



Stroke Care Quality Improvement Initiatives in Critical Access Hospitals

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KEY FINDINGS

- Across the U.S., there are some excellent initiatives focused on improving the quality of stroke care available to rural communities through Critical Access Hospitals (CAHs).
- Education and training are the most common components of stroke care quality improvement initiatives, and along with community awareness are central to improving the identification, protocols, and treatment practices of stroke care in rural communities.
- It is important for CAH stroke quality improvement initiatives to include data collection and analysis as a component of their initiative, with measures looking at Door-to-Needle Time and Pre-Notification by EMS being the most important measures.
- The majority of CAH stroke quality improvement initiatives rely heavily on partnerships with various organizations, including the American Heart Association/American Stroke Association for training and data support, as well as state-level EMS offices and local EMS agencies to focus on identification and pre-notification of strokes for CAHs.

PURPOSE

The purpose of this project is to describe successful evidence-based programs that have been implemented to improve stroke care in CAHs and other rural hospitals.

BACKGROUND

Each year over 795,000 Americans experience a stroke, resulting in about 140,000 deaths.¹ While stroke death rates have declined 38% among adults ages 35 and older since 2000, these declines have tapered off in 38 states.²

Research has shown that there are higher stroke mortality rates in rural areas, but these seem to be attributable to higher stroke incidence rather than case fatality.³ Additionally, Critical Access Hospitals (CAHs) have higher mortality rates than non-CAHs.⁴ All hospitals in rural areas need to be prepared to assess and treat stroke patients or know when patients need additional care their rural hospital may not be able to provide.

Timely stroke care is of the utmost importance for all stroke patients, particularly for those suffering ischemic strokes, which account for about 87% of all stroke cases

and occur when a clot blocks a vessel supplying blood to the brain.⁵ The best treatment for ischemic strokes, tPA (tissue plasminogen activator), must be used within 3 hours of having a stroke.⁶ This leaves little time for delay to call for help, be transported to the hospital, and receive a diagnosis—challenges exacerbated in rural areas with greater travel times between homes and hospitals. Many ischemic stroke patients miss the 3-hour window because they don't arrive to the hospital in time,⁶ a finding that can have implications for rural areas where distance to hospitals are typically greater.

This year, the American Heart Association/American Stroke Association updated guidelines for stroke treatment, extending the time limit on mechanical clot removal from 6 hours to up to 24 hours for some patients.⁷ While this doesn't change the treatment for tPA administration, it does allow for additional treatment options for eligible stroke patients at facilities that are able to provide this procedure, and may have implications for rural treatment and transfer of stroke patients.

Not all hospitals are able to treat stroke patients, and less than 66% of the U.S. population lives within an hour of a Primary Stroke Center,⁸ indicating a greater need for



rural hospitals to be prepared for stroke patients in their facilities. Studies have shown that ischemic stroke patients who are administered a thrombolytic, like tPA, are more likely to recover fully or have less disability than those who don't receive the drug.^{9,10} While tPA use is increasing, use in urban hospitals is increasing much more quickly compared to rural hospitals.¹⁰ Preparedness or training, availability of tPA, and comfort with tPA administration are important challenges to overcome, specifically in rural areas.

Individuals in rural areas are also more likely to have less knowledge about heart attacks and strokes than those in non-rural areas.^{11,12} Without the knowledge to understand someone might be having a stroke, victims and those around them are unable to ensure that they are able to get the time-sensitive medical care that they need. Hospital pre-notification of stroke by EMS has shown to reduce time to CAT Scan (CT) completion and interpretation, while tPA administration occurred twice as often in the patient cases with pre-notification.¹³ Rural EMS agencies often have additional challenges related to providing services that they must address, including a greater reliance on volunteers, higher vacancy rates, and outdated equipment.¹⁴ This highlights the importance of utilizing ambulance services for suspected strokes, as well as appropriate training for EMS in rural areas where access and time to proper facilities may prevent or overcome additional challenges to the time-sensitive procedures necessary for stroke treatment.

Due to the challenges faced by rural hospitals in diagnosing and treating strokes, initiatives using data for quality improvement are essential. Acknowledging the current challenges and setting goals for measured improvement in quality of care will allow rural hospitals to be able to realize their capabilities for stroke treatment, and look to improve their care provided to align with quality stroke treatment goals.

APPROACH

We reviewed the literature on stroke and stroke care, including articles in peer-reviewed health care journals, as well as reports and websites from public and private organizations working on stroke and related issues. We sought to identify programs and strategies that have been implemented nationwide that hold promise for potential adaptation in CAHs.

We also reviewed information in the state Medicare Rural Hospital Flexibility (Flex) Program work plans

submitted for FY 2016 and FY 2017, and identified states that mentioned stroke care. We contacted these states for information, and also completed a survey of all state Flex Program Coordinators seeking information on stroke initiatives in their states to find out if any additional states had initiatives. We interviewed Flex Coordinators in states responding affirmatively to our survey to ask about their stroke care quality improvement initiatives involving CAHs and how those activities were implemented.

RESULTS

National Initiatives

Stroke care quality improvement initiatives identified in the literature included several toolkits, certification criteria, and educational programs developed by associations and organizations across the country.

- **Get With The Guidelines – Stroke (GWTG)** is an in-hospital program created by the American Heart Association/American Stroke Association to improve stroke care through data submission on stroke treatment measures. Since its creation in 2003, over 1,600 hospitals have participated in contributing stroke patient records into the GWTG database.¹⁵ Through this program, hospitals receive quality improvement support, performance feedback, and other tools and resources for improvement of stroke clinical care in their facilities.¹⁵ Many state-based initiatives include GWTG as a part of their quality improvement work, and supplement the data with additional programmatic components.
- **The Paul Coverdell National Acute Stroke Program (Coverdell)** at the Centers for Disease Control and Prevention (CDC) provides support and funding to state health departments to measure and track acute stroke care and improve quality of stroke care.¹⁶ The program has existed since 2005, and has provided assistance to 13 states since inception, including several states currently working on CAH stroke initiatives (see below).
- **The Joint Commission**, in collaboration with the American Heart Association/American Stroke Association, developed a certification process for stroke programs for Commission-accredited hospitals.¹⁷ These varying levels of certification include



Acute Stroke Ready, Primary Stroke Center, and Comprehensive Stroke Center. Hospitals applying for certification must meet certain clinical requirements and expectations, and have an on-site review by Joint Commission reviewers. Acute Stroke Ready hospitals are the first level of certification, indicating that these hospitals fulfill a community need within a stroke system.¹⁸ As such, CAHs that are certified are often certified as Acute Stroke Ready hospitals.

Some states have chosen to offer their own certification or designation processes, which encourage hospitals to reach minimum standards for certification as a means of participation in state programs or for knowledge of EMS services serving hospitals in given areas. Some follow similar standards of the Joint Commission, while others allow for self-attestation or other modifications for hospitals to meet their standards of participation.

There are many other initiatives and educational programs across the country targeting improvement of stroke care, and these national programs are just a few that are widespread and often integrated with state initiatives as well.

State Initiatives

Based on the results of a survey of all State Flex Coordinators, we completed 15 interviews with 11 states that have stroke initiatives with CAH involvement, for a total of 14 different initiatives. Interview participants included State Flex Coordinators, state employees, and other individuals involved directly in running the initiatives. The study states are categorized below as states that are actively implementing their stroke initiatives statewide, and those that are in the early or planning stages of their work. Table 1 (next page) provides a summary of general characteristics of the 14 stroke care quality improvement initiatives we identified, emphasizing the variation in focus, quality improvement measures, and scope of each initiative.

Active Implementation Initiatives

- **Illinois Critical Access Hospital Network (ICAHN) Stroke Initiative** – In Illinois, ICAHN began their stroke initiative with the goal of reducing stroke incidence and mortality through timely treatment, and bringing rural health stroke treatment to the same level as larger, urban hospitals. This initiative

is funded primarily by Flex Program funding. As of 2017, all 51 of Illinois' CAHs participated in the initiative which combines GWTG data collection, educational programming, and hospital certification. Their data collection allows ICAHN to monitor individual CAHs for specific stroke treatment areas needing improvement (like changes in Door-to-Needle or Door-to-CT time), and their professional education is adapted to reflect the greatest needs for each CAH. Community education through their "Pact to Act Fast" program is another piece of the initiative that is essential to informing communities about the importance of immediately calling 911 and using ambulance services to get to the hospital when a stroke occurs. Successes of their program include Acute Stroke Ready certification for 100% of Illinois CAHs and almost 70% of rural hospital patients meeting the time protocol for stroke treatment.

- **Kansas Initiative for Stroke Survival (KISS)** – This initiative was originally spearheaded by the Kansas State Stroke Task Force, and is now run by an executive board made up of individuals from a variety of backgrounds including physicians, EMS, hospital program coordinators, and stroke outreach coordinators. KISS is operated with funding from the Flex Program, and by a strong group of volunteers. As a part of the initiative, CAHs and other hospitals develop protocols for timely stroke treatment and self-attest to being Emergent Stroke Ready by having the ability to provide CT scans and labs 24 hours a day. A key component of the initiative is the 24/7 call line staffed by stroke neurologists at non-local Comprehensive Stroke Centers that provide guidance to CAHs on when and how to provide tPA to patients in their care. Physicians from interventional centers across the state have agreed to be on call to CAHs and smaller hospitals to offer recommendations for patient-specific stroke treatment to CAH staff at the time of intervention. Education is provided regionally by KISS staff for EMS, hospital staff, and physicians including topics of the importance of early notification, community awareness, and other issues tailored to specific needs of communities. The initiative includes minimal data collection at this time, including data collected about information pre- and post-education programming, and would like to increase data collection in the future.



Stroke Care Quality Improvement Initiatives in CAHs

Table 1. Stroke QI Initiatives: Key Elements, Data Collected, and CAH Participation

	Initiative Name	Key Elements	Quality Improvement Stroke Data	CAH Participation
Active Implementation Initiatives	ICAHN Stroke Initiative	<ul style="list-style-type: none"> GWTG Data Collection Professional Education Community Education Hospital Certification 	Get With The Guidelines - Stroke Data Collection	51 (of 51)
	Kansas Initiative for Stroke Survival (KISS)	<ul style="list-style-type: none"> Protocol Development Hospital Certification 24/7 tPA Assistance Call Center Education 	Focus on pre-education and post-education test data	51 (of 84)
	Kentucky Educational Program	<ul style="list-style-type: none"> Education Trainings Relationship Building 	Stroke Quality Data Collection Not a Focus	20 (of 27)
	Kentucky Stroke Encounter Quality Improvement Project (SEQIP)	<ul style="list-style-type: none"> GWTG Data Collection Quality Improvement Initiatives 	Get With The Guidelines - Stroke Data Collection	1 (of 27)
	Minnesota Stroke Program	<ul style="list-style-type: none"> Data Registry Hospital Designation Capacity Building 	CDC Registry, including GWTG measures and more	59 (of 78)
	Minnesota EMS Feedback Pilot Program	<ul style="list-style-type: none"> EMS Collaboration EMS-Hospital Communication and Feedback 	Stroke Quality Data Collection Not a Focus	2 (of 78)
	North Dakota State Stroke and Cardiac System	<ul style="list-style-type: none"> Hospital Certification GWTG Data Collection Education EMS Protocols CAH Assessments 	Get With The Guidelines - Stroke Data Collection	34 (of 36)
	Utah Stroke Receiving Facilities Initiative	<ul style="list-style-type: none"> Hospital Certification Toolkit for Protocol Development and Education Data Submission 	Use own set of measures to track quality improvement	9 (of 12)
	Washington State Emergency Cardiac and Stroke System	<ul style="list-style-type: none"> GWTG Data Collection Hospital Certification Hospital Staff Education and Training 	Get With The Guidelines - Stroke Data Collection	6 (of 39)
	Wisconsin Rural Hospital Stroke Improvement Program	<ul style="list-style-type: none"> GWTG Data Collection Education 	Get With The Guidelines - Stroke Data Collection	13 (of 58)
Wisconsin Coverdell Program	<ul style="list-style-type: none"> GWTG Data Collection Capacity Building Education 	Get With The Guidelines - Stroke Data Collection	14 (of 58)	
Early Stage/Planning Initiatives	Arizona Initiative	<ul style="list-style-type: none"> EMS Needs Assessment Planning for Training 	Stroke Quality Data Collection Not a Focus	NA
	Maine Stroke Advisory Committee	<ul style="list-style-type: none"> Protocol Development Education and Training 	Stroke Quality Data Collection Not a Focus	7 (of 15)
	Nebraska Stroke System of Care	<ul style="list-style-type: none"> Hospital Designation Education Planning for Data Collection 	Currently identifying data measures for inclusion in initiative analysis	NA

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- Kentucky Educational Program & Stroke Encounter Quality Improvement Project** – The Kentucky Hospital Association has partnered with the American Heart Association/American Stroke Association to create an educational program for CAHs in the state to be able to have a target for expertise in identification, treatment, and transfer of stroke patients and to improve their outcomes. Over 20 CAHs have participated in the curriculum, including a webinar series and face-to-face training – with the initiative completely funded by Flex Program dollars. The program also focuses on building relationships between stroke staff at CAHs and the Primary Stroke Centers where CAHs refer patients. These relationships are developed through face-to-face trainings at Primary Stroke Centers that include individuals from referring rural hospitals in order to facilitate introductions and familiarity. Rural hospitals in Kentucky have expanded patient treatment after realizing that they have the expertise and capability to provide treatment (like administering tPA) in their own hospitals before, or instead of, having to transfer patients.

Kentucky also operates a Stroke Encounter Quality Improvement Project (SEQIP) dedicated to improving the stroke system of care in the state. Initially created with CDC funding in 2008, the program now operates as a voluntary, committee-run organization that shares best practices and identifies opportunities for improvement within stroke care (and does not include any direct Flex Program involvement). Hospitals that are certified submit data through GWTG, and SEQIP focuses on different initiatives for improvement each year. SEQIP has successfully improved stroke care through initiatives focused on dysphagia screening, administering thrombolytic therapies to eligible patients, and decreasing Door-to-Needle time for stroke patients. In 2017, only one CAH participated in SEQIP, with the main challenge preventing participation likely being resource issues, such as lack of funding or staff availability, for CAHs to be able to collect data and participate in the program.

- Minnesota Stroke Program & EMS Feedback Pilot Program** – Minnesota’s Stroke Program is a grantee state under the CDC’s Coverdell program and began

with a registry in 2008. Focusing on improving stroke care quality through prevention, treatment, and recovery, the program concentrates on data collection and reporting, and also on the designation of hospitals across the state. CAHs can self-attest to meeting requirements to be designated as Acute Stroke Ready (ASR), and the state performs site visits to confirm their designation and provide education and support. As of 2017, 59 of the 78 CAHs in the state were ASR designated, and 26 CAHs were fully participating in the data registry (though there is no formal Flex Program participation). Data collected for the registry include the same measures as are collected by GWTG, but the state does not use the GWTG tool, as the data for the Minnesota registry goes beyond that necessary for GWTG. The program also recognizes the importance of capacity building with both EMS and hospitals, and the importance of these entities coordinating care for stroke patients. Engagement in stroke care quality improvement efforts from physicians and hospital leaders—as well as public awareness of stroke risks and prevention techniques—are key to the continued improvement of stroke care through this program.

Minnesota is also piloting an initiative aimed at improving feedback between EMS agencies, rural hospitals (including 2 CAHs), and tertiary care hospitals for time critical diagnoses, including stroke. This project is funded primarily by Flex Program dollars, with additional in-kind participation from the EMS region. They have been working in one region of the state (soon to be joined by a second region) to help stakeholders create their own feedback processes that will build capacity for quality improvement related to time critical diagnoses and work to improve health outcomes.

- North Dakota State Stroke and Cardiac System** – North Dakota’s Stroke and Cardiac System aims to provide definitive, quick, high-quality care through a statewide system, which combines state-based hospital certification, GWTG data collection, education, and EMS transport plans. All of North Dakota’s 36 CAHs participate in the statewide system, with 34 participating in GWTG data collection in 2017. CAHs receive individualized assessments about their strengths and weaknesses, and are provided



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with feedback and training from tertiary facility stroke coordinators and Department of Health staff to help improve their processes and quality of care. Communication and collaboration within the state system are critical, with collaboration between CAHs and tertiary hospital staff, as well as improved systems of communication between CAHs and EMS agencies to improve stroke treatment throughout the entire episode of care.

- **Utah Stroke Receiving Facilities Initiative** – This program was created to improve morbidity and mortality resulting from stroke in rural areas by ensuring that rural hospitals are able to provide the same emergent stroke care as any comprehensive tertiary facility in the state. Stroke Receiving Facilities are certified by the state through in-person visits if they meet necessary requirements, and receive a toolkit to use for integrating stroke protocol and providing education to staff. As of 2017, 9 of 12 CAHs in Utah were certified as Stroke Receiving Facilities. Certified hospitals submit stroke care data (their own set of measures developed by a task force) to track parameters for the program, and reports have shown a statewide decrease in time-critical measures related to stroke care in rural areas, including a decrease in the debilitating aspects of strokes. The most difficult barrier was convincing rural hospitals that they were capable of performing at the same level as urban and tertiary hospitals for emergent stroke care. Once rural hospitals incorporated processes for diagnosing stroke and procedures for tPA administration where hospital staff felt comfortable treating stroke patients in their facilities, they were able to show notable improvements.
- **Washington State Emergency Cardiac and Stroke System** – Washington's system is a grantee state under the CDC's Coverdell program and combines many components targeted to create a strong system of care in all areas of the state, and address rural disparities in stroke. Data collection through GWTG and self-attested hospital certification are the central pieces of the system allowing for consistent reporting on how the overall system is functioning. A key program function has been to target stroke coordinators in CAHs and other rural hospitals to provide them with an orientation and background information. Since CAH stroke coordinators often wear many

hats, this education provided by program staff helps them build expertise in data collection and quality improvement, as well as obtain the tools to be able to improve their hospitals' protocols and communication related to stroke care. While all hospitals in the state are considered to be a part of the system, as of 2017, 2 CAHs were certified and 6 participated in the GWTG data collection. Though the program is run out of the Department of Health, some Flex Program funding is used to assist CAHs with being categorized as stroke centers as a part of the stroke systems of care. Increased participation by CAHs is a long-term goal of the program, but is currently low due to a lack of ample funding to assist with rural hospital certification and GWTG participation.

- **Wisconsin Rural Hospital Stroke Improvement Program and Coverdell Stroke Program** – The Rural Hospital Stroke Improvement Program in Wisconsin focuses on how CAHs can improve stroke care in rural areas through participation in data monitoring and education. This partnership with the American Heart Association/American Stroke Association has worked to enroll 13 CAHs who agree to participate in GWTG data collection. The State Flex program assists with payment of the GWTG usage fee, and CAHs voluntarily submit data to the State Flex Coordinator quarterly. The program also has an annual Rural Hospital Stroke Conference which provides education on stroke care and quality initiatives for attendees.

Wisconsin's Coverdell program also works with hospitals and CAHs to improve the complete continuum of stroke care. They work with CAHs through Partner Agreements targeted to smaller hospitals and help them to build stroke capacity, and operate a registry through GWTG. The program has a hospital coordinator who works with individual stroke coordinators to assist them in their work. Through the program, CAHs can also receive virtual stroke education program licenses to educate their stroke teams.

Early Stage/Planning States

- **Arizona Initiative** - In Arizona, the Flex Program recently completed an EMS Needs Assessment to evaluate needs for treating critical diagnoses such as stroke. This assessment came from a strong partnership

between CAHs and EMS agencies, and revealed the need for additional training of EMS staff related to time critical diagnoses. The results stressed the importance of system integration from EMS to local hospitals to regional systems, and indicated that training and additional support would improve the use of best practices and coordination of care. The state has a quality assurance program, AZ-PIERS, which collects data on pre-hospital and EMS care. A major goal of the Arizona program is to encourage EMS agencies and CAHs to participate in the AZ-PIERS program so they can collect and track data on stroke and other measures.

- **Maine Stroke Advisory Committee** – This committee is working to have a defined stroke care model with best practices for treating stroke patients as well as hospital and EMS protocols and procedures in place. As of 2017, 7 out of 16 CAHs in Maine were participating through surveys and meetings, and the program includes education and training for best practices of stroke care. They are working toward the goal of being able to provide access to quality care no matter where stroke patients live.
- **Nebraska Stroke System of Care** – In 2016, Nebraska passed a state law creating a Stroke System of Care and task force to provide representation from stakeholders. Under the system, hospitals can become designated through the Joint Commission, but even those not designated must submit triage stroke treatment plans to the state. These efforts target CAHs (most often not designated), and also ask about other aspects of stroke treatment, such as CT capacity and whether or not CAHs carry tPA in their facility, to assess treatment readiness and opportunities for growth. Though CAHs are targeted as a part of the initiative, there is no formal Flex Program participation. Education for CAHs and EMS is also a part of the system, and program staff use the American Heart Association's Mission Lifeline model as well as training on pre-notification and in-hospital protocols. Staff are currently in the first stages of developing the data collection and analysis processes for stroke measures, and plan to focus on tracking and improving key stroke performance and outcome measures.

DISCUSSION

Each of the above state initiatives focus on improving the quality of stroke care, particularly to patients in rural areas. Data collection is a critical component for tracking quality improvement of stroke treatment, and is a central part of many of the initiatives. While 6 of the 9 initiatives collecting data participate in GWTC, some other states collect data on their own set of measures to track quality of care in their hospitals. Lacking a defined set of measures for stroke care quality creates comparability constraints for quality improvement. Ideally, data collected would fall into a defined set of rural-relevant national measures that would allow for comparison of CAHs as well as to other hospitals across the country.

The initiatives participating in GWTC and those collecting their own data often collected a multitude of different measures, so we asked participants which measures these initiatives depended on most heavily for quality improvement. Table 2 (next page) shows initiatives that included data collection as a part of their program, and indicates responses of the top five most useful measures for monitoring quality improvement in stroke care used by each initiative.

The two most helpful measures for these initiatives identified by interview participants are Door-to-Needle (tPA) Time and Pre-Notification by EMS. Door-to-Needle Time is an essential measure for timely ischemic stroke treatment, and Pre-Notification helps hospitals to be notified when a possible stroke patient is incoming to their facility from EMS. Door-to-CT (image) Time, Door-to-CT Read Time, and Mode of Arrival were also commonly indicated measures. Again, the measures related to CT scans relate to the ability to provide timely stroke care, and the mode of arrival (whether via ambulance or other modes) can be important to track how patients arrive at the hospital and if they receive any treatment or evaluation en route that may expedite further care upon arrival.

Some barriers to implementing quality improvement initiatives and specifically data-related aspects of quality improvement for stroke care were highlighted by our interviews. A common theme mentioned was the existence of resource problems for CAHs. These challenges include having enough staff to devote to stroke or quality improvement issues, enough time for designated staff to dedicate to stroke efforts (such as developing/implementing protocols or collecting data), and proper training. Many CAH staff have multiple responsibilities, so a CAH stroke



Table 2. Top QI Outcome Measures

	Door-to-Needle (tPA) Time	Pre-Notification by EMS	Door-to-CT (image) Time	Door-to-CT Read Time	Mode of Arrival	# Patients who Qualify for tPA	Door-to-Physician Time	Door-to-Transfer	# Patients Transferred	Last Known Well Time to ED Arrival	% of All Ischemic Stroke Patients Receiving IV tPA	% of Eligible Ischemic Stroke Patients Receiving IV tPA	Reason for Not Receiving tPA	Stroke Education	Receive VTE Prophylaxis or Why No VTE Prophylaxis Given	EMS Service Used	Pre/Post Test Score from Stroke Education Series	IV tPA Arrive by 2 hours, Treat by 3 hours	Dysphagia Screen	Decision to Transfer to Time Left ED	30-Day Readmission Rates
Illinois Critical Access Hospital Network Stroke Initiative	X	X		X	X								X								
Kansas Initiative for Stroke Survival	X							X	X							X	X				
Kentucky Educational Program				X		X	X		X												X
Kentucky Stroke Encounter Quality Improvement Project	X	X	X		X	X															
Minnesota Stroke Program	X		X					X			X	X									
North Dakota State Stroke and Cardiac System		X	X	X														X	X		
Utah Stroke Receiving Facilities Initiative	X	X	X	X			X														
Washington State Emergency Cardiac and Stroke System	X	X	X		X					X											
Wisconsin Coverdell Stroke Program		X			X					X	X										X
Wisconsin Rural Hospital Stroke Improvement Program ¹														X	X						

1. Only tracks two measures

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coordinator may also have several other programmatic responsibilities and not be able to focus as much time as a stroke coordinator in a larger hospital whose role is only associated with stroke care. With improved training in quality improvement and assistance in developing specific stroke protocols, staff may be able to be more effective with the time they're able to spend dedicating to stroke care and quality improvement.

Along with staffing resource issues, the cost of data collection and analysis can be difficult for CAHs to absorb. The knowledge of how to collect applicable data and submitting processes, combined with the time it takes to train staff on how to collect the data and the data collection itself can also be a barrier for CAHs. Additionally, the cost of participation in a program like GWTG can be unmanageable or particularly difficult to rationalize for a CAH that might only see a dozen stroke patients each year.

Low stroke patient volumes may result in another barrier, making it more difficult to track quality of care and improvement over time. Low volumes can result in difficulties such as data suppression and lack of reliable comparisons. Increased data collection across CAHs can help improve the number of cases able to be analyzed and provide comparisons for CAHs, even when they continue to see low volumes in their own facility.

In response to these challenges, many of the CAH stroke care quality improvement initiatives are resourceful in the ways they incentivize CAHs to participate in their programs and data collection. In response to GWTG program participation cost barriers, several initiatives assisted CAHs by paying for or subsidizing the cost of participation in GWTG, with several using Flex Program funding and other initiatives using state or grant funds. Involvement in the GWTG program also comes with support for data collection and analysis, making this resource more valuable when CAHs are able to participate. An increase in use of Flex funds to incentivize participation in GWTG could encourage more CAHs to participate in data collection and quality improvement initiatives.

Establishing and building relationships with EMS agencies and state offices of EMS were common themes that facilitated improvement in stroke care. Acknowledging

that stroke care and the ability to provide timely stroke treatment depend on the early identification of stroke symptoms, the involvement of community organizations and EMS agencies is integral to achieve improved overall stroke outcomes. Other relationships with work groups, task forces, and organizations like the American Heart Association/American Stroke Association also broadened support for these initiatives and provided additional resources that the initiatives might otherwise find difficult to provide. The inclusion of physicians, EMS providers, hospital administrators, hospital staff, and community members was critical to these initiatives' success.

CONCLUSIONS

Education and training were key components of improving stroke treatment and the quality of stroke care in CAHs throughout nearly all of the initiatives we identified. Often, initiatives received assistance from or collaborated with the American Heart Association/American Stroke Association for education and community awareness resources to improve the knowledge of CAH staff and local communities alike. Relationships with state and local EMS organizations led to the development of protocols that improve stroke identification and treatment, which are particularly important for timely stroke care.

Data collection was also a critical element of actively implemented initiatives, allowing participants to track and benchmark the quality of their stroke care and identify areas for improvement.

The initiatives featured here have been implemented, or are about to be, in CAHs across the country and are potentially useful to State Flex Programs, CAHs, and other stakeholders interested in initiating or improving stroke care quality improvement activities in CAHs. Their anecdotal evidence of improvements in the quality of stroke care justify an increase in these types of initiatives in CAHs and a further focus on data collection to demonstrate improvements. The outlook for enhancing quality improvement for stroke care in rural communities looks quite positive.



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