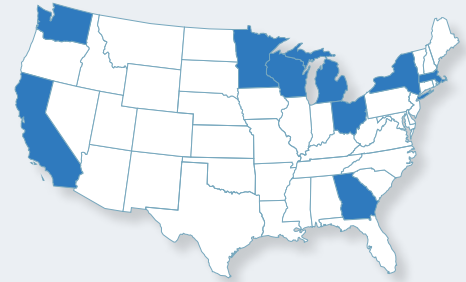


Program Background

In 2015, the Centers for Disease Control and Prevention’s (CDC’s) Paul Coverdell National Acute Stroke Program (Coverdell) funded nine state health departments to develop statewide comprehensive stroke systems of care and improve the quality of patient care across three settings: pre-hospital, hospital, and post-hospital. This brief highlights evaluation findings from 2015 to 2018 of the Coverdell Program (concluding in 2021), including progress the program has made toward strengthening stroke systems of care infrastructure and improving the efficiency and quality of care for stroke patients.



Coverdell Recipients (2015 to 2021): California, Georgia, Massachusetts, Michigan, Minnesota, New York, Ohio, Washington, and Wisconsin

Figure 1. States funded by Coverdell

Coverdell Strategies Across the Stroke System of Care

Coverdell recipients and their partners implement strategies to improve quality of care across the stroke system of care, which includes all aspects of patient care from the first signs of stroke to post-hospital recovery.

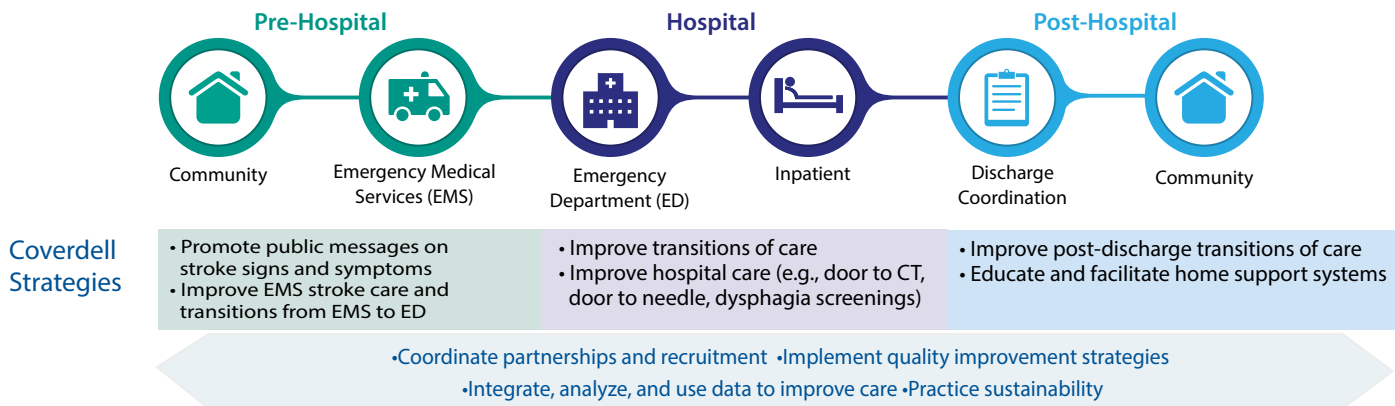


Figure 2. Coverdell strategies to establish stroke systems of care

Evaluation Approach

CDC and RTI International used a mixed-methods evaluation design to assess the progress that Coverdell recipients and their partners are making toward improving quality of care across stroke systems of care. This brief presents evaluation findings for the following evaluation questions:

1. How have Coverdell recipients and their partners implemented strategies to improve stroke systems of care?
2. To what extent have Coverdell recipients and their partners had an effect on stroke systems of care infrastructure?
3. To what extent have Coverdell recipients and their partners improved the efficiency and quality of care for stroke patients?

Primary Data Sources

- 💰 Cost: Recipient reported program implementation costs (n=9)
- 📞 Interviews: Qualitative data collected via semistructured phone interviews with key staff and partners.

Secondary Data Sources

- 📊 POPM: Recipient-reported measures collecting quantitative and qualitative and short-term and intermediate outcomes.
- ✅ QPM: Recipient-reported data on EMS, hospital, and post-hospital quality performance.
- 📄 APR: Recipient-reported progress on implementation and outcomes of specific strategies for establishing stroke systems of care.

KEY: POPM=Coverdell Process and Outcome Performance Measures; QPM=Coverdell Quality Performance Measure Data; APR=Annual Performance Reports

Data Source Description of Analyses



Conducted descriptive analyses and bivariate analyses to assess progress on Coverdell strategies and short-term and intermediate program effects on stroke systems of care components, efficiency, and quality of stroke care. Conducted multivariate regression analyses to examine potential factors that contributed to improvements in quality of stroke care.



Conducted thematic content analysis to supplement descriptive and bivariate analyses findings.



Analyzed total implementation costs for each state health department individually, by year and in total; examined correlation of increases in performance measures with program implementation costs. Analyzed implementation costs for a subset of partners that volunteered to submit cost data.

How have Coverdell recipients and their partners implemented strategies to improve stroke systems of care?

We assessed how recipients and their partners have implemented strategies to improve stroke systems of care by collecting qualitative data on the following activities: **linking and using acute stroke patient data, building capacity for post-hospital data collection and quality improvement (QI), fostering collaboration between partners, and tailoring public awareness campaigns to reach diverse audiences.** We also collected cost data to quantify the average cost of implementing these activities.

Linking and Using Acute Stroke Patient Data Across the Stroke System of Care

Coverdell recipients began to link and share data across the stroke system of care to identify areas for improvement during transitions of care. Data collection, linkages, and management incurred the greatest proportion of total costs from 2015 to 2018, with an average cost of \$174,163 out of \$694,334 average total program costs in Program Year 3. This value remained consistent across program years.

Coverdell recipients used linked data to provide report cards to hospitals and EMS agencies on their performance, convened work groups to share data and lessons learned, and reviewed data to identify reasons for delays in stroke care.

Coverdell recipients used diverse strategies to link data, including:

- Using integrated data management software
- Leveraging statewide mandates for EMS agencies and hospitals to submit data
- Improving documentation and data reporting
- Completing small-scale pilot initiatives

Examples of QI projects to improve EMS and hospital care that resulted from these efforts included:

- Reviewing and updating EMS agency and hospital stroke protocols
- Implementing pilot initiatives and mini-grants to test new strategies
- Focusing on improving EMS pre-notification, door-to-needle times (alteplase), and door-to-CT times

Building Capacity for Post-Hospital Data Collection and Quality Improvement

Coverdell recipients made progress engaging post-hospital partners, increasing QI efforts, and building capacity for data collection. Correspondingly, recipients increased their average investment in post-hospital activities by \$41,624 between Program Years 1 (\$67,634 out of \$603,183) and 3 (\$109,258 out of \$694,334), with the greatest costs in Program Year 2: (\$121,526 out of \$720,563). Hospital partners implemented various ways to collect post-hospital data, and some have been able to use the preliminary data to identify gaps in the coordination of care after discharge.

Early lessons learned in post-hospital data collection included:

- Partnering with local primary care clinics to ask a few targeted questions at follow-up visits
- Dedicating staff time, hiring additional staff.
- Implementing an automated call system that follows up with patients after discharge

Fostering Collaboration Between Partners

Coverdell recipients invested \$134,847 on average (out of \$694,334) in Program Year 3 to recruit and maintain partners. This value has remained consistent across program years. Recipients and their partners reported that the expanded focus on pre-hospital and post-hospital settings has helped foster collaboration among partners that otherwise would not work together. Partners have gained a better understanding of their role and potential contribution to improving their state's stroke systems of care.

Tailoring Public Awareness Campaigns to Reach Diverse Audiences

Coverdell recipients and their partners increased the number of activities to raise public awareness of stroke signs and symptoms among priority populations every year since Program Year 1. Coverdell recipients invested \$62,647 on average (out of \$694,334) in Program Year 3 on public awareness activities. This value has remained consistent across program years.

The strategies recipients have used to reach diverse audiences included:

- Created the [BE FAST Bella](#) character to help educate school-aged and low-literacy populations
- Educational videos with stroke survivors age 30-40
- Translation of media materials into Spanish, Chinese, or other languages
- Educational ads in African American communities
- Educational mini-grants to Native American communities
- Radio PSAs and ads in public transit areas and in EMS vehicles

“As you can imagine, the burden of collecting information is a challenge for a stroke coordinator. People are looking at different ways of collecting it. We have one hospital that's using a volunteer to collect and make phone calls, and one hospital who has a staff member who has dedicated staff time. Some hospitals will have their stroke coordinator do it. Some hospitals are working with case managers or other follow-up phone mechanisms.”

(Principal Investigator)

“One of the best things Coverdell has done for my state is bring everyone to the same ball field. We all play together, play well together. Doesn't matter if you're hospital down the street or 200 miles away, the networking opportunities and just being able to talk about common themes, successes, common challenges, common opportunities, has been hugely successful here in [state].”

(Hospital Partner)

To What Extent Have Coverdell Recipients and Their Partners Had an Effect on Stroke Systems of Care Infrastructure?

We assessed the effect of the Coverdell program on stroke systems of care infrastructure by using program performance measure data to examine **expanded reach and partnerships, established data linkages between EMS and hospital data, and increased implementation of quality improvement and stroke care practice changes.**

Expanded Reach and Partnerships

In Program Year 3, Coverdell-participating hospitals treated 139,692 stroke patients, and Coverdell-participating EMS agencies transported 29,120 stroke patients. Coverdell recipients developed partnerships across the system of care to expand the reach of program activities and improve coordination between organizations involved in the care of acute stroke patients. The proportion of stroke patients transported and treated by Coverdell-participating EMS agencies and hospitals has increased in each year of the program (Figure 3), driven largely by increased recruitment of partners (Figure 4).

Coverdell-participating EMS agencies and hospitals reached 27% and 68% of acute stroke patients in Program Year 3, respectively

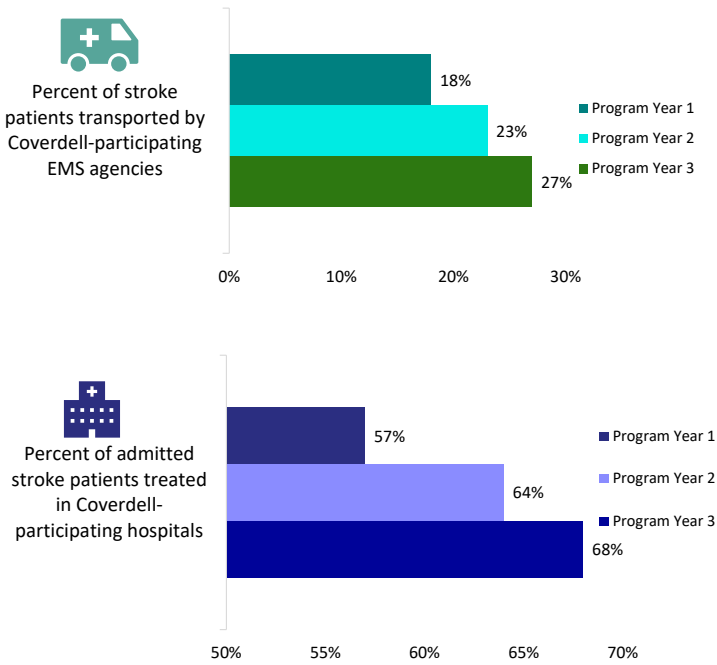


Figure 3. Transports and admissions from Program Years 1–3

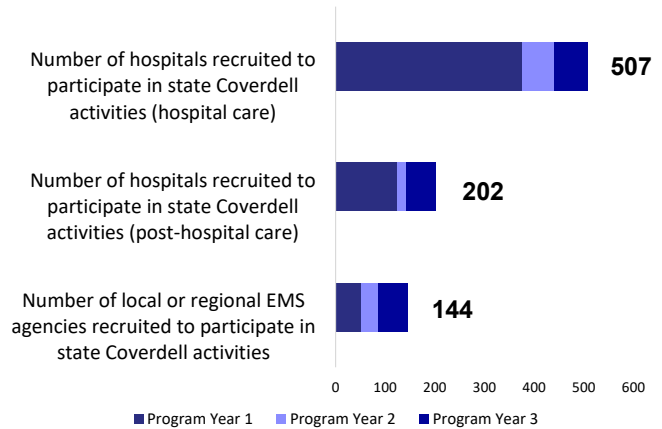


Figure 4. Number of EMS agencies and hospitals from Program Years 1–3.

On average, by the end of Program Year 3, **53% of Coverdell-participating EMS agencies** had linked EMS data to hospital data.

Established Data Linkages Between EMS and Hospital Data

Linked data can facilitate collaboration between providers to improve transitions of care. The number of Coverdell recipients that linked EMS and hospital data has increased from two recipients in Program Year 1 to six recipients by the end of Program Year 3. On average, by the end of Program Year 3, 53% of Coverdell-participating EMS agencies had linked EMS data to hospital data, an increase from 22% reporting at the end of Program Year 1.

Increased Implementation of Quality Improvement and Stroke Care Practice Changes

Coverdell recipients leveraged their data and partnerships to drive implementation of QI activities and changes in stroke care practices among participating EMS agencies and hospitals. The proportion of EMS agencies and hospitals that reported implementing changes in stroke care practices has increased since Program Year 1, following increased number of QI activities offered by Coverdell recipients in all three care settings (Figure 5).

In Program Year 3, **91% of hospitals**, **72% of EMS agencies**, and **56% of post-hospital partners** implemented changes in stroke care practice

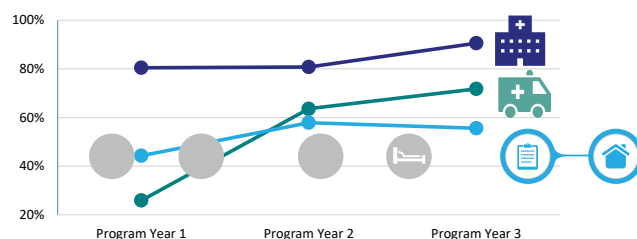


Figure 5. Coverdell-participating hospitals and EMS agencies that reported implementing changes in stroke care practices

To What Extent Have Coverdell Recipients and Their Partners Improved the Efficiency and Quality of Care for Stroke Patients?

To assess changes in efficiency and quality of care for stroke patients among EMS-hospital transitions of care and hospital stroke care, we used Coverdell hospital registry and program performance measure data. We examined trends for a subset of stroke quality of care measures, including **EMS-hospital feedback loops, stroke alert pre-notification, door-to-CT and door-to-needle (alteplase) time, and defect-free care.**

The proportion of EMS-hospital teams using feedback loops grew from **54%** in Program Year 1 to **65%** in Program Year 3

EMS to Hospital Transitions of Care

EMS-hospital teams increased the flow of information by using EMS-hospital feedback loops, which can lead to improved timeliness and quality of stroke care. Performance feedback loops have improved slightly since Program Year 1; however, there is room for continued training, collaboration, and quality improvement.

When EMS provide a stroke alert pre-notification, hospital staff can prepare for the arrival of the patient and reduce time to treatment. Figure 6 shows the percentage of suspected stroke patients for whom EMS agencies provided a stroke alert pre-notification to Coverdell-participating hospitals. Fostering EMS-hospital partnerships, implementing changes in stroke care practices, and improving communication between EMS and hospital staff is an important step toward achieving timely and appropriate EMS response.

EMS provided advance notification to hospitals for 57% of stroke patients in Program Year 3



Figure 6. Percentage of suspected stroke patients for whom EMS agencies provided a stroke alert pre-notification

Hospital Stroke Care

Timely treatment for stroke patients improved for two key in-hospital quality performance measures: door-to-CT time and door-to-needle (alteplase) time.

Administration of the clot-busting medication alteplase is associated with reduced hospital mortality and increased ability to walk independently at discharge for Coverdell stroke patients. To be most effective, alteplase must be administered within 4.5 hours of symptom onset. A CT scan in the ED is a crucial step to determining a patient's eligibility for alteplase.

National guidelines recommend administering alteplase to eligible stroke patients within 60 minutes of arrival in the ED and a CT scan within 45 minutes of arrival at the ED. Figure 7 shows the percentage of eligible patients who received care within the guidelines at Coverdell-participating hospitals.

Improvements in Efficiency and Quality of Stroke Care

Defect-free care is the proportion of patients who received all of the interventions for which they were eligible, such as antithrombotic treatments, anticoagulation therapy, statin medications, dysphagia screening, and counseling and educational materials.

The percentage of ischemic and hemorrhagic stroke patients with defect-free care remained consistent from program year 1 to program year 3 (ischemic 80.1% in PY1 to 79.1% in PY3 and hemorrhagic 81.2% in PY1 to 81.4% in PY3.)

Figure 8 shows the percentage of ischemic and hemorrhagic stroke patients who received defect-free care over the first 3 years of the Coverdell program. The stroke performance measure for defect-free care are listed beneath the figure.

From Program Year 1 to Program Year 3 Median door-to-needle time decreased from 48 minutes to 45 minutes. Median door-to-CT scan time decreased from 42 minutes to 38 minutes.

83% (about 4 in 5) of stroke patients receiving alteplase receive it within 60 minutes of ED arrival in Program Year 3



42% (about 2 in 5) of patients received a CT scan within 45 minutes of ED arrival in Program Year 3



Figure 7. The percentage of eligible patients who received care within the American Stroke Association guidelines at Coverdell-participating hospitals.

Defect-free care has remained consistent over the first 3 program years

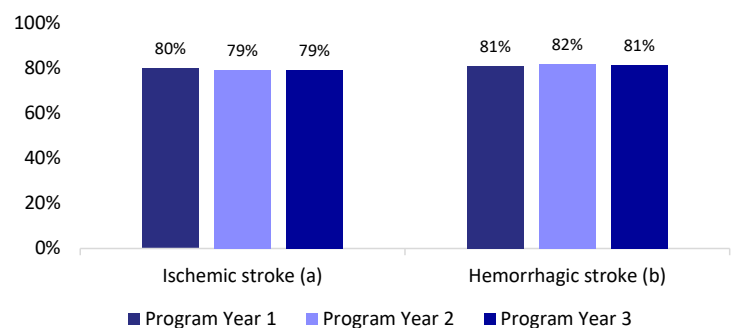


Figure 8. The percentage of stroke patients who received defect free care
Measures included: dysphagia screening^{a,b}; intravenous alteplase given when indicated^a; venous thromboembolism prophylaxis^{a,b}; antithrombotic therapy within 48hrs^a; anticoagulation for atrial fibrillation^a; discharged on statin medication^a; discharged on antithrombotic therapy^a; assessed for rehabilitation^{a,b}; smoking cessation counseling/advice^{a,b}; stroke education^{a,b}

Opportunities for Improvement



Pre-Hospital

While Coverdell recipients have increased engagement among EMS providers, indicators of EMS-hospital transitions of care have only improved slightly.

To improve timely arrival to the ED and coordination between providers, recipients can consider offering and evaluating training on documenting key variables such as time since patient was last known to be well, encouraging hospital and EMS partners to collaborate on QI projects, and sharing examples of how EMS agencies can use linked data for QI.



Hospital

The percentage of ischemic stroke patients with defect-free inpatient care remained steady over the last 3 years. To improve defect-free care, recipients can examine which measures within the defect-free care composite measure are performing lower and work with their hospital partners to implement QI activities to improve those measures.

There is also an opportunity to strategically engage EMS and hospital partners in trainings and continuous QI focused on timely EMS response, data reporting, and hospital stroke care. Focusing on transitions of care and promoting messaging that emphasizes the important role of EMS may help to facilitate interest and motivation among EMS providers and stroke coordinators to participate in Coverdell activities and trainings. Continued efforts between EMS and hospitals to communicate and provide feedback may also facilitate timely and appropriate EMS response.



Post-Hospital

Despite progress from 2015 to 2018, there remains room for improvement in engaging partners in post-hospital QI activities, collecting post-hospital data, and developing and implementing standard-of-care protocols for monitoring and coordinating care for discharged patients. To increase participation, recipients can consider sharing examples of how data collection can facilitate coordination of post-discharge care with their hospital partners. Coverdell recipients can convene post-hospital partners to identify potential strategies to improve the transition from hospital to next care setting.