.5, respectively; these were not significantly different than pre-intervention (p=0.25 and p=0.25, respectively).

For Question 2 (confidence recognizing signs of an acute stroke), the average pre-intervention confidence score was 6.6 (SD=1.8). Medical students on average reported 5.6, PGY2 residents reported 7.0, PGY3 residents

reported 7.1, and attending physicians reported 9. Post-intervention, the average reported confidence was 7.0, which was not statistically different from the pre-intervention score, but trended toward significance ( $p=0.07$ ). For the medical student subgroup, the post-intervention average reported confidence was 6.4; statistical significance was obtained for this group ( $p=0.01$ ). For the PGY2, PGY3, and attending subgroups, average post-intervention reported confidence was 7.6, 7.3, and 7.5, respectively; these were not significantly different than pre-intervention ( $p=0.14$ , 0.34, and 0.25, respectively).

For Question 3 (confidence understanding indications/contraindications for acute stroke intervention), the average pre-intervention confidence score was 5.8 ( $SD=1.9$ ). Medical students on average reported 5.1, PGY2 residents reported 6.2, PGY3 residents reported 6.6, and attending physicians reported 6. Post-intervention, the average reported confidence was 6.8, which was statistically different from the pre-intervention score ( $p=0.0007$ ). For the medical student and PGY2 resident subgroups, the average reported confidence was 6.3 and 7.5, respectively; statistical significance was obtained for these groups ( $p<0.0001$  and  $p=0.004$ , respectively). For the PGY3 and attending subgroups, average post-intervention reported confidence was 7.1 and 7.5, respectively; these were not significantly different than pre-intervention ( $p=0.27$  and  $p=0.10$ , respectively).

The majority of respondents felt that a lecture on acute stroke management was a useful part of their internal medicine training. Forty five out of 51 (88%) either agreed or strongly agreed to the utility of the intervention. The remaining six were undecided; no respondents disagreed that the intervention was useful. On average, respondents scored the lecture 4.4 ( $SD=0.7$ ) out of 5. Medical students reported a score of 4.5, PGY2 residents reported 4.1, PGY3 residents reported 4.6, and attending physicians reported 5.

Among those who completed all three surveys, three (23%) were medical students, four (31%) were PGY2 residents, six (46%) were PGY3 residents. In the knowledge assessment portion of the delayed test, the average score for the total group was 89%, which was not significantly different from the post-intervention score of 87% ( $p=0.31$ ). This also held for each subgroup (medical student  $p=0.5$ , PGY2 resident  $p=0.32$ , PGY3 resident  $p=0.18$ ). With regards to the confidence questions, similarly, there was no significant difference between the reported confidence levels at the post-intervention survey and the delayed survey (Confidence question 1  $p=0.16$ ; Confidence question 2  $p=0.09$ ; Confidence question 3  $p=0.13$ ). There was no significant difference between the reported level of utility for this talk between the post-intervention survey and the delayed survey ( $p=0.14$ ).

## DISCUSSION

This quality improvement study aimed to determine the impact of a “value-added” lecture-based intervention on pre-existing knowledge and level of comfort with acute ischemic stroke management on the inpatient services among medical students, internal medicine trainees and physicians at a single academic institution’s affiliated primary stroke center. In an attempt to combat “neurophobia”, and even “strokophobia,” this project’s findings may provide evidence for a mechanism for medical educators to improve knowledge gaps and confidence in acute stroke management for internal medicine physicians-in-training, using institution-specific and protocol-oriented lectures aimed to standardize acute stroke care among non-neurologists.<sup>12,13</sup>

It has been shown in several studies that “poor teaching,” as perceived by general medical trainees, has been associated with neurophobia in this population.<sup>9-11</sup> There appears to be a diminishing level of emphasis given to traditional didactics, partly evidenced by a decreasing trend in lecture attendance at the medical student level.<sup>14</sup> It is conceivable that “poor teaching” may be one of the facets leading to this trend. A “value-added” lecture, prepared with institution-specific protocols in mind, may lead to improved medical knowledge of acute stroke management among internal medicine students and residents, and an improvement in confidence in several aspects of stroke management.

We found a trend of significant improvement in trainees’ reported confidence in responding to an inpatient stroke code and in recognizing indications/contraindications for acute stroke intervention. When the groups were sub-divided, the ‘early’ cohorts (medical students and PGY2 residents) demonstrated a significant improvement in knowledge and confidence scores. There was no significant difference in confidence scores for recognizing signs of an acute ischemic stroke following this lecture intervention.

Although this small survey has significant limitations, including low number of respondents, high attrition rate, high proportion of medical student respondents, absent PGY-1 responses, absence of a control group, lack of long-term follow up beyond one month, and inability to generalize to PGY1 residents or trainees in other specialties or other institutions, the intervention reveals several interesting and novel findings. First, this survey study may indicate that a practical stroke management lecture bestows knowledge and increases confidence to internal medicine residents and students, when clinically-relevant knowledge, and institution-specific protocols are delivered. Although simulation-based learning, flipped-classroom, and technologically based didactics are used successfully in improving confidence and efficiency in responding to stroke codes, this intervention suggests that a dedicated lecture may be a useful tool.<sup>15-20</sup> A

model of “value-added” lectures, where the lecture attendee garners practical, institution-specific tools beyond what is delivered via a factoid-based presentation, may mitigate some perceived issues with traditional lecturing in neurology to non-neurologists.

Secondly, the results of the survey suggest that this lecture-based intervention provided lasting results regarding knowledge and confidence. Our survey demonstrated that twenty-two days, on average, after the lecture intervention was given, there was no significant difference in knowledge scores from immediately after the intervention, indicating a possible trend of retention of this important information and improved confidence scores over time. We did not measure whether there was an effect of trainees applying the knowledge gained from the lecture to a real-life clinical ‘code stroke’ setting over the course of their month-long rotation. Whether this type of resilience improves patient care may be an interesting avenue of further study.

Thirdly, this survey revealed that while the ‘early’ cohort garnered a significant benefit from the lecture-based intervention, nearly 50% of the respondents surveyed at our institution either report having never had a lecture, or could not recall having had a lecture, on acute stroke management. This finding corroborates other studies’ findings that trainees early in their training have less confidence in managing in-hospital acute clinical events.<sup>21</sup> These points may indicate that acute stroke care is an under-recognized learning opportunity at the medical school or early residency training stages, and that capturing the student or resident with this type of lecture may lessen neurophobia as they advance.

Finally, the findings above suggest that internal medicine trainees not only benefit from inpatient neurology lectures, but they find value in this type of pedagogy. Ways to foster this type of learning may include a recurring lecture series, ideally with a longitudinal aspect to encourage growth and address knowledge gaps in this aspect of inpatient care, to update on new management concepts, and to sustain the positive effects noted from this survey; or perhaps a flipped classroom style of learning, which has shown promising positive results in a neurology resident population for neurologic emergencies.<sup>22</sup>

## CONCLUSION

This study documents the observation that a “value-added,” lecture may benefit internal medicine trainees’ knowledge retention and confidence building with re-

gards to acute stroke management. Given the incidence and prevalence of stroke, this is a facet of undergraduate and graduate medical education that is not only exceedingly important in the practice of clinical medicine, no matter what specialty the trainee chooses, but could be a lighting-rod intervention to combat neurophobia, to promote “neurophilia,” or perhaps to attain a degree of “neurognosis” – the recognition that a basic understanding of clinical neurology, particularly highly prevalent conditions such as stroke, is important in day-to-day clinical practice.<sup>23</sup>

## Author Contributions

All authors have reviewed the final manuscript prior to submission. All the authors have contributed significantly to the manuscript, per the International Committee of Medical Journal Editors criteria of authorship.

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
- Drafting the work or revising it critically for important intellectual content; AND
- Final approval of the version to be published; AND
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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## Disclosures/Conflicts of Interest

The authors have no conflicts of interest to disclose

## Corresponding Author

Vincent A. LaBarbera MD  
1 James P. Murphy Hwy., West Warwick, RI 02893  
Telephone: 401-606-4600  
Email: [vincent\\_labarbera@brown.edu](mailto:vincent_labarbera@brown.edu)



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## **SUPPLEMENTARY MATERIALS**

### **Supplement 1**

Download: <https://bhm.scholasticahq.com/article/91547-improvement-of-confidence-and-knowledge-retention-for-stroke-management-among-internal-medicine-trainees-during-an-institution-specific-protocol-orie/attachment/190794.docx>

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