

Paul Coverdell National Acute
Stroke Registry Program
Summary Report
2007–2012

Acknowledgments

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Table of Contents

Executive Summary 4

Introduction 5

 Program History 5

 PCNASR Program Description 5

 Program Reach and Impact 6

Lessons Learned 9

State Strategies to Improve Stroke Care 11

 Massachusetts: Employing Multifaceted Strategies to Engage Hospitals in QI 12

 Ohio: Training Hospitals in Health Literacy and Protocols for Stroke Education 16

 Michigan: Engaging Hospitals to Improve Dysphagia Screening 19

 Minnesota: Improving Documentation and Protocols for tPA 22

 Georgia: Building Partnerships to Improve Door-to-Needle Time 26

 North Carolina: Sustaining Stroke Systems of Care through Partnerships 29

Conclusion 32

References 32

**Appendix: Performance Measures for the Paul Coverdell
National Acute Stroke Registry Program. 35**

Executive Summary

This summary report presents an overview of the Paul Coverdell National Acute Stroke Registry program and six vignettes of specific programmatic strategies and activities employed by states funded by the Centers for Disease Control and Prevention (CDC) during 2007–2012 to work with hospitals to improve the quality of stroke care across their state. The selected themes were identified and compiled from a review of existing program data sources, such as state annual progress reports and data submitted to CDC on performance measures for the quality of stroke care, and from ongoing discussions with state program staff. Each vignette highlights the level of improvement in stroke care practices (as indicated by performance measure data), the strategies determined to have contributed to the success of the state stroke registry program, how states overcame challenges, and relevant lessons learned. The lessons learned across each of the six states were to

- Gain a higher level of buy-in from hospital administration, clinicians, and emergency medical services.
- Maintain high-quality data.
- Enable hospitals to incentivize and individualize their quality improvement efforts.
- Facilitate networking and resource sharing between hospitals.
- Foster diverse partnerships to sustain improvements in stroke care.

This report provides information that individual states can use to foster communication and collaboration with other states, with hospital systems, and with communities to improve timely treatment and coordinated care for stroke.

Introduction

Program History

Stroke is a leading cause of death and long-term disability in the United States,¹ and in 2010, strokes were responsible for 1 out of every 19 deaths in this country.² Judging from recent estimates, during the course of a year approximately 800,000 Americans will have a stroke, and about 10%–25% of stroke victims will die at the time of the stroke event or soon after.^{3–6} Nearly half of stroke victims remain permanently disabled, resulting in lifelong challenges to the individual and his or her family.¹ The economic effects of stroke are enormous, with U.S. estimates for 2010 placing the cost due to disability and death at \$36.5 billion.¹ This total includes the cost of health care services, medications, and missed days of work.

In response to the high burden and cost of stroke and in memory of Senator Paul Coverdell of Georgia, who died of a stroke in 2000, the U.S. Congress directed CDC to implement state-based stroke registries to improve the quality of stroke care. In 2001, the Paul Coverdell National Acute Stroke Registry (PCNASR) program⁷ was created to

- Measure, track, and improve the quality of care and access to care for stroke patients from onset of stroke symptoms through rehabilitation and recovery.
- Decrease the rate of premature death and disability from stroke.
- Eliminate disparities in care.
- Support the development of stroke systems of care that emphasize quality of care.
- Improve access to rehabilitation and opportunities for recovery after stroke.

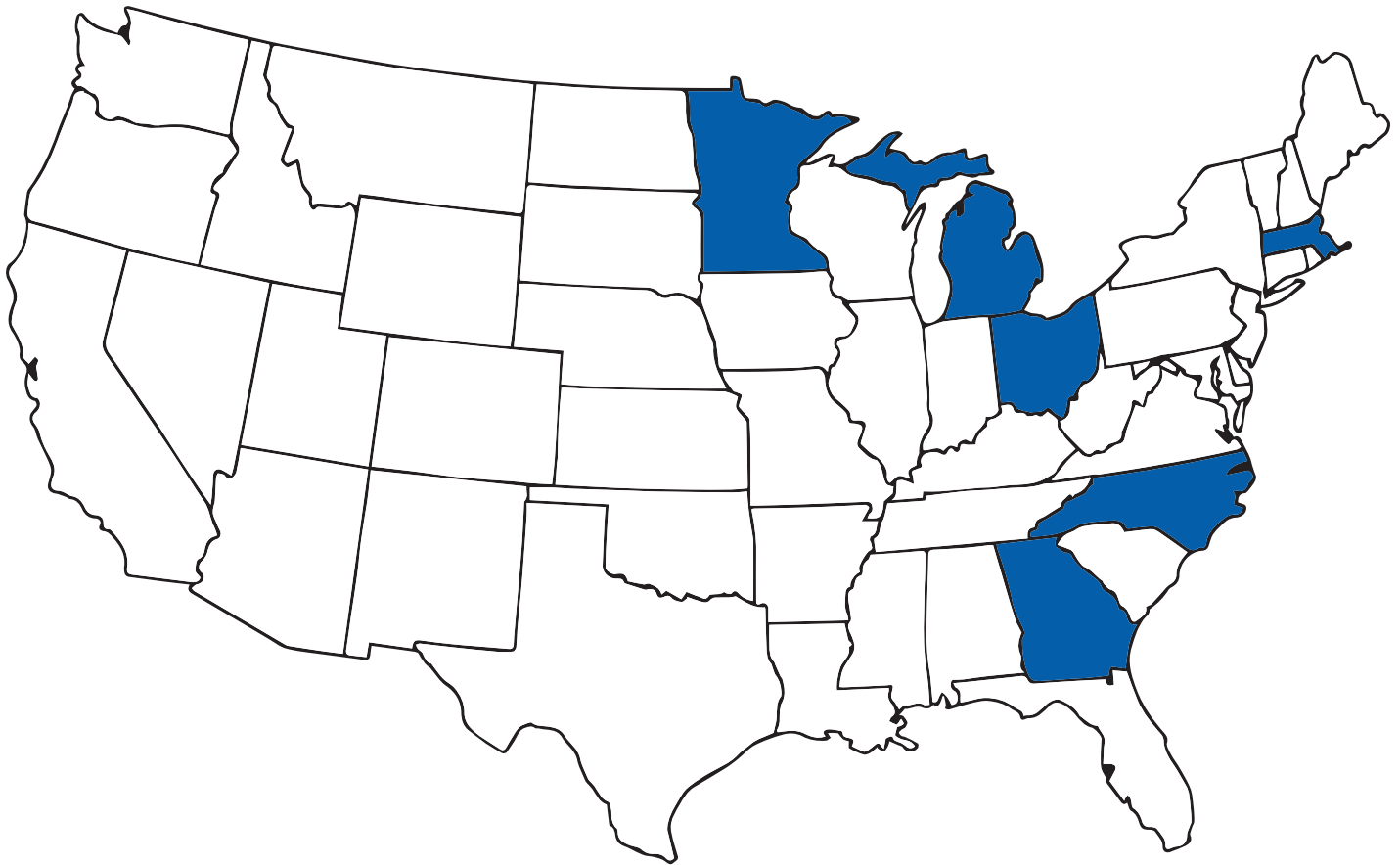
- Increase the workforce capacity and scientific knowledge of stroke care within stroke systems of care.

Since 2001, CDC has expanded the PCNASR program to improve the quality of care for acute stroke patients. During the pilot phase (2001–2004), eight registries were led by CDC-funded clinical investigators in academic and medical institutions, and the full implementation of statewide registries led by CDC-funded state health departments began in 2004. Four state health departments were funded in 2004–2007, and the program expanded to six state health departments in 2007–2012.

PCNASR Program Description

To support the PCNASR mission, from 2007 to 2012 the CDC funded the state departments of health for Georgia, Massachusetts, Michigan, Minnesota, North Carolina, and Ohio with approximately \$600,000 annually to establish state-based stroke registries (see Figure 1). The program encouraged the states to collaborate with key stakeholders, raise public awareness, and recruit hospitals to join the PCNASR program and become certified stroke centers.^{8,9} Enrollment by a hospital in the PCNASR required compliance with current stroke guidelines, data collection and the tracking of performance measures for stroke quality, and the implementation of stroke-related quality improvement (QI) efforts. The performance measures for stroke quality of care are a standardized set of in-hospital data metrics (see Appendix). These measures enable the monitoring of each hospital's improvements and challenges in compliance with the PCNASR requirements.

Figure 1. Map of PCNASR State Departments of Health, 2007–2012.



During 2007–2012, each state tailored its program design, focus, and evaluation efforts to address the needs and opportunities unique to that state. All of the states required participating PCNASR hospitals to conduct QI activities and to participate in evaluation activities organized by the states' departments of health to ensure ongoing improvement of the performance measures and corresponding stroke systems of care.¹⁰ Examples of state program activities included educational conference calls, webinars, hospital site visits, and the facilitation of communication and networking between hospitals and partners.

For additional information about the PCNASR program, visit www.cdc.gov/dhdsp/programs/stroke_registry.htm.

Program Reach and Impact

The vast improvements in stroke care from 2007 to 2012 can be identified through the stroke quality of care performance measures and annual QI and evaluation reports generated by each funded state. Beginning in 2007, each state began recruiting hospitals to join the PCNASR. In 2008–2012, more than 213,500 patients were tracked and treated and thus benefited from improved quality of care in the more than 300 hospitals participating in PCNASR in the six states. Table 1 illustrates the number of participating hospitals by state and the percentage of each state's stroke admissions treated by these hospitals in 2012.

Methods to Identify Promising Practices and Lessons Learned

To identify key strategies used by each state, a mixed methods approach involving both quantitative and qualitative analyses was employed. Data sources included annual reports, records of site visits, notes from the bimonthly All-State Conference Calls, evaluation reports, and 2007–2012 data on the stroke quality-of-care performance measures. Additionally, the CDC-funded states carried out evaluations of hospital activities and statewide efforts through a variety of methods, including

- Annual hospital inventory survey (required).
- Questionnaires/surveys.
- Reports from Get with the Guidelines[®],¹¹ which are PCNASR reports with de-identified quality-of-care data from participating hospitals.
- Focus groups.
- Interviews with key informants.
- Feedback/information solicited during regularly scheduled conference calls.

- Reviews of reports on chart audits.
- Reviews of program records (e.g., quarterly reports, meeting/call minutes, progress on the work plan).
- Records of site visits.
- Evaluations of training feedback surveys of the participants in trainings.
- Meeting/call attendance records.
- Data on the number of website “hits.”

Each state selected the evaluation questions it wished to address based on its own context and needs (see examples in box). Findings from the state-level evaluations also informed the identification of key strategies. Once the strategies were identified, they were discussed and confirmed with program staff from each state.

The initial investigation into emerging or promising practices began with analysis of the stroke quality-of-care measures aggregated from the six funded states over the funding period. This analysis revealed three measures—stroke education, dysphagia screening, and adherence to the use of intravenous tissue plasminogen activator (tPA, a thrombolytic medication) within 3

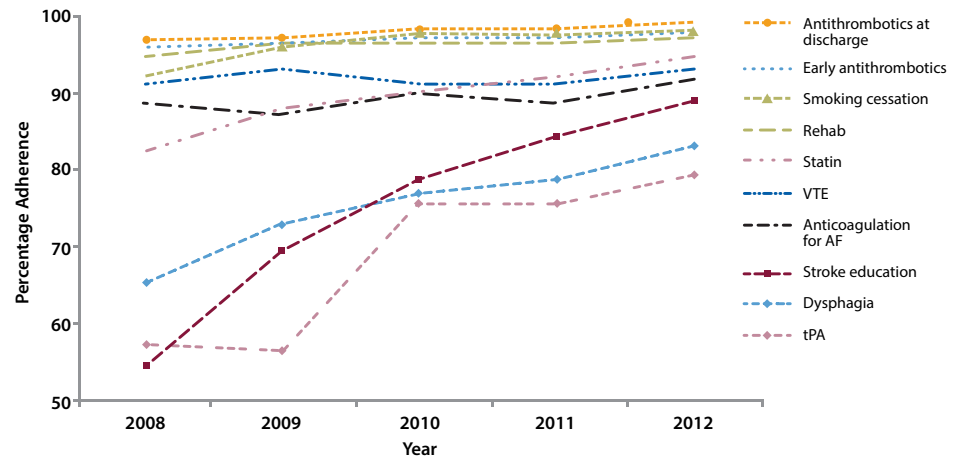
Table 1. Number of Participating Hospitals and Percentage of Stroke Admissions by PCNASR State in 2012.

State	Number of Participating Hospitals	State Stroke Admissions (%)
Georgia	63	79%
Massachusetts	58	87%
Michigan	35	43%
Minnesota	52	48%
North Carolina	62	82%
Ohio	43	25%

Evaluation Questions Most Commonly Used by PCNASR Programs

- How are partner hospitals using their stroke registry data to improve the quality of stroke care their facility provides to patients?
- What QI activities were implemented by hospitals that have improved stroke care practices?
- What challenges have hospitals and hospital personnel encountered in trying to implement their QI efforts?
- Do other hospital QI initiatives promote or hinder stroke care?

Figure 2. Aggregated Percentages for Adherence to Paul Coverdell National Acute Stroke Registry Performance Measures for All Participating Hospitals in the Six Funded States, 2008–2012.*



*Figure 2 includes measures that were in place across the entire time period (2008–2012). Measures in the Appendix include some that were added during the funding period, and thus not all are in Figure 2.

Antithrombotics at discharge: Antithrombotic medication prescribed at discharge. *Early antithrombotics:* Early antithrombotic medication. *Smoking cessation:* Counseling about smoking cessation. *Rehab:* Assessed for or received rehabilitation. *Statin:* Statin medication prescribed at discharge. *VTE:* Prophylaxis for venous thromboembolism. *Anticoagulation for AF:* Anticoagulation for atrial fibrillation. *Stroke education:* Education on stroke, including its risk factors and medications. *Dysphagia:* Screening for dysphagia. *tPA:* Adherence to the tPA protocol.

hours[†]—on which all six states achieved the greatest improvement as compared with the other measures, many of which were already at consistently high rates of performance (see Figure 2). These three performance measures were prioritized and disaggregated to enable the comparison of data trends at the state level over time, and data were systematically abstracted from the states’ annual reports. The abstracted information demonstrated recurring themes and strategies that directly and indirectly contributed to

improvements in stroke education, dysphagia screening, and the use of tPA. Using these recurring themes and ongoing discussion with program staff, this summary report presents a series of state vignettes that highlight key strategies, show how challenges were overcome, and recount lessons learned in improving statewide stroke systems of care.

[†]See Appendix for a description of the stroke quality-of-care measures.

Lessons Learned

The state vignettes presented below illustrate opportunities for hospitals, emergency medical services (EMS), related service providers, and statewide organizations to improve their stroke systems of care. Although the context and conditions may be unique for each state, the key strategies employed and lessons learned that are shared in this report can offer guidance to other organizations and states as they work to strengthen the quality of stroke care and improve their QI initiatives.

The five lessons below were identified across all six states:

1. Gain a higher level of buy-in from hospital administration, clinicians, and EMS.

- Identify a stroke champion at each hospital to steer the implementation and maintenance of the stroke registry and enhanced stroke protocols.
- Obtain buy-in from hospital administration to ensure flexibility for ongoing trainings, meetings, technical assistance, and program evaluations.
- Engage physicians about current stroke guidelines (e.g., those for tPA) and gain their support to implement corresponding stroke protocols.
- Include hospital QI staff in ongoing discussions, trainings, and evaluations of stroke protocols to build a team-based approach to improving stroke care.
- Establish strong partnerships between each hospital's emergency department (ED) and EMS to improve care and foster the development of a

relationship in which the ED and EMS work together as a team.

2. Maintain high-quality data.

- Ensure that all hospitals receive uniform training in data compliance and data abstraction so that both the quality of the data and efforts to monitor performance measures are maintained.
- Make sure that hospitals can find, use, and interpret their data to allow them to run their own QI reports.
- Supplement and tailor training on data based on the needs and experience of each hospital and its stroke coordinators.
- Provide ongoing trainings to offset staff turnover, deal with discrepancies in data abstraction, and adjust to updates in the stroke guidelines.
- Educate hospitals and EMS about the connection between having high-quality data and the ways in which the interpretation of these data affects performance measures and drives QI.
- Further explain the evaluation steps needed to monitor the ongoing productivity and success of each hospital.

3. Enable hospitals to incentivize and individualize QI efforts.

- Educate hospitals to run and use their own QI reports and to target their lowest aggregate performance measures. The selection of priority indicators should be driven by the data and based on an analysis of the greatest gaps in care and opportunities to improve patient outcomes.

- When possible, invest available funds into individualized hospital QI projects and ongoing QI activities to enable hospitals to address barriers to QI based on their specific needs. Notably, a lack of hospital-based resources to support these activities was frequently identified as a reason for inability to sustain participation in the PCNASR.
- Develop exemplary protocols for hospitals and EMS and allow hospitals to be creative in adapting these protocols to their own specific needs and barriers.
- Learn from high-performing hospitals and/or stroke coordinators so as to benefit from their successful strategies.
- Develop an awards program to incentivize hospitals and EMS through achievable benchmarks and recognition for their accomplishments.

4. Facilitate networking and the sharing of resources between hospitals.

- Use regional meetings, conference calls, and trainings to allow hospitals and EMS to share resources, tools, protocols, and QI reports.
- Foster a supportive environment in which hospitals and EMS can openly share their experiences in both successful and unsuccessful strategies for collaborative problem solving.
- Build a resource website to share current stroke guidelines, to archive webinars, and to facilitate discussions

and problem solving between hospitals. A resource website makes teleconferences and recorded webinars more accessible, which is important in light of hospital scheduling conflicts and staff turnover. It also reduces travel time and expenses for hospital staff.

- Incorporate regularly scheduled in-person meetings; in-person meetings are more engaging and establish relationships. Ask key stakeholders to assist in facilitating in-person meetings to keep costs down.

5. Foster diverse partnerships to sustain improvements in stroke care.

- Gather a well-rounded team of partners from state government, academic centers, communities, and nonprofit organizations to advocate for ongoing support of statewide stroke systems of care.
- Identify opportunities to collaborate or integrate with other state-sponsored entities.
- Frame the prevalence and burden of stroke and the need for improved stroke systems of care in ways that are meaningful and useful to stakeholders.
- Implement efficient stroke protocols to empower stroke teams to maintain data collection and use QI reports. These competencies will help sustain good practices regardless of changes in hospital oversight or funding.

State Strategies to Improve Stroke Care

Strategies to improve stroke care that were developed by the six participating states are presented in this section[†]:

- Massachusetts: Employing Multifaceted Strategies to Engage Hospitals in QI
- Ohio: Training Hospitals in Health Literacy and Protocols for Stroke Education
- Michigan: Engaging Hospitals to Improve Dysphagia Screening
- Minnesota: Improving Documentation and Protocols for tPA
- Georgia: Building Partnerships to Improve Door-to-Needle Time
- North Carolina: Sustaining Stroke Systems of Care through Partnerships

Current PCNASR programs and other entities, at the state level or elsewhere, that are interested in improving the quality of stroke care are encouraged to consider the promising practices and the lessons learned that are described in this summary report. Additionally, this report is intended to foster future communication and collaboration between state departments of health, stroke systems, and communities to improve timely treatment and coordinated care for stroke.

[†]The information presented in this summary report is limited to the 2007–2012 funding period. The activities mentioned in this report are ongoing and may have evolved since the publication of this report. Additionally, the organizational structure and funding budget for each PCNASR state included in this report may have been redistributed after 2012.

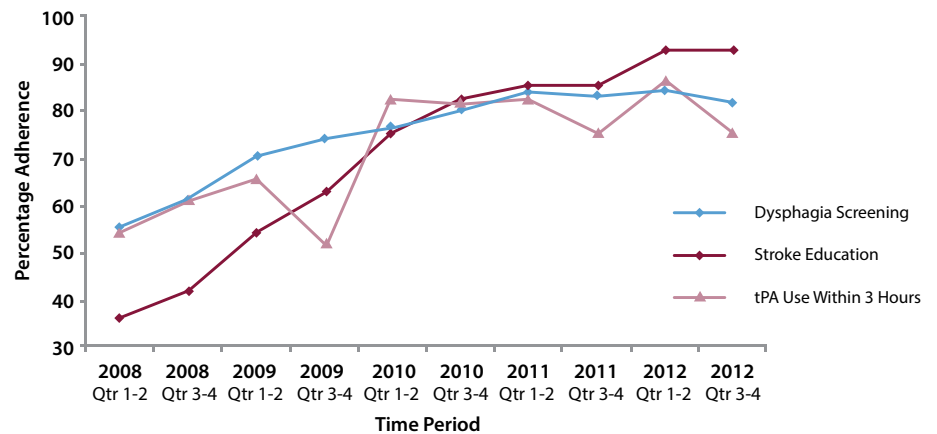
Massachusetts: Employing Multifaceted Strategies to Engage Hospitals in QI

Massachusetts Stroke Collaborative Reaching for Excellence

Review of the three performance measures with the lowest levels of adherence across the six funded PCNASR programs (stroke education, dysphagia screening, and tPA use within 3 hours) indicated that the Massachusetts Stroke Collaborative Reaching for Excellence (SCORE) had performed remarkably well (see Figure 3).

Accordingly, CDC systematically investigated the strategies that SCORE had implemented across all three of these performance measures. This investigation found that SCORE consistently targeted training efforts and technical assistance for participating hospitals around their lowest performance measures, which mirrored the three lowest measures for all six funded states. In particular, SCORE employed key QI strategies, including data training, sharing of resources and networking, and recognition of achievements for hospitals. The SCORE staff viewed these as essential to advancing the PCNASR quality of care measures.

Figure 3. Massachusetts SCORE Percentage Adherence to PCNASR Performance Measures: Dysphagia Screening, Stroke Education, and tPA Use Within 3 Hours, 2008–2012.



What is the significance of the performance measures? Performance measures and the corresponding QI in the PCNASR program are data driven. Thus, it is imperative that hospitals understand the importance of knowing how to enter data accurately and employ these data to evaluate their programs and make improvements in them.

Hospital Data Training and QI

SCORE made an ongoing effort to educate hospitals on how to use data to drive QI. The program employed several methods of data training, including quarterly conference calls, annual in-person group trainings, didactic sessions, an annual chart audit on at least 5% of complete records, and graphs that provided feedback on data that had been submitted. The training sessions addressed questions related to data abstraction, such as running reports, analyzing data, and the clinical rationale for various data elements and performance measures. SCORE staff continuously monitored several areas:

1. The completeness of case ascertainment.
2. The completeness and accuracy of data elements.
3. The hospitals' compliance with the timeline for submitting data.

In addition to group training, program staff recognized the need for more tailored individualized training because of the variations in experience among stroke coordinators and abstractors. New hospital staff, or those with an identified need for support, received site visits focused on data training, and the annual chart audit process reinforced data training. The audit, which was performed in person at each site, provided an opportunity to give individualized feedback to abstractors during the review. In addition, coordinators were provided with written feedback on any discrepancies found. Graphs providing feedback on data submitted for various measures were also provided to hospitals to illustrate how they could use the data to compare their own QI trends with trends

for other de-identified hospitals having a similar stroke volume. Additionally, evaluators collected ongoing feedback from hospitals to ensure that data trainings were timely and appropriate and that hospitals were efficiently entering the data needed to generate and then use QI reports.

QI Networking Sessions

SCORE facilitated numerous regional meetings that provided a venue for networking and small-group discussions focused on QI topics. SCORE reported that focusing the topics at regional meetings on hospital needs kept attendance high at these meetings; hospitals were surveyed beforehand to determine what topics would be most helpful to their QI efforts. Examples of the topics that were covered included

1. The model for improvement.
2. Strategies for empowering stroke coordinators.
3. The evidence for dysphagia, assessing different screening tools, and gaining hospital and staff buy-in for screening all stroke patients for dysphagia.
4. The components of an effective stroke-team meeting.
5. Review of aggregate performance on the discharge measures.

The regional meetings also provided the opportunity for hospitals to share their QI reports. Each hospital was asked to bring its own QI reports and given time to present and collect feedback on them from other hospital representatives. In addition to sharing QI barriers at these regional meetings, newly recruited hospitals were matched with more experienced hospitals as a way of giving them support and

Continue to monitor adherence rates and provide specific targeted technical assistance to lowest-performing hospitals and focus training efforts around performance measures with the lowest aggregate adherence.

—Massachusetts SCORE, 2011

extending advice to further foster mentorship, networking, and collaboration.

Although the regional meetings presented some barriers related to scheduling and location, SCORE found that they were valued by the hospitals because of the interactive format. Hospitals took turns hosting the meetings to ensure a balanced opportunity to attend while also easing the burden for each institution.

Tools and Resource Sharing

The SCORE website provided a venue to share articles, sample protocols, meeting slides, informed consent forms, and tools developed by the SCORE QI nurse. One of these tools was the hospital self-assessment tool, which was used as part of orientation and annual site visits. This tool provided a road map to facilitate understanding of the stroke program's structure and helped hospitals comply with SCORE requirements and the state's Primary Stroke Service (PSS) regulations.¹² In 2009, a hospital inventory survey was developed, which enabled SCORE to identify which hospitals had protocols for ischemic and hemorrhagic stroke and a written EMS plan in place. The survey revealed that 14% of SCORE hospitals did not have written protocols for hemorrhagic stroke. SCORE followed up with those hospitals and provided them with sample protocols for this kind of stroke and information regarding the PSS regulations requiring that hospitals have these protocols in place. In addition, 4% of SCORE hospitals did not have a written EMS plan, which is required by PSS regulations. Hospitals with existing EMS plans were asked to share their plans, and these samples were posted on the SCORE website along with sample protocols for

ischemic and hemorrhagic stroke. Both the stroke protocol and EMS examples prompted more discussion at SCORE trainings and a mini-workshop to help hospitals write EMS plans and to ensure that staff were aware of and meeting PSS regulations. Additionally, case ascertainment had been an ongoing issue for data abstractors. Several tools were developed to address this topic, including a case ascertainment protocol with a quick reference guide, a concurrent case ascertainment tool, and an abstractor orientation tool. All of the tools were distributed and posted to the website.

Incentivize and Recognize Hospitals' Accomplishments

SCORE developed an annual awards program to both incentivize and recognize participating hospitals for their achievements in improving the quality of care to stroke patients. Award categories varied each year and were based on the measures that were focused on during that time period. One award category, however, did not change: the "closest to defect-free care" award.[§] Overall, the exact criteria for the awards evolved over the funding period as SCORE learned which criteria were too easily attained and, conversely, which were unattainable. For example, the benchmark for defect-free care was raised from greater than 70% to 80% of a hospital's eligible stroke patients. These awards were seen as illustrating the culmination of QI efforts among exemplary hospitals.

[§]The defect-free care measure, which includes the 10 stroke consensus measures, reflects the percentage of patients receiving all of the interventions for which they were eligible.

Lessons Learned

- Target the lowest aggregate performance measures and ensure uniform data compliance and monitoring across all participating hospitals.
- Provide ongoing and individualized training on data abstraction to drive QI.
- Facilitate networking and the sharing of resources, tools, and protocols between hospitals through regional meetings and a program website.
- Create achievable benchmarks and provide recognition for hospitals' accomplishments through an awards program.

Contact Information

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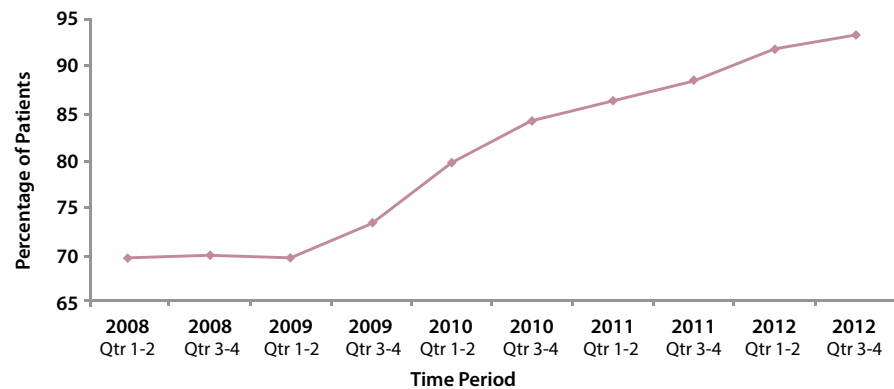
Ohio: Training Hospitals in Health Literacy and Protocols for Stroke Education

Ohio Coverdell Stroke Registry

From the onset of the funding period, the Ohio Coverdell Stroke Registry program recognized the need to address one of its lowest performance measures, stroke education. In 2009, the Ohio Coverdell Hospital QI Initiative for Stroke Education was established, and stroke education became a

priority quality indicator for all of its participating hospitals. Correspondingly, Ohio's upward trend for the stroke education measure reflects a continuous improvement in that measure starting in 2009 (see Figure 4). In addition to the ongoing goal to successfully train hospital staff to document and deliver all five components of the stroke education measure, the Ohio Coverdell Stroke Registry has performed exceptionally well through its emphasis on health literacy and patient comprehension for its stroke patients and their families.

Figure 4. Percentage of Eligible Patients in the Ohio Coverdell Stroke Registry That Received Stroke Education, 2008–2012.



What is the significance of stroke education? Stroke education to patients and their families has been shown to increase healthy behaviors, improve health status, and decrease health care costs for patients.

What are the guidelines? Clinical practice guidelines recommend stroke education programs for ischemic and hemorrhagic stroke patients and their families during hospitalization, and they facilitate linkages to resources and support services after hospitalization.

How is the stroke education performance measure monitored? To meet the criteria for stroke education, hospitals must provide stroke education or materials on five focus areas during hospitalization: personal risk factors for stroke, warning signs for stroke, activation of EMS, the need for follow-up after discharge, and medications prescribed at discharge.^{13–16}

Improving Data Quality

At the onset of the funding period, the Ohio Coverdell Stroke Registry established data accuracy as a priority indicator to help achieve higher performance in stroke education. To identify documentation problems and discrepancies found from hospital charts, a monitoring report was generated during each site visit and discussed with hospital staff. From these reports, the Ohio Coverdell Stroke Registry learned to correct some common root causes of hospital chart and data discrepancies through improvements in the case ascertainment methodology, re-abstraction of data for greater inter-rater reliability, and further review through quarterly meetings that offered networking and technical assistance.

Health Literacy Training

To target and improve stroke education, the Ohio Coverdell Stroke Registry worked with partners such as the Ohio State University's Area Health Education Center to facilitate several trainings on stroke education and QI for nursing staff that interacted regularly with stroke patients and their families. Not only did these trainings clarify the five chart components required to meet the criteria for the stroke education measure, but they also explained more efficient ways to successfully communicate preventive stroke behaviors to patients and gain their comprehension of these behaviors. Examples of training topics included "Improving Communication between Patients and Staff: It's Time to Take It Seriously" and "You Can't Tell By Looking! Assessing a Patient's Ability to Read and Understand Health Information." The learning objectives of these trainings included

1. Identify elements in assessment of learning needs, style, and readiness to learn.
2. Identify ways to incorporate patient teaching into daily work plans to use time more efficiently.
3. Discuss strategies to overcome barriers to patient learning and to staff teaching.
4. Describe ways to evaluate learning outcomes.

In general, these trainings on stroke education and health literacy taught hospital staff how to evaluate patients' comprehension of the stroke education by collecting frequent feedback from them to ensure understanding and successful application. Here the staff used the teach-back method, in which patients explain the lessons in their own words, and behavioral rehearsal (e.g., what if...?).

In addition to training nursing staff, the Ohio Coverdell Stroke Registry team recognized the need for a team approach to stroke education and QI. This included fostering communication, creating additional resources, and establishing protocols between team members to avoid duplication of efforts or gaps in care. Some examples of QI included reviewing monthly data feedback with staff nurses and brain-and-stroke committee members, sharing educational articles, developing new instructions for stroke home care in both paper and electronic formats, updating clinical pathways to include stroke-specific education, specifying in the hospital set of orders at admission that the patient should receive a stroke education folder, and incorporating stroke-specific education into the electronic discharge instructions. The Ohio team also conducted evaluations of its stroke education

[E]stablishing accurate data collection serves as the basis for identifying opportunities for improvement and monitoring progress over time in other quality improvement initiatives.

—Ohio Coverdell Stroke Registry, 2008

trainings and protocols by distributing surveys to hospital staff. These surveys identified ongoing barriers and the need for future trainings, resources, and improved hospital protocols.

Supporting Hospital Staff Trainings through the Ohio Wiki Site

The Ohio Coverdell Stroke Registry learned that it was crucial to monitor data entry and to reinforce efficient QI practices to ensure that the quality of the data for measuring the performance of stroke education was maintained. Hospitals were encouraged to provide their nursing staff with the time and support needed to attend these trainings. Because of the high rates of staff turnover in hospitals, recurring data abstraction and stroke education trainings were needed to reinforce key practices to both new and long-term hospital staff. However, these ongoing trainings, meetings, and technical assistance for hospitals posed challenges because the hospital staff needed to miss work to attend Coverdell meetings, obtain staff coverage during their absence, and cover travel time and expenses. To address these problems, monthly QI conference calls via webinar were initiated. This enabled staff to watch and participate in the QI conference calls without causing the problems outlined above. Additionally, these webinars were recorded to accommodate staff who could not travel or change their schedule to attend the meetings live. Recordings of the meetings were made available on the Ohio Coverdell Stroke Registry resource website (known as the Ohio wiki site). The Ohio wiki site also provided a venue to share tools, resources, protocols, online assistance,

and opportunities for networking with participating hospitals. Over the course of the funding period, 80% of the Coverdell hospitals reported using the Ohio wiki site. This continuous access to trainings and QI support enabled the Ohio Coverdell Stroke Registry to greatly improve stroke education for stroke patients and their families across the state.

Lessons Learned

- Establish accurate data collection for the five elements of the performance measure for stroke education.
- Reinforce health literacy and patient comprehension strategies to key hospital staff.
- Use a team-based approach to stroke education and QI by ensuring that appropriate protocols and resources are available to staff.
- Make trainings and QI protocols easily accessible through a resource website in anticipation of hospital scheduling conflicts and staff turnover.

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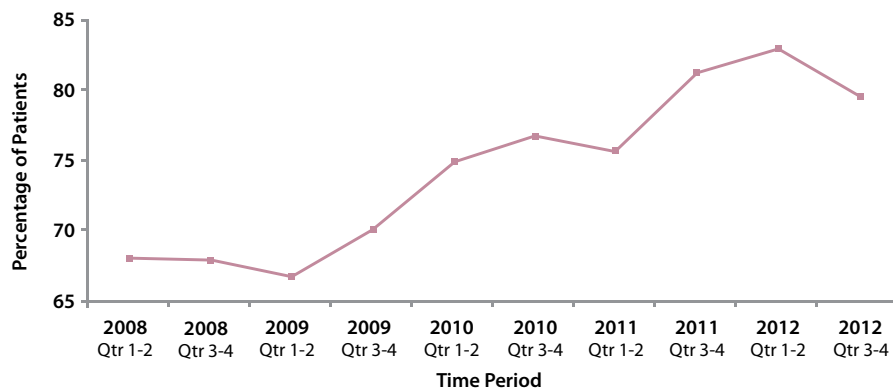
Michigan: Engaging Hospitals to Improve Dysphagia Screening

Michigan's Stroke Registry and Quality Improvement Program

Michigan's Stroke Registry and Quality Improvement Program (MiSRQIP) recognized the importance of improving the rate of dysphagia screening among participating hospitals in the state. MiSRQIP learned that the measure of

compliance with dysphagia screening among participating hospitals was only 66% and decided to select this measure as a priority QI indicator through the entire funding period of 2007–2012. MiSRQIP achieved considerable improvements in dysphagia screening (see Figure 5) through ongoing support of partner hospitals as they individualized their practices and made hospital-level changes. This was accomplished by fostering collaboration and sharing key strategies between and among hospitals.

Figure 5. Percentage of Eligible Patients in Michigan's Stroke Registry and Quality Improvement Program That Received Dysphagia Screening, 2008–2012.



What is the significance of dysphagia screening? Patients who have dysphagia, or difficulty with swallowing, after a stroke are at high risk of developing aspiration pneumonia or experiencing malnutrition. Recent evidence suggests that pneumonia rates in this population may be reduced when systematic screening for dysphagia is included in a management plan for ischemic stroke.

What are the guidelines? National guidelines for acute stroke recommend screening all patients through the use of a validated screening tool prior to their being given any food, fluids, or medication by mouth.

How is the dysphagia screening performance measure monitored? This measure is determined by assessing the percentage of a hospital's acute stroke patients that are screened for their ability to swallow prior to receiving any nutrition, fluids, or medications by mouth.^{17–20}

Prioritizing Dysphagia Screening

As part of its programmatic efforts, MiSRQIP supported the implementation of QI methods and strategies at participating hospitals. To ensure that dysphagia screening continued to be at the forefront of hospitals' QI efforts, it was frequently emphasized in the state's communications with hospitals and its educational efforts, including training topics, discussions at site visits, and one-on-one meetings. No single protocol was required as the gold standard to implement for all patients with suspected stroke. Rather, hospitals were encouraged to identify and tailor dysphagia screening protocols that were applicable to their specific resources, settings, and staff. For example, MiSRQIP noted that one large urban hospital with an annual volume of approximately 700 stroke admissions implemented a policy change to add competency in dysphagia screening to its annual nursing education week. Subsequently, dysphagia screening became a standard order for all suspected stroke patients. The interventions at this hospital resulted in an improvement in its adherence rate to this protocol from 87% in quarter 1 of 2010 to 100% in quarter 2 of 2011. The site leader credited a well-planned, carefully implemented multidisciplinary educational effort that spanned 6 months, which catalyzed this change and sustained the momentum. From leading examples like this one, MiSRQIP learned that many of the changes that hospitals implemented were system level in nature, rather than resource intensive.

Annual reports and program records indicated that the level of hospital engagement was the most prominent

element associated with a positive trend in dysphagia screening. A strong level of engagement initiated and sustained key changes in several hospitals, including clinical changes and the updating of existing procedures. For example, a clinical change in the ED of one hospital included an update to the electronic medical record system that prevented the dispensing of oral aspirin if a dysphagia screening had not been performed. A different clinical change was the addition by another hospital of dysphagia screening orders to requests for computed tomographic (CT) scans for stroke patients. This hospital had critically reviewed missed opportunities and found that although many suspected stroke patients did not receive dysphagia screening, most of the patients with suspected stroke in the ED did receive a head CT scan in a timely manner. The hospital made the system change such that when a head CT was ordered on a possible stroke patient, an order for dysphagia screening was automatically generated as well. During a 1-year period, this hospital's compliance rate for dysphagia screening increased from 40%–60% to 95%. Thus, through simple system-level changes like these, participating MiSRQIP hospitals could sufficiently address and document dysphagia in each suspected stroke patient, which ultimately improved their overall performance.

Fostering Collaboration and Sharing Resources

Another critical component of MiSRQIP's communication with partner hospitals was providing ongoing technical assistance or teaching to develop the hospitals' capacity to extract and interpret their data. This support often revealed problem

areas and corresponding opportunities for collaboration and the sharing of resources. For example, from discussions on dysphagia screening protocols, a small, rural, low-volume hospital recognized that it did not have a formal stroke protocol in place. Accordingly, it elected to use a hospital-wide screening protocol that was being employed at a nearby primary stroke center as part of its efforts to “take on” dysphagia screening. The sharing of protocols was further extended to sharing staff between hospitals with similar structures. Many of the MiSRQIP hospitals were critical-access hospitals and sometimes shared physicians and hospital staff; the sharing of resources enabled hospitals to exchange protocols and practices. In another instance, a partner hospital took extra measures in implementing a dysphagia screening protocol, determining the reliability and validity of a dysphagia tool prior to its full implementation. The hospital then went on to showcase its success at the 2012 International Stroke Conference.²¹

In addition to sharing and reporting these successful strategies, MiSRQIP added a reporting requirement that participating hospitals document their unsuccessful strategies for addressing dysphagia screening within their quarterly reports. Information from these reports was synthesized by MiSRQIP staff to identify common themes and to guide discussions during the monthly conference calls. The hospitals actively engaged in these discussions and typically presented on their experiences—both good and bad. With this useful information on

dysphagia screening strategies, hospitals could employ the successful strategies and avoid the pitfalls learned and shared by their partnering hospitals. MiSRQIP staff strongly believed that their primary role was to serve in a supportive role to hospitals, which enabled those institutions to achieve the successes observed with dysphagia screening rates.

Lessons Learned

- Require hospitals to make dysphagia screening a standard order for all suspected stroke patients, but allow them to take an individualized approach instead of establishing one protocol as the gold standard.
- Encourage communication and the sharing of resources between hospitals to systematically implement and update clinical pathways and stroke protocols.
- Support hospitals in reporting and sharing both successful and unsuccessful strategies in stroke protocols and guidelines for dysphagia screening.

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It's important to let hospitals be in control because it's their quality journey, and it's our role [MiSRQIP] to support and respect it.

—MiSRQIP, 2013

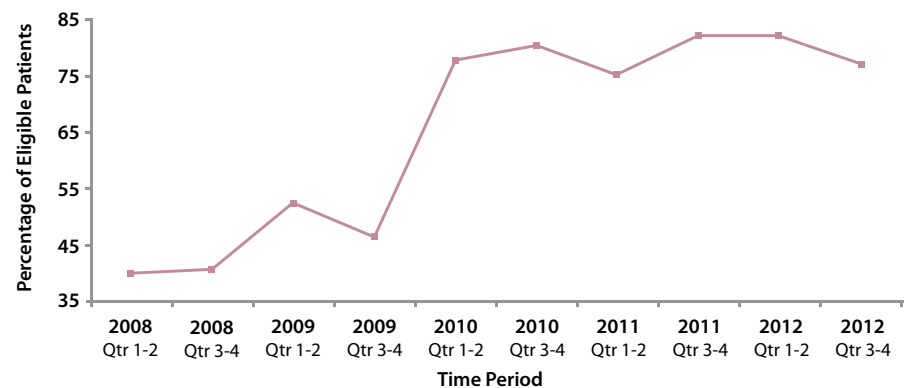
Minnesota: Improving Documentation and Protocols for tPA

Minnesota Stroke Registry

As was the case in other funded PCNASR states, in the Minnesota Stroke Registry (MSR), administration of intravenous tPA was consistently identified as one of the lowest-scoring performance measures. MSR's advances on this measure were dramatic from 2009 to 2010, and its greatly improved performance was sustained over the remainder of the funding period (see Figure 6). This improvement was attributed to both internal and external contributors

to tPA use. Internally, MSR began prioritizing tPA as a QI indicator in 2008 after determining that there was considerable opportunity for improving the provision of this drug within 3 hours after the onset of symptoms to eligible stroke patients across the state. MSR used a three-pronged approach that focused on data quality, development of a learning collaborative, and the creation of a mini-grant program to identify and address issues related to tPA. Externally, discussions revolving around required measures for stroke care further accelerated the uniform effort across participating hospitals to improve their compliance with the tPA performance measure.

Figure 6. Percentage of Eligible Patients Who Received tPA Within 3 Hours of Symptom Onset among Those Who Arrived Within 2 Hours of Symptom Onset, Minnesota Stroke Registry, 2008–2012.



What is the significance of tPA? tPA is a thrombolytic medication that is used to dissolve blood clots that cause heart attacks and strokes. This medication has been shown to reduce death and disability from ischemic stroke. Because of the significant impact that timely administration of tPA can make on the survival and recovery of ischemic stroke patients, the provision of this drug has been identified as one of several performance measures targeted for improvement through the PCNASR program.

What are the guidelines? Intravenous tPA provided within 3 hours of the onset of an ischemic stroke is a recommended treatment in patients who do not have contraindications to this medication.

How is the tPA performance measure monitored? The tPA performance measure is monitored by hospitals, the PCNASR program, and CDC. The performance measure is calculated as the percentage of those patients who arrive in the emergency department within 2 hours of the time they were last known to be well who receive intravenous tPA within 3 hours of the time they were last known to be well, unless contraindicated. Documentation of contraindications for intravenous tPA is required for success on this measure.^{13,17}

Data Quality

To help ensure that tPA was administered to all eligible ischemic stroke patients in a timely manner, the MSR found it was critical to share the most up-to-date guidelines for this intravenous medication with hospital physicians and staff. Once hospital staff bought into effectively employing this medication, the MSR worked toward achieving high-quality data on tPA administration and using this data to drive QI. Correspondingly, hospital staff and data abstractors received extensive training in the data elements essential to tracking both eligible and ineligible patients for tPA and their health outcomes. In particular, there was emphasis on including accurate documentation in patients' medical records as to why tPA was not provided if the patient did not receive it. Training sessions on data quality included discussions on data elements, case ascertainment, methods, and abstraction issues. The MSR received feedback that although training in data abstraction was burdensome at times, hospitals new to this task found the trainings on data quality to be extremely helpful.

Stroke-Learning Collaboratives

The MSR facilitated stroke-learning collaboratives among hospitals across the state

to foster networking and intensive QI support. These collaboratives included a series of seminars, with required QI activities held between sessions. The collaboratives also offered a performance improvement collaborative (PIC), a 9-month series of meetings and "action periods" among hospitals that were collectively focused on improving performance on a particular metric for the quality of stroke care, including the use of tPA. Adapted from the Institute for Healthcare Improvement's Breakthrough Series Collaborative model,²² the PIC consisted of three virtual learning sessions in which participants shared strategies for improvement, with each session followed by an action period in which participants carried out QI activities for improving care at their own facilities. The ongoing engagement, progress, and success of the PIC was tracked and assessed by the PIC director during each action period.

PIC Mini-Grant Program

Through the PIC, several small rural hospitals were given the opportunity to apply for mini-grants to enhance their QI activities. This funding enabled hospital stroke teams to make meaningful changes in processes and policies in their hospitals, which in turn led to improved patient care. When a rural hospital received a mini-grant

**Financial resources
(mini-grants) catalyze
and promote creative
thinking and action.**

—Minnesota Stroke Registry, 2011

dedicated to a specific project or issue, those who were leading the project were given permission (and in most cases, support) to expend time, energy, and resources towards the issue/project that otherwise would probably have received little to no support. It was noted that hospital administrators tended to be more supportive of these efforts when supplemental funding was supplied rather than money being used from the hospital's regular operating budget. Correspondingly, stroke coordinators and those leading their hospitals' efforts to improve stroke care could implement novel approaches and protocols needed in their hospitals in an unrestrained manner when provided with mini-grants. Examples of projects included the development of protocols for stroke care, standardized order sets, staff education on stroke care, improved laboratory procedures that enabled time targets for tPA treatment to be met, and the designation of a physician "champion" to improve stroke care. Without these additional financial resources dedicated to QI and, in part, tPA, the pressing needs for improved tPA protocols and resources would likely not have been addressed in several small rural hospitals across Minnesota.

External Influences on Adherence and Improvement in tPA

Discussions with program staff revealed that the substantial improvement in tPA performance was based on improvements made by not just one or two hospitals but, instead, involved a uniform effort across all hospitals. For example, in 2009, four primary stroke centers (PSCs) were not excelling on the tPA performance measure,

having a score of only 33%, but they more than doubled this metric in 2010, scoring 78%. Five other PSCs also improved markedly, raising their collective level of adherence to the tPA standard from 67% in 2009 to 89% in 2010. This was achieved through continued efforts by PSCs to build their programs, educate their staff, improve their protocols, and focus on improving tPA administration, with support from the MSR.

The MSR staff also identified external influences on participating Coverdell hospitals that may have helped further stimulate eagerness to improve their performance in tPA. In the spring of 2009, the Centers for Medicare & Medicaid Services (CMS) made an announcement about a proposed rule to require certain core measures for stroke like the use of tPA in hospitals if they wished to participate in a stroke registry. The MSR staff believed that the hospitals' anticipation of these proposed core measures accelerated each institution's examination into its processes and compliance with the tPA standard. Furthermore, this focus on tPA was sustained through the requirement for hospitals to report two stroke measures to the Minnesota Department of Health beginning in 2011–2012. Although these requirements may have fueled hospitals' targeted efforts in tPA, these hospitals would not have been as well equipped to implement the necessary process changes without the ongoing training and QI support of the MSR. In particular, required data collection, increased exposure to reports, an emphasis on QI, and the training of data abstractors by the MSR helped hospitals achieve and maintain their successes in administering tPA to eligible stroke patients.

Lessons Learned

- Provide tPA-related resources and trainings to gain support from physicians and hospital staff to meet tPA guidelines.
- Sponsor creative approaches and networking to solve tPA-related barriers through learning collaboratives and mini-grants.
- Keep hospitals abreast of required stroke measures and provide ongoing trainings with an emphasis on QI to meet all requirements.
- Identify external influences that have the potential to generate and maintain hospital buy-in and engagement in improving select performance measures.

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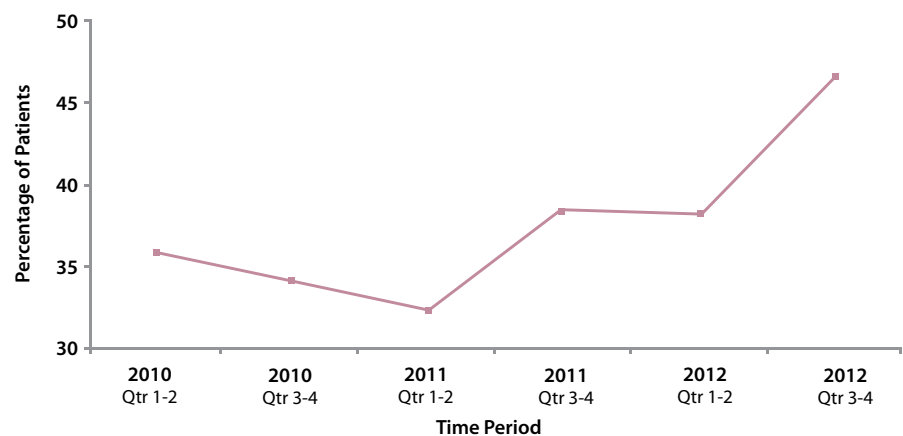
Georgia: Building Partnerships to Improve Door-to-Needle Time

Georgia Coverdell Acute Stroke Registry Program

The Georgia Coverdell Acute Stroke Registry (GCASR) program adopted door-to-needle time as a statewide priority QI indicator for participating hospitals from 2011 to 2012 (see Figure 7). Reducing the statewide average door-to-needle time was particularly difficult because of the diverse environment of stroke care across Georgia, with 63 hospitals of varying sizes serving urban and rural parts of the state (see Table 2). The GCASR, however, worked to foster camaraderie and the sharing of

best practices between hospitals even in the face of the hospitals' various sizes, locations, and unique challenges. Through support from the Georgia legislature, the GCASR also helped establish an unprecedented partnership between hospitals and EMS to improve coordination and timely response to stroke before arrival to hospitals. The coordinated services resulting from the partnership greatly reduced the average door-to-needle time across the state. This relationship between the hospitals and EMS would not have been possible without their deep commitment to improving stroke care, consistent leadership, programmatic and clinical expertise, and encouragement from "champion physicians" and GCASR health department staff.

Figure 7. Percentage of Door-to-Needle Times of 60 Minutes or Less Among Eligible Patients in GCASR, 2010–2012.



What is the significance of door-to-needle time? Timely treatment of an ischemic stroke patient with intravenous tPA can effectively improve neurological outcomes and result in greater functional recovery. Inefficient processes for assessment and provision of intravenous tPA can lead to treatment delays.

What are the guidelines? Achieving a door-to-needle time of 60 minutes or less is a quality metric that is endorsed by the National Quality Forum.

How is door-to-needle time monitored? The door-to-needle indicator measures the time between the arrival of an ischemic stroke patient at the emergency room "door" and the initiation of intravenous tPA ("needle").^{17,23,24}

Enhancing the GCASR-EMS Partnership

In 2011, the Coverdell-Murphy Act (CMA), or Senate Bill 549,²⁵ was enacted. The CMA mandated the collection and reporting of specific types of stroke data (e.g., thrombolytic checks, blood glucose, and time elapsed from EMS arrival on the scene to scene departure) from hospitals and EMS to each other and to the Georgia Department of Public Health. These data provide a baseline for assessing whether the required data are complete, a way of checking whether the priority stroke care elements are present, and an opportunity to view EMS activity across the state. Using these data, GCASR and Georgia EMS implemented an annual report card that it published and shared with the state legislature.²⁶ The CMA also included a number of stipulations that helped solidify the relationship between the state health department, stroke hospitals, and EMS, which contributed to improved average door-to-needle times. The examples below illustrate the improved partnership between hospitals and EMS and the development of better protocols:

- Local EMS representatives became members of the GCASR steering committee and helped develop plans to communicate feedback between hospitals and EMS. This, in turn, led to the development and eventual launch of a hospital feedback form for EMS providers that also included feedback on the outcomes of tPA-eligible patients.
- A statewide inter-facility transfer protocol was developed to transport patients from a remote stroke treatment center to a primary or comprehensive stroke center during or just after the time they received intravenous tPA.

- A statewide hospital designation process was developed for remote stroke treatment centers that could provide tPA prior to a patient’s transfer to a primary or comprehensive stroke center.

Communication and Training

Enhanced communication between hospitals and EMS was the result of multiple conference calls, webinars, and workshops that educated hospitals and EMS about the latter’s role in achieving better door-to-needle times and the importance of providing data feedback to EMS. The webinars focused on practical methods to decrease the time to administer tPA within the stroke unit and the ED. For example, webinar topics included data trends in door-to-needle time, the American Stroke Association (ASA) Target: Stroke campaign,²⁷ and ASA’s 10 best practice strategies²⁸ (e.g., rapid CT scan and advance mixing of tPA). There were also EMS-specific trainings, including a webinar titled “Stroke Signs & Symptoms.” In addition, EMS personnel were encouraged to attend Advanced Stroke Life Support (ASLS)²⁹ instructor workshops with trainings on contraindications to tPA. Graduates of the ASLS instructor workshop, in turn, were trained to teach the class to others at their facility to extend the training for tPA and protocols on door-to-needle time. Finally, the Georgia Stroke Professional Alliance mailing list of approximately 300 members, including physicians, subject experts, and others, acted as a resource; questions regarding stroke guidelines, QI activities, data requirements, and more could be asked on most days of the week, and each inquiry received multiple timely responses.

Table 2. GCASR Hospitals by Bed Size and Geographic Location, 2012.

Category	GCASR Hospitals (%)
Bed Size	
< 100	28%
101–250	27%
251–400	21%
> 400	24%
Urbanicity**	
Metropolitan	71%
Non-Metropolitan	29%

**Based on Rural-Urban Commuting Area Codes: 1–3 for metropolitan and 4–10 for non-metropolitan: www.ers.usda.gov/data-products/rural-urban-commuting-area-codes.aspx.

The GCASR program implemented a unique and consistent approach to reducing average door-to-needle times across the state by 31%, from 85 minutes in 2007–2008 to 58.5 minutes in 2012–2013—a savings of 26.5 minutes.

—GCASR, 2013

Individualized Door-to-Needle QI Interventions

In addition to enhanced collaboration and protocols between hospitals and EMS, GCASR focused some QI interventions on hospitals to target door-to-needle time. For example, GCASR educated hospitals on how to access and employ registry data to drive their QI activities and decisions. One approach that GCASR took to aid less equipped and newly recruited hospitals was to pair them up with more experienced PSCs for QI mentorship. GCASR also implemented a new door-to-needle strategy, which individualized QI interventions to each hospital's context. The QI director at GCASR and consultants selected three hospitals each month to conduct individualized door-to-needle time interventions and offered facility-specific recommendations at the monthly site visit. Innovations included the implementation of a system where specimens sent to the laboratory from acute stroke patients could jump to the front of the queue of specimens awaiting analysis for rapid laboratory testing, where appropriate, to further reduce turnaround times. The experiences gained during the site visits provided "promising practices" and were shared more broadly with other hospitals through webinars and conferences as part of the QI training plan.

Incentivizing and Recognizing Hospitals' Success

To incentivize hospitals to work toward reducing door-to-needle time, in 2011 GCASR established the "Golden Hour" award. The criteria for this award have evolved annually as the appropriate benchmarks are determined, with the 2012 criteria including two requirements:

1. Demonstrating a 20% decrease in door-to-needle time for a 6-month period in the current year versus the same 6-month period the year before.
2. Achieving a minimum of five patients with an average door-to-needle time of less than 60 minutes for 6 consecutive months.

GCASR evaluated the award program using a hospital focus group as well as verbal feedback and found that the awards were strong motivators for hospital staff. Hospitals placed a high value on these awards, and they helped to raise the profile of stroke teams within the hospitals.

Lessons Learned

- Solidify statewide partnerships between hospitals and EMS with external support.
- Foster communication, collaboration, and trainings between hospitals and EMS in order to establish statewide protocols and plans to communicate feedback between hospitals and EMS.
- Individualize door-to-needle QI interventions to meet the unique barriers and needs at each hospital.
- Develop an awards program to incentivize and recognize the achievements of hospitals in reducing door-to-needle times.

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<http://dph.georgia.gov/georgia-coverdell-acute-stroke-registry>

North Carolina: Sustaining Stroke Systems of Care through Partnerships

North Carolina Stroke Care Collaborative

Despite fluctuations in funding for stroke-related activities, the North Carolina Stroke Care Collaborative (NCSCC) has maintained a focus on sustaining partnerships and QI strategies with its participating hospitals. During the 2007–2012 funding period, the NCSCC provided ongoing collaboration and guidance to its diverse partners across the state. This alliance of stroke care advocates also gained the support of the North Carolina legislature and received state funding, above and beyond CDC funding that enabled coordinated efforts between hospitals and EMS. When there were unforeseen budget cuts in the North Carolina legislation, the NCSCC and its partners managed to maintain legislative support by demonstrating the ongoing need for, and impact of, coordinated stroke systems of care supported by the North Carolina Coverdell stroke registry program.

Convening Diverse Partners and Leadership

Throughout the funding period, there was an ongoing emphasis on growing and diversifying the NCSCC, which is made up of a variety of leaders and individual stakeholders from North Carolina representing academic centers, community hospitals, state government, and nonprofit organizations. Additionally, the NCSCC benefited from an advisory council, which carried out the following roles:

1. Advised and guided the NCSCC steering committee in developing and maintaining cooperation and collaboration among participating hospitals.
2. Provided input on the design, conduct, and evaluation of the NCSCC.
3. Assisted with linking the NCSCC to organizations within the “chain of survival,” such as EMS.
4. Developed a blueprint for expansion of the NCSCC to cover a majority of the eligible hospitals in the state.
5. Served as staff to the NCSCC.
6. Collaborated with, guided, and supported the NCSCC team.

Notably, the NCSCC and its advisory council were embedded in the Heart Disease and Stroke Prevention (HDSP) branch within the North Carolina Department of Health. This integration within the HDSP branch gave the NCSCC access to a variety of resources, including epidemiological services, media and public relations, policy intervention, and evaluation services.

Included in the diverse partnerships of stroke care advocates were members of the North Carolina legislature and the Justus Warren Heart Disease and Stroke Prevention Task Force (JWTF), appointed by the North Carolina General Assembly to oversee legislative efforts and funding to reduce and prevent heart disease and stroke within the state. The JWTF assembled its own advisory council, known as the stroke advisory council (SAC), to provide leadership within the JWTF. From 2007 to 2012, many members of the NCSCC’s advisory council were active members of the SAC.

Financial strength is important, but it is also critical to focus on the areas of the program that its “customers” (i.e., participating hospitals, partners, etc.) feel are important to North Carolina’s stroke system of care.

—NCSCC, 2012

North Carolina Legislative Funding and Economic Challenges

In 2007, the North Carolina legislature answered funding requests from the NCSCC and SAC by appropriating \$900,000 of state funds towards implementing a statewide system of stroke care. Of the total, the NCSCC received about one-third in annual recurring funds to support and expand its work. These funds complemented and enhanced CDC funding, enabling the NCSCC to recruit new hospitals by covering expenses incurred to meet the registry standards, retain existing hospitals by supporting their stroke QI programs financially, and provide trainings and resources at no cost to hospitals. For example, an initial start-up stipend (approximately \$1,500–\$2,500) was provided to each newly enrolled hospital as an incentive payment; the hospitals were encouraged to use the funds to develop and expand their stroke care QI programs. The trainings, which covered a range of topics from stroke education to running QI reports, provided an opportunity for nurses and physicians to earn continuing education credits.

Beginning in 2007 with the initial award of state funding, however, in each year the NCSCC faced potential reductions in non-recurring state funds. In response to these financial challenges, the NCSCC prepared select members of the JWTF, SAC, American Heart Association (AHA)/ASA, and other key stakeholders to defend the hard-won non-recurring funds provided toward stroke care in past years. All of these stakeholders were provided talking points that framed the issues and the need for renewed funding in ways that they would likely respond to. For example, at

the legislative hearings in 2009 and 2010, spokespersons shared information about how funds towards stroke systems of care and public awareness offset the medical and economic burden of stroke in North Carolina. Ultimately, the North Carolina legislature continued to provide funds to stroke partners and the Stroke Signs and Symptoms Campaign.

QI Innovative Grant Program

The NCSCC learned that each hospital approaches the process of change and QI in different ways, showing that in North Carolina there is not a “one size fits all” model. The strengths and barriers within each hospital are unique, and they must be identified to proceed with QI. To address the unique challenges posed at each hospital, NCSCC conducted on-site visits at each hospital to provide the opportunity to train, educate, and provide support and encouragement to hospital staff. During these site visits, hospitals were shown their progress in meeting the stroke registry standards by benchmarking their performance data against other de-identified hospitals of comparable size in the state. NCSCC also updated participating hospitals on new policies and guidelines that had been published recently by the AHA/ASA and other leaders in stroke care QI.

In an effort to provide more extensive QI support to hospitals, the NCSCC implemented the QI innovative grant program, which was funded entirely with state funds. Through this program, hospitals could apply for up to \$15,000 in total costs to build the capacity of their stroke QI efforts and sustain them going forward. Hospitals applied for several different categories of programs and projects through this program:

1. Systems approach to improved quality of stroke care
2. Health care provider training and education
3. Data quality initiatives
4. Improvement in one or more of the Joint Commission stroke performance measures
5. Equipment and/or materials

Funds from the QI innovative grant program were also used to foster collaboration across hospitals and with EMS through QI webinars, annual regional workshops, and quarterly calls. These forums enabled participating sites to address collective concerns, identify available resources and expertise, monitor progress, and discuss evidence-based stroke care concepts. From 2007 to 2012, the NCSCC funded 51 hospitals through its QI innovative grant program.

Lessons Learned

- Gather a well-rounded team of partners from state government, academic centers, communities, and nonprofit organizations to advocate for ongoing support of statewide stroke systems of care.

- Identify opportunities to collaborate or integrate with other state-sponsored entities.
- Frame the prevalence and burden of stroke and the need for improved stroke systems of care in ways that are meaningful and useful to stakeholders.
- When possible, invest funds in an individualized QI program or intervention to enable hospitals to address QI barriers based on their specific needs.

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Celebrate success along the way. The work will not be accomplished overnight, so appreciate the small steps as they are accomplished.

—NCSCC, 2009

Conclusion

Building a network of partners and support helped Georgia, Massachusetts, Michigan, Minnesota, North Carolina, and Ohio to make great strides in improving the stroke systems of care within their respective states. During the 5-year funding period, the strategies implemented by each state evolved, and they continue to do so. These evolving strategies led to hospital-wide system and policy changes for QI that produced substantial benefits. With this brief summary report, stakeholders such as hospitals, organizations, and states are encouraged to communicate and solve problems with each other as they continue their efforts to expand their hospital-wide and statewide systems of stroke care and QI. Lastly, future efforts in the expansion of the stroke system of care should continue to include the collection, analysis, and use of performance measures in additional care settings.

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Appendix: Performance Measures for the Paul Coverdell National Acute Stroke Registry Program^{††}

Performance Measure	Description
Venous thromboembolism (VTE) prophylaxis (NQF 0434)	Ischemic and hemorrhagic stroke patients and those with stroke not otherwise specified who received VTE prophylaxis or have documentation why no VTE prophylaxis was given either the day of or the day after hospital admission
Discharged on antithrombotic therapy (NQF 0435)	Ischemic stroke and transient ischemic attack (TIA) patients prescribed antithrombotic therapy at hospital discharge
Anticoagulation therapy for atrial fibrillation/flutter (NQF 0436)	Ischemic stroke and TIA patients with atrial fibrillation/flutter who are prescribed anticoagulation therapy at hospital discharge
Thrombolytic therapy (NQF 0437)	Acute ischemic stroke patients who arrive at this hospital within 2 hours of time last known well and for whom intravenous tPA was initiated at this hospital within 3 hours of time last known well
Antithrombotic therapy by end of hospital day 2 (NQF 0438)	Ischemic stroke and TIA patients administered antithrombotic therapy by the end of hospital day 2
Discharged on statin medication (NQF 0439)	Ischemic stroke and TIA patients with a low-density lipoprotein (LDL) level greater than or equal to 100 mg/dL, or whose LDL was not measured, or who were on a lipid-lowering medication prior to hospital arrival, who were prescribed a statin medication at hospital discharge
Stroke education ^{††}	Ischemic or hemorrhagic stroke patients, patients with stroke not otherwise specified, and TIA patients or their caregivers who were given educational materials during the hospital stay addressing activation of the emergency medical system, need for follow-up after discharge, medications prescribed at discharge, risk factors for stroke, and warning signs and symptoms of stroke
Assessed for rehabilitation (NQF 0441)	Ischemic or hemorrhagic stroke or stroke not otherwise specified patients who were assessed for rehabilitation services
Smoking cessation counseling ^{§§}	Ischemic or hemorrhagic stroke patients or stroke not otherwise specified and TIA patients who are current smokers who receive or refuse smoking cessation counseling
Dysphagia screening (NQF 0243)	Patients aged 18 years and older with a diagnosis of ischemic stroke or hemorrhagic stroke or stroke not otherwise specified who receive any food, fluids, or medication by mouth (PO) for whom a dysphagia screening was performed prior to PO intake in accordance with a dysphagia screening tool approved by the institution in which the patient is receiving care
Recording of NIH Stroke Scale score	Patients aged 18 and older with ischemic stroke, or stroke not otherwise specified, with an initial NIH Stroke Scale recorded Patients with acute ischemic stroke who receive intravenous tPA who have an NIH stroke scale score recorded
Time to intravenous thrombolytic therapy (NQF 1952—endorsement pending)	Acute ischemic stroke patients aged 18 years and older receiving intravenous tPA therapy during the hospital stay and having a time from hospital arrival to initiation of thrombolytic therapy administration (door-to-needle time) of 60 minutes or less Median time from hospital arrival to administration of intravenous tPA therapy in acute ischemic stroke patients aged 18 years and older
Door to brain imaging time (NQF 0661)	Head CT scan interpretation within 45 minutes of arrival for acute ischemic stroke or hemorrhagic stroke patients who arrive within 2 hours of last known well who received head CT

^{††} The PCNASR metrics are based on the final clinical diagnosis rather than the principle ICD-9-CM diagnosis code (www.cdc.gov/dhdsp/programs/pcnasr_metrics.htm).

^{††} Also part of the Joint Commission's six core measure set accreditation requirement (www.jointcommission.org/stroke).

^{§§} Also part of the Joint Commission's six core measure set accreditation requirement (www.jointcommission.org/stroke) and CMS' Clinical Quality Measures (www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/2014_CQM_EH_FinalRule.pdf).

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