National Implementation of Acute Stroke Care Centers in the Veterans Health Administration (VHA): Formative Evaluation of the Field Response

Teresa M. Damush, Ph.D.^{1,2,3,4}, Kristine K. Miller, PT., Ph.D.^{1,5}, Laurie Plue, M.A.^{1,2}, Arlene A. Schmid, Ph.D., OTR^{1,6}, Laura Myers, Ph.D.², Glenn Graham, MD^{1,7}, and Linda S. Williams, MD^{1,2,3,8}

¹HSRD VA Stroke QUERI Center, Roudebush VAMC, Indianapolis, IN, USA; ²Department of Veterans Affairs, Veterans Health Administration, Health Services Research and Development Service CIN 13-416, Center for Health Information and Communication (CHIC), Indianapolis, IN, USA;

³Regenstrief Institute, Inc., Indianapolis, IN, USA; ⁴Department of General Internal Medicine and Geriatrics, Indiana University, Indianapolis, IN, USA;

⁵School of Rehabilitation Science, Department of Physical Therapy, Indiana University, Indianapolis, IN, USA; ⁶Department of Occupational Therapy, Colorado State University, Ft. Collins, CO, USA; ⁷VHA Office of Specialty Care Services, Washington, DC, USA; ⁸Department of Neurology, Indiana University, Indianapolis, IN, USA.

BACKGROUND: In 2011, the Veterans Health Administration (VHA) released the Acute Ischemic Stroke (AIS) Directive, which mandated reorganization of acute stroke care, including self-designation of stroke centers as Primary (P), Limited Hours (LH), or Supporting (S).

OBJECTIVES: In partnership with the VHA Offices of Emergency Medicine and Specialty Care Services, the VA Stroke QUERI conducted a formative evaluation in a national sample of three levels of stroke centers in order to understand barriers and facilitators.

DESIGN AND APPROACH: The evaluation consisted of a mixed-methods assessment that included a qualitative assessment of data from semi-structured interviews with key informants and a quantitative assessment of stroke quality-of-care data reporting practices by facility characteristics.

PARTICIPANTS: The final sample included 38 facilities (84 % participation rate): nine P, 24 LH, and five S facilities. In total, we interviewed 107 clinicians and 16 regional Veterans Integrated Service Network (VISN) leaders.

RESULTS: Across all three levels of stroke centers, stroke teams identified the specific need for systematic nurse training to triage and initiate stroke protocols. The most frequently reported barriers centered around quality-of-care data collection. A low number of eligible veterans arriving at the VAMC in a timely manner was another major impediment. The LH and S facilities reported some unique barriers: access to radiology and neurology services; EMS diverting stroke patients to nearby stroke centers, maintaining staff competency, and a lack of stroke clinical champions. Solutions that were applied included developing stroke order sets and templates to provide systematic decision support, implementing a stroke code in the facility for a coordinated response to stroke, and staff resource allocation and training. Data reporting by

facility evaluation demonstrated that categorizing site volume did indicate a lower likelihood of reporting among VAMCs with 25–49 acute stroke admissions per year.

CONCLUSIONS: The AIS Directive brought focused attention to reorganizing stroke care across a wide range of facility types. Larger VA facilities tended to follow established practices for organizing stroke care, but the unique addition of the LH designation presented some challenges. S facilities tended to report a lack of a coordinated stroke team and champion to drive process changes.

KEY WORDS: reorganizing care; clinical champions; organization barriers; organization facilitators.

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INTRODUCTION

Ischemic stroke is common among veterans, accounting for over 6,000 admissions to VHA facilities and for approximately 60,000 outpatient visits for stroke-related care annually.¹ As noted in the recent Patient Care Services (PCS) National Task Force report to the Undersecretary for Health, led by Dr. Gary Tyndall, Director of Emergency Medicine within PCS, veterans need to be able to obtain emergency stroke care that meets a single standard of care among similar VHA facilities nationally. Prompt access to high-quality care is crucial to limiting damage caused by a stroke. The Office of Quality and Performance (OQP) Stroke Special Study, which was conducted by Stroke QUERI investigators in partnership with VHA operational and clinical offices, demonstrated that although the quality of some inpatient stroke care processes was high, the performance quality of other processes, especially those involved in early phases of care, was widely varied and had room for improvement.^{2,3}

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The Early Management of Acute Stroke PCS Task Force report, with representation from the VHA Office of Emergency Medicine, Specialty Care Services, and the Stroke QUERI (QQuality Research Initiative) Center, served as a critical blueprint for reorganization of acute stroke service delivery for VA facilities and was a novel effort to standardize stroke services across the VHA and stimulate organizational change. The report led directly to the VHA Acute Ischemic Stroke (AIS) Directive⁴ (released in November 2011) that mandated reorganization of VHA acute stroke care, including the self-designation of level of acute stroke care by each VA facility and implementation of new local policies by June 2012. The AIS Directive was released to each Veteran Integrated Service Network (VISN) for network-directed coordination of responses from all facilities in the network. This activity was timely, as several states across the U.S. had passed laws requiring ambulances to transport acute stroke patients to the nearest certified stroke center, thus potentially bypassing uncertified VA facilities and resulting in fragmentation of care for veterans and increased cost for the VHA, as well as the potential to influence veterans' decisions about calling 911 for stroke symptoms.

In response to the national release of this directive and its resulting organizational and policy changes in acute stroke care services in the VHA, we conducted a formative developmental evaluation in collaboration with the VHA directors of Emergency Medicine and Specialty Care Services across the three levels of stroke centers (P, LH, and S) in order to understand the facilitators and barriers facing VA facilities across each level in response to the AIS Directive and to identify factors related to decisions about self-designation of acute stroke level of care.

METHODS

The VA Central Institutional Review Board (IRB) granted permission for this project to complete local IRB review. We received approval from the Indiana University institutional review board and the Roudebush VAMC Research and Development committee to conduct the project.

We employed semi-structured interviews to address our specific objectives. We conducted interviews in a private location at a time and place convenient for the participant. All telephone and onsite semi-structured interviews were audio-recorded, with permission from the respondents, and were conducted by trained and experienced study staff using a standardized interview guide (see [Appendix](#), which is available online). A VA-approved contractor transcribed verbatim all interviews prior to qualitative analysis and removed the subject's identifiable information. We summarized closed-ended questions (e.g., training in stroke care) and utilized NVivo 10 software to manage and organize the qualitative

data across sites by assigning codes to text strings within the transcripts. In addition, we utilized NVivo 10 software to organize the unstructured data and create hierarchical codes denoting stroke designation level across facilities.

Site Identification

We used the facility self-designation level (P, LH, or S) as reported by VA facilities in response to the AIS Directive. From the AIS Directive response, there were 32 P, 31 LH, and 59 S facilities. We excluded from the sample the 11 P, two LH, and one S facilities that were involved in an ongoing Stroke QUERI inpatient stroke care quality improvement study, and we also excluded 12 S facilities with fewer than 40 acute stroke admissions annually and low surgical complexity scores.

Invited VAMCs represented all three stroke care designation levels, including 13 P, 26 LH, and six S. Of these, 38 (84 %) of the 45 total invited sites chose to participate in the interviews, with representation from all designation levels (9 P, 24 LH, and 5 S) (see Table 1).

Stroke Team Interviews

Clinicians and clinical leadership staff were invited by the VA Stroke QUERI Center and the directors of Emergency Medicine and Specialty Care Services in the VHA, first by e-mail, and followed by telephone calls, to participate in semi-structured interviews.

Medical Center Personnel Identification. As we have done in prior facility-level projects, we identified the administrative and clinical stroke service leaders at each site via contact with

Table 1. Facility Characteristics by Designated Level of Stroke Center of Surveyed VHA Medical Centers in Response to the AIS Directive

Facility characteristics	Primary (P) n=9	Limited hours (LH) n=24	Support (S) n=5
Region			
Eastern U.S.	2	11	2
Middle U.S.	4	12	2
Western U.S.	3	1	1
FY 2011 stroke cases			
≤40	1	9	0
40< × <80	3	12	5
≥80	5	3	0
FY 2011 surgical complexity level			
1a	7	8	2
1b	1	3	1
1c	1	7	2
2	0	4	0
3	0	1	0

VHA implemented a "complex" surgical rating in 2010 based upon facilities, equipment, and staffing where a "1a" rating denotes the highest complexity level. The rating served to ensure surgical quality across facilities.

the facility's chief of neurology and chief of emergency department. The clinical leaders identified 3–5 key persons, targeting staff members most involved in decision-making regarding acute stroke care and the response to the AIS Directive (see Table 2).

Facility interviews were conducted in person or by phone by trained investigators and research coordinators. On-site interviews were conducted at 22 facilities (7 P, 11 LH, and 4 S), and all other interviews (16 sites) were conducted by phone (2 P, 13 LH, and 1 S). In total, 107 persons were interviewed across the 38 sites (see Table 2).

VISN Director and Chief Medical Officer Identification.

Given the role of the Regional Veterans Integrated Service Networks (VISN) director in the AIS Directive, we also interviewed approximately 50 % of the total VA VISN leadership ($n=10$) from the VISNs that included at least one participating VA facility in our sample. In total, 16 VISN personnel were interviewed by telephone.

Measurement

The semi-structured interviews were centered around the elements of the AIS Directive (see the [Appendix](#), which is available online). Key concepts of the interview included specific barriers and facilitators with regard to implementing early acute stroke services at each facility, decisions to collaborate with external stroke centers, the existence of a stroke clinical champion and local opinion leader, existence of a stroke team, regularly scheduled meetings where patient stroke care is discussed, cross-service communications regarding stroke, and stroke resources.

Analyses

Qualitative analysis of the provider interviews followed standardized procedures that we have used previously.⁵ Using the de-identified interview transcripts, at least two investigators independently summarized and coded open-ended questions. We independently reviewed and coded transcripts by assigning labels and codes to data segments. We began with a guide of common themes from our previous stroke care quality improvement efforts for coding, while permitting emerging themes to be coded in a bottoms-up manner. Quotes were grouped according to our major themes. The data analysis group met regularly to discuss their emergent codes and to resolve discrepancies.

Using NVivo software, we used the transcripts to catalog the principal themes that emerged. The first step in the analysis created a set of agreed-upon codes and a codebook that served as a template for further coding of the data. We began with a deep dive into the first several interviews. The investigators used an iterative consensus-building process to generate codes. Each investigator, working independently, highlighted sections of the field notes and transcripts that illustrated a code. In a subsequent meeting, the investigators compared notes, noted agreements, and attempted to resolve disagreements. Once agreement was reached on the codes, they were arranged into a codebook, with each code defined. The codebook allowed us to convert the group conversations into a formal set of categories that were systematically applied to each transcript. Following the development of the codebook, two coders worked independently but simultaneously to read each transcript, attaching the relevant codes to selected sections of text. As a quality-control measure, the two coders' transcripts were merged and the results compared. Duplicative codes were collapsed into a single code, while codes that were

Table 2. Participant Roles Across All Sites and All Stroke Centers ($n=107$)

Provider role	Total no. of providers across all sites $n=107$	Primary Stroke Center $n=28$ providers	Limited Hours Stroke Center $n=56$ providers	Supporting Stroke Center $n=23$ providers
ED chief	20	6 (21.4 %)	11 (19.6 %)	3 (13 %)
Chief of neurology	18	3 (10.7 %)	11 (19.6 %)	4 (17.4 %)
Stroke coordinator	2	1 (3.6 %)	1 (1.8 %)	
Neurologist	8	2 (7.1 %)	5 (8.9 %)	1 (4.3 %)
Neuroradiologist	3	1 (3.6 %)	2 (3.6 %)	
Stroke neurologist	4	2 (7.1 %)	2 (3.6 %)	
Chief of staff	2		1 (1.8 %)	1 (4.3 %)
Pharmacist	5	3 (10.7 %)	1 (1.8 %)	1 (4.3 %)
ED physician	5	1 (3.6 %)	3 (5.4 %)	1 (4.3 %)
ED nurse manager	7	1 (3.6 %)	5 (8.9 %)	1 (4.3 %)
ED nurse	4		3 (5.4 %)	1 (4.3 %)
Staff physician	4	3 (10.7 %)	1 (1.8 %)	
Clinical nurse manager	5		3 (5.4 %)	2 (8.7 %)
Staff nurse	5	3 (10.7 %)	1 (1.8 %)	1 (4.3 %)
Staff nurse neurology	2	1 (3.6 %)		1 (4.3 %)
Quality management	5	1 (3.6 %)	1 (1.8 %)	3 (13 %)
Clinical nurse educator	2		1 (1.8 %)	1 (4.3 %)
Radiology	3		1 (1.8 %)	2 (8.7 %)
Miscellaneous (includes Hospitalist, Clinical Application Coordinator, and Intensive Care Unit representatives)	3		3 (5.3 %)	
Total VAMC sites	38	9	24	5

unique to one of the reviewers were discussed, and if deemed relevant, were included in the merged file.

Once the coding was complete, we generated reports of coding themes and frequencies across the three levels of stroke centers. The goal was to detect patterns that characterized potentially meaningful differences or similarities among the three types of centers.

We also created a series of matrices to tag and visualize these patterns and relationships. First, the implementation barriers and facilitators were listed across the rows and the VA facilities grouped by level of stroke center across the columns for comparison of convergent and divergent patterns. Second, with facility permission, we analyzed proportions using chi-squared tests of facility-reported IPEC data to evaluate patterns of reporting by stroke level.

RESULTS

Participants. The average professional experience of facility respondents ($n=107$) was 24.9 years (range 2–47 years), and the average length of time spent working in the VA was 13.6 years (range 1–38 years). Respondents from the S facilities reported the least time working in the VHA ($m=9.95$ years). Respondents' roles were diverse and inclusive of providers across the stroke care spectrum (see Table 2). The percentages of participant roles were quite similar across the three levels of stroke centers, particularly among nursing staff. P and LH facilities interviewed more ED chiefs and chiefs of neurology and neurology staff compared to the S facilities. Additionally, leadership ($n=16$) from 10 VISNs completed telephone interviews.

Primary Stroke Centers (P)

Overall Directive Impact to P Facilities. Across the P facilities, the AIS Directive served to heighten awareness of acute stroke services among the staff across multiple clinical service areas and to facilitate the standardization of processes and resource allocation to meet the requirements for operating as a Primary Stroke Center.

“Our facility already had all of the pieces in place for a primary stroke center, but the directive made our protocol a smoother, efficient system.”

As facilities responded to the AIS Directive, they reported specific changes made to serve as a VA P facility. The most common response was to increase nursing education. Some facilities developed acute stroke mock codes for training purposes, and many also focused on educating rotating neurology residents on their facility's acute stroke protocol. One-third of the facilities worked on increasing radiology FTEs to meet the required demand for non-contrast head CT 24 hours a day, 7 days a week. Three (33 %) facilities developed a new system

for alerting stroke team members to a possible acute stroke. Two facilities (22 %) created a tPA “tackle box” that nurses could carry to a patient's bedside in response to an acute stroke alert in order to facilitate the administration of tPA treatment.

Facilitators for Implementing the AIS Directive. Once P facilities began implementing their stroke protocols, respondents reported the following factors as positively affecting their efforts. First, most (78 %) of the facilities developed and implemented stroke order sets and templates to facilitate rapid acute stroke evaluation and to provide ways to track quality-of-care data. Some sites trained their nurses in using their stroke protocols and established a first-alert system for stroke patients in the ED. Many of the respondents reported that they had revised existing templates or downloaded copies from the VA SharePoint site for stroke cyber-training. The majority of P sites were able to offer CT services 24/7 or had existing CT services. Some reported cross-training X-ray technicians to do CTs during nighttime or weekend hours. The directive also helped respondents obtain resources at their respective P facilities. One P site successfully made a business case to their facility leadership that resulted in the hiring of one FTE stroke neurologist and stroke coordinator. Other sites were also successful in obtaining resources for acute ischemic stroke services, including extra ED beds and multiple pagers for neurology residents and stroke service FTEs. In addition, some facilities reported new efforts spent on coordinating care across services, and two sites (22 %) met with their local EMS to provide updates on their service capabilities in the community.

P Barriers to Implementation of the AIS. Respondents at the P sites also encountered a number of barriers as they implemented the AIS directive. Some received resistance from radiology services or delays in CT readings. About one-third reported problems or lack of time for stroke service quality data collection and did not receive any additional staff support to collect and report these data. Staff shortages, and nursing shortages in particular, often interrupted the implementation of the stroke protocol. Respondents from sites that characterized the assigned stroke champion as unknowledgeable about the local organization or lacking enthusiasm stated that this lack of knowledge/enthusiasm hindered the process changes associated with the AIS Directive.

Some sites experienced information technology (IT) delays with the uploading of their stroke order sets and templates into the electronic medical records system, as they had limited access to the facility's clinical application coordinators (CACs). Several P sites experienced resource constraints when their stroke coordinator FTE was cut. A common barrier across all sites was the delayed response by patients to seek care right away after symptom onset.

“We need to reach our patients to recognize stroke symptoms and come into the VA right away.”

Limited Hours Stroke Centers (LH)

The Limited Hours Stroke Center was a hybrid of the P and S facilities. It served as a P facility during the week from 8 a.m. to 5 p.m., and then operated as an S facility after-hours and on weekends. This designation was unique to the VHA in allowing more facilities to provide acute stroke care services.

Changes in Structure to Provide Designated Level of Care.

One-third of the LH facilities reported that, with the directive, they had now established a formal acute stroke protocol where none had previously existed, and that they now needed to focus on execution of the protocol among staff across clinical services. Implementation of the directive often illuminated the lack of a system for acute stroke care, regardless of staff knowledge and skills.

Specific changes made by LH facilities in response to the AIS Directive included establishing (12.5 %) a formal patient transfer agreement with a local community hospital for acute stroke care services for veteran patients. These sites reported that they had been transferring patients prior to the directive, but that they had now established a more formal written agreement that may reduce transfer times. Other LH sites reported at the time of interview that their formal agreement was in progress and being routed through local offices. In addition, approximately 20 % of the LH sites spent efforts on staff training, including training nurses on the quality indicator and National Institutes of Health Stroke Scale (NIHSS) as well as setting up a paging system (e.g., a stroke code) to reach the acute stroke team responders. Similar to the P sites, some of the LH sites put efforts into setting up a stroke team, developing stroke order sets and templates, cross-training X-ray techs to perform CT scans, and practicing protocols through mock codes. One site (4 %) decided to hire hospitalists to facilitate their acute stroke protocol.

Facilitators for Implementing the AIS Directive at LH Facilities. Major facilitators for responding to the directive that emerged from the data were that key informants recognized examples of best practices either from affiliate programs or from similar quality improvement efforts from other clinical conditions. A few sites reported that having the university affiliate review and comment on the VA LH protocol was helpful. In addition, some LH sites reported establishing stroke protocols similar to their affiliates, when possible, for consistency among the neurology residents serving both the VA and affiliate medical centers. As was stated by a chief of neurology services, “*Basically, we try to have them [protocols] quite consistent with what’s done at [university name], which has a major stroke center, just because the residents are back and forth to the facility...just so there’s no ambiguity and so no one’s in disagreement with things. I mean, none of this is new. It’s just policy.*”

Another emergent theme from the data was the application of quality improvement efforts for the stroke initiative from

other clinical areas. LH sites recognized the similarities between stroke protocols and their existing efforts for cardiology care practices and the use of other disease protocols to guide changes in stroke care.

“...I think that if we find that we’re falling out in timeliness in certain areas, we need to find out why and look at that process. I think that’s helpful ...I want to do what the American Heart Association says....That’s the standard care. I do it with heart; I want to do it with stroke. So we need to know if we’re meeting those goals or not, but again, I think we can do that internally with the volume of tPA that we’re actually giving is not that much.”

Barriers to LH implementation of AIS Directive. In a majority of the sites, reported barriers to LH implementation of the directive included lack of 24/7 access to neurology or radiology services, limited access to neurology services (i.e., consultative services), delayed radiology response time, and difficulties in documenting stroke care quality indicators (e.g., dysphagia screening, NIHSS). Respondents reported that data collection was resource-intensive, given the need to review charts manually and the lack of a dedicated FTE. Sites that reported having a reluctant stroke clinical champion or no existing champion characterized their sites as floundering in implementing the protocol: that the protocols were written but were less likely to be practiced by facility staff.

Additionally, approximately one-third of LH sites reported that EMS did not deliver acute stroke patients to their facility. Thus, facility administration often did not allocate additional resources or extra FTEs to support the directive with the availability of acute stroke services at a nearby fully staffed affiliate hospital. Many of the LH sites reported that their neurology service was understaffed and that this hindered the implementation of their response to the AIS Directive.

In one-third of the LH facilities, the most frequently reported process urgently in need of improvement was timely reaction within the treatment window on the part of all services in cases of a patient presenting with an acute stroke. Educating patients on seeking urgent treatment and providers on timely reaction and related protocols were both often reported by LH providers as processes in need of improvement.

Stroke Support Stroke Centers (S)

Support stroke centers were designated as facilities that did not administer tPA on-site but established a protocol to transfer the acute stroke patient to a nearby stroke center in the community in order to provide standardized stroke treatment in a timely manner.

S Facilitators to Implementing the AIS Directive. Several of the S facilities were beginning to make process changes in response to the AIS Directive. Two (40 %) of the five S

facilities reported that they had recently started training in CT scanning for all X-ray techs in order to provide 24-hour in-house CT scan coverage. One S protocol appeared to be championed by their ED, as they reported that they would like to continue acute stroke management on-site and coordinate with their university affiliate hospital. According to a board-certified ED physician, the mandated practices were already considered standard of care.

“...what’s a little strange for emergency – I’m a board-certified emergency-trained physician, residency-trained specifically...so I think that this is something that is done in every hospital...This is an expected standard of care. It’s already been rolled out and it’s...a matter of fact [and] so much more distributed in other [non-VA] hospitals.”

Barriers to Directive Implementation. Lack of access to specialty care – and specifically, the lack of neurology and radiology services – was frequently reported as a barrier in S sites. One S facility that had originally declared as an LH recently changed its status to S when they lost a neurology FTE. Another S site was initially going to declare as an LH, but leadership thought they might not be able to meet the protocol demands during the day. Another barrier to implementing the directive was the lack of an on-site stroke team, often due to the absence of a stroke clinical champion to organize the team. Other barriers included patient transport to an affiliate hospital and the confusion among the ED board-certified staff regarding the S protocol requirements. Finally, in light of the low volume of acute stroke patients, the ability of the staff to maintain competency in the stroke protocol was of concern.

S sites also discussed the issue with EMS diverting stroke patients to nearby stroke centers and bypassing the VA:

“But the reality is that the rescue squads...are functioning with stroke in a similar fashion now to what they’ve been doing with myocardial infarction for decades. They take patients to the nearest medical center, and a veteran cannot –or family member cannot steer them further away than the closest emergency room that is designated as being able to receive strokes.”

Patterns of Stroke Quality-of-Care Data Reporting. Given that this initiative mandated the reporting of stroke quality-of-care data, we also evaluated patterns in facility-level self-reporting of quality of care (IPEC; VA Inpatient Evaluation Center) (see Table 3). Neither facility self-designation of stroke care capability nor the mean number of stroke admissions varied significantly by IPEC reporting status. However, site volume categorization did reveal a lower likelihood of reporting among VAMCs with 25–49 admissions per year ($p<.001$). This may indicate a volume level that is below the

Table 3. Facility (VA Inpatient Evaluation Center (IPEC) Reporting Stroke Quality-of-Care Data by Facility Characteristics

IPEC reporting			
Facility designation	Yes	No	p value
Primary Stroke Center	11	22	0.92
Limited Hours Stroke Center	14	23	
Supporting Stroke Center	20	34	
Stroke Admissions (10/12–4/13)	39.4	35.5	0.50
Mean (SD)	(33.9)	(23.0)	
Annual Stroke Admissions (CY 2012)			<0.001
>100	9	12	
50–99	18	29	
25–49	6	16	
<25	11	19	

Data reporting period per the Acute Ischemic Stroke Directive included 2012–2013

threshold where facilities are able to dedicate additional resources to acute stroke care reorganization, but above the threshold where reporting is less difficult due to infrequency of admissions.

VISN – Veteran Integrated Service Network Leadership. VISN leadership understood that acute stroke care services were evidence-based and had been routinely implemented in non-veteran clinical settings. They were often aware of their respective state EMS laws and the need to transport acute stroke patients to certified stroke centers. Some VISN leaders reported attending EMS meetings in order to gain recognition of their P stroke centers. Upon the release of the AIS Directive to the field, VISN leadership reported that each facility in their region evaluated their existing capabilities and expertise, and chose a corresponding stroke level designation.

DISCUSSION

The AIS Directive succeeded in focusing attention on the reorganization of stroke care across a wide range of facility types. Larger VA facilities tended to follow established practices for organizing stroke care that incorporated order sets and templates, but the unique addition of the LH designation presented some challenges. The presence or absence of a stroke clinical champion to coordinate the implementation of AIS Directive components was perceived as instrumental in bringing about organizational change at the facility level. As such, strategies to develop effective clinical champions would likely prove fruitful in the context of implementing coordinated care processes within healthcare organizations. Moreover, a structured stroke team was perceived as helpful for responding in a coordinated manner, suggesting that clinical champions may benefit from having a supportive multidisciplinary team of colleagues. The AIS Directive also served as a template with which facilities could design their stroke care quality improvement efforts. In addition, examples of best practices have begun to emerge, and a number of specialty group

meetings have been used to communicate this practices to the field (e.g., SQUINT⁶; SharePoint sites; clinician calls, e.g., ED nurses national call).

As respondents across the VHA reported that their clinicians often provided evidence-based stroke care, the challenge to the facilities was coordinating processes across services and across clinical providers in a timely and systematic fashion. Some clinicians recognize the similarities between cardiology (e.g., STEMI treatment) and stroke (e.g., AIS Directive), and have organized their efforts in a similar manner. As is the case with treatment of acute stroke, there is variation in the level of care by the receiving centers, and providing patients with timely access to nearby facilities is routine for centers without these resources. A national VHA cath lab database (Cardiovascular Assessment Reporting and Tracking System for Cath Labs; CART-CL) was developed to standardized quality indicators.⁷ The CART-CL in the VHA included software for data entry and report generation, and it also served as a national data repository with benchmarking. Similarly, access to timely acute stroke care processes, data tracking, and reporting are key elements of the AIS Directive. As the quality and frequency of data reporting improves, future efforts can target the national evaluation of stroke quality-of-care outcomes on performance process measures utilized in the directive, including the percentage of eligible patients receiving tPA, patients with symptoms of AIS for whom the NIH Stroke Scale has been completed, and patients being screened for dysphagia prior to oral intake.⁴ Clinical outcomes associated with these processes include in-hospital mortality and intracranial hemorrhage, ambulatory status at discharge, and discharge destination.⁸

The AIS Directive represents the initial effort to standardize acute stroke care services across the VHA.

Coordination of care across providers and settings has been associated with higher quality of care.⁹ Where gaps existed in local resources, centers were required to coordinate with nearby facilities to provide acute stroke care. As has been seen in other stroke quality improvement programs (e.g., Get With the Guidelines Stroke), the ¹⁰ respondents across all levels of stroke care reported patient late arrival to the facilities after symptom onset and lack of EMS use as barriers to timely acute stroke care. These barriers are important not only for the timeliness of treatment, but this data often factors into resource allocation for quality data collection and facility staff skill competencies.

Partner Research. The results of this study have been presented to our operational partners in Emergency Medicine and Specialty Care Services and to the stroke field clinicians in the VHA through the SQUINT monthly cyber-meetings. Both the VA Office of Emergency Care Services and the Stroke QUERI Center are currently developing tools to facilitate real-

time documentation of acute stroke care services delivered in the field, as well as tools to reliably collect facility-level stroke quality-of-care data in response to the barriers in data-tracking that have been noted. Moreover, the Stroke QUERI has expanded its partnership with the VA Office of Nursing Services as we explore how best to develop nursing champions to serve as first responders for acute stroke care, as well as to effectively collaborate with interdisciplinary stroke teams in applying these lessons learned to expand nurse champion support to other clinical areas of complex care within the VHA.

Limitations. There were several limitations to this study. The data presented is based upon facility staff self-reports and may vary based upon respondents' perceptions and personal experiences. Thus, we attempted to interview multiple staff from each site in order to gain a representative facility perspective, and we began with facility Stroke Center Director listed in the AIS Directive formal response. In addition, our interviews began within the first nine months after the release of the AIS Directive from the VHA to the facilities. Our findings may not generalize to other healthcare organizations, particularly those that volunteer to become certified stroke centers. In addition, the Limited Hours Stroke Center designation is unique to the VHA.

Nonetheless, these data present an organizational snapshot of a mandated organizational restructuring of acute clinical care processes, the first of its kind for neurology services. The data represent lessons learned as well as opportunities to redesign and improve upon the systematic delivery of acute stroke care services within the VHA. Furthermore, by engaging throughout the planning processes with operational partners from the Early Management of Acute Stroke Task Force, the stroke cyber-training to the field, and the formative evaluation of the response to the AIS Directive, we have a greater understanding of the field's needs and challenges as well as opportunities for improvement.

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Corresponding Author: Teresa M. Damush, Ph.D.; HSRD VA Stroke QUERI CenterRoudebush VAMC, Indianapolis, IN, USA (e-mail: Teresa.damush@va.gov).

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