JULY 2023

Emergency Medical Services Outcome Measurement Strategies for State Flex Programs

JOHN A. GALE, MS

KAREN PEARSON, MLIS, MA

CELIA JEWELL, RN, MPH

SARA KAHN-TROSTER, MPH

KENNETH ROSATI, MS.Ed

KEY FINDINGS

- Education and collaborative learning are important activities in State Flex Program (SFP) emergency medical services (EMS) Improvement strategies, but it is difficult to directly link them to improved outcomes on rural EMS agencies or EMS systems of care.

- Shared learning collaboratives/cohorts provide a structured framework to coordinate EMS activities across the Flex Program funding cycle.

- SFPs often focus primarily on output and long-term outcome measures for EMS activities and less on short- and intermediate-term outcome measures.

- Efforts to document Flex Program impact would benefit from less emphasis on outputs and greater emphasis on outcome measures, particularly short- and intermediate-term outcome measures to provide a causal pathway from project activities to long-term outcomes.

INTRODUCTION

The Medicare Rural Hospital Flexibility (Flex) Program funds initiatives to improve the performance and viability of emergency medical services (EMS) in rural communities under Program Area 4: Rural Emergency Medical Services Improvement.[1-2] This optional program area focuses on work to improve rural EMS in two primary areas of concern: improving the organizational capacity of rural EMS services and improving the quality of those services. The focus on organizational capacity encourages the creation of interventions that address financial and operational problems in vulnerable rural EMS agencies to maintain and improve the availability of EMS services to every rural resident. The focus on quality of care encourages the development of interventions that improve the management of time-sensitive diagnoses as well as providing technical assistance for data reporting. State Flex Programs (SFPs) may propose initiatives in one or more of the four optional rural EMS improvement activity categories:

- 4.1 Statewide rural EMS needs assessment and action planning
- 4.2 Community-level rural EMS assessments and action planning
- 4.3 EMS operational improvement
- 4.4 EMS quality improvement

As an extension of the Flex Monitoring Team's (FMT's) efforts to assist SFPs in reporting the impact of their activities, this brief describes outcome measures strategies for select EMS interventions implemented under Program Area 4 and provides examples of relevant outcome measures. It further presents a strategic framework to connect the four activity categories under Program Area 4 across the project funding cycle.

APPROACH

This brief builds on the FMT's experience with the evaluation of SFP activities, including the development of rural EMS performance measures (See Appendix). It is grounded in the FMT's work in developing practical tools for SFPs (including a logic modeling toolkit), briefs on the use of quality cohorts and outcomes for financial and operational performance improvement, and providing input to the Federal Office of Rural Health Policy (FORHP), Flex Program partners, and SFPs on outcome measurement and evaluation. The FMT study team reviewed competitive and non-competitive Flex grant applications and progress reports for the Fiscal Year 2019-2023 funding cycle to identify common SFP EMS interventions. In addition to leveraging the information from the FMT briefs from our past work, the study team conducted an extensive literature review of select EMS activities to identify appropriate outcome measures for use by SFPs.

Development of a Funding Cycle Strategy to Implement and Monitor EMS Activities

Program Area 4 focuses on activities to improve the organizational capacity and quality of rural EMS. In prior evaluation studies across the Program Areas, the study team observed that SFPs struggled to develop strategic, actionable initiatives with measurable outcomes for the interventions implemented within each project year as well as across the scope of each competitive five-year funding cycle. To assist SFPs in measuring the impact of their EMS interventions, this document presents a framework that connects the activity categories under Program Area 4 into a strategic process within individual project years as well as across the project funding cycle. This framework consists of a series of steps that move sequentially from identifying the needs to be addressed, educational programing to prepare participants to engage in proposed interventions, development of learning collaboratives to support performance improvement, and the development of and implementation of interventions to address

identified needs. The framework is comprised of the following four overarching components:

1. Initial Assessment and Action Planning: This first step in the timeline covers Activity Categories 4.1 statewide and 4.2 community-level needs assessment and action planning. Statewide needs assessments should inform the design of SFP EMS activities in the initial competitive year of the funding cycle as well as to revise and update project activities in subsequent non-competitive funding years. Assessment activities should be completed in or before the start of year one with the results used to identify and prioritize activities for subsequent years. In subsequent years, these assessments should be updated at the start of each year to identify the changing needs of rural EMS agencies and modify planned activities as needed.

Using the results from the statewide assessment, vulnerable communities and rural EMS agencies can be selected for community-level assessments to identify areas of need and recommend improvement activities. Once specific needs are identified, the work at this stage involves identifying and recruiting potential participants based on their needs and vulnerabilities, securing their commitment to participate, and planning the implementation of interventions to address identified needs. While outputs can be identified, no real outcomes can be attributed to these activities.

2. Educational Events and Programs: Educational events, trainings sessions, and other skill-building programs follow from the initial assessment and action planning and should prepare participants to engage in and support their ongoing participation in the planned interventions. Changes in knowledge and the use of knowledge gained through the educational event can be measured and contribute to the outcomes of planned interventions and/or shared learning collaboratives/cohorts. Educational events and programs, particularly one-time educational or training events that do not support a planned intervention, are unlikely to have directly measurable outcomes.

3. Creating a Shared Learning Collaborative/Cohort: This activity engages participants in the implementation of a common intervention in which participants meet regularly to share their plans, successes, challenges, and strategies. It also involves securing agreement on common metrics that will be collected and reported by all participants. A subject matter expert or facilitator plays a significant role in managing the learning collaborative/cohort, monitoring active engagement by participants, ensuring appropriate collection and use of data, developing and/or obtaining data use agreements as appropriate, collecting and aggregating data from participants, distributing aggregated data to participants, and assisting with implementation of the chosen interventions. This strategy was described on our brief on the use of learning collaboratives/cohorts for SFP quality improvement initiatives. Effective learning collaboratives/cohorts exhibit the following features:

- Target an important rural EMS need among a group of rural EMS agencies and/or communities
- Define clear expectations for participation and reporting
- Engage participants in evidence-based performance improvement interventions with a chain of short, intermediate, and long-term outcomes
- Identify common metrics, establish baseline data, and set facility-specific targets
- Monitor program implementation
- Measure impact at various stages of the program[3]

Rural EMS agencies and their community partners can benefit from working with shared learning collaborative/cohort members to implement a consistent set of interventions, outcome measures, and quality assurance practices across the funding cycle. As with the earlier steps, no direct outcomes can be attributed to the shared learning collaborative/cohort process. The outcomes will be driven by the interventions selected. It is still important, however, to monitor output and process measures to assess and

manage the level of engagement and the satisfaction of rural EMS agencies with their participation in the shared learning collaborative/cohort. The impact of shared learning collaboratives/cohorts can be monitored by tracking the level of participant engagement; changes in rural EMS agency operations, strategies, or policies; and improvements in the stability of rural EMS agencies over time through meeting records, periodic surveys of participants, and the collection of performance data using common metrics (Table 1).

4. Development and Implementation of Interventions: This is the stage of the strategic process that generates measurable outcomes driven by the chosen interventions. Activities under Activity Category 4.3 Rural EMS Operational Improvement are intended to assist vulnerable agencies with organizational, administrative, and operational transformation. Activities under Activity Category 4.4 Rural EMS Quality Improvement are intended to integrate EMS with the wider healthcare delivery system and/or improve the quality of patient care. The following are examples of EMS performance improvement initiatives and related outcome measures that target known rural EMS vulnerabilities and/or capacity needs and align with the Medicare Rural Hospital Flexibility Program Structure for FY 2019 – FY 2023 (Tables 2, 3, and 4).

DEFINITIONS

Outcomes are the changes or benefits to individuals, groups, organizations, and communities that result from program interventions (e.g., implementation of programs to improve stroke systems of care or improve the capacity of rural EMS agencies to report accurate run data). Outcomes can be measured in the short-term (one to two years), intermediate-term (three to four years), and long-term (more than four years). Outcome statements should be written for each problem that the program intends to address. These statements should specify 1) who or what the program hopes to change, 2) what change is expected to occur, 3) when the change is

expected to occur, and 4) what the expected results are.[4] Short and intermediate-term outcomes reflect a causal pathway moving towards long-term outcomes.

Outputs are frequently confused with outcomes. Unlike outcomes, which are changes or benefits to the program's targeted participants; outputs result from the successful completion of program activities. They can also be thought of as the products resulting from program activities. Under the Flex Program, outputs might include the amount of technical assistance provided to CAHs, the number of trainings held, or the number of participants in those trainings.

Although this brief focuses on outcome measurement, it includes a brief discussion of the outputs necessary to monitor the implementation and performance of shared learning collaboratives/cohorts, an approach that has been successfully used to support quality improvement and other program area initiatives by SFPs (Table 1). Tables 2 and 3 present short, intermediate, and long-term outcomes for initiatives focused on building capacity (e.g., improving rural EMS billing or data reporting capacity). Table 4 presents a set of short, intermediate, and long-term outcomes for initiatives to improve the functioning of systems of care for time critical diagnoses (e.g., stroke or trauma) and patient survival.

TABLE 1: Example Output Measures for Share Learning Collaboratives/Cohorts

Theory of Change: Shared learning collaboratives/cohorts provide a foundation for the implementation of EMS initiatives by encouraging shared learning, identification and sharing of best practices, implementation of a common intervention, and identification and reporting of common metrics at various stages of the program.[3] Outcomes will be driven by the interventions selected. The implementation of shared learning collaborative/cohort-based projects can expand an SFP's reach and conserve scarce resources by engaging a greater number of EMS agencies in a common set of interventions.
Output Measures
• # and % of EMS agencies participating in programs and activities of the shared learning collaborative/cohort
• # and % of rural EMS agencies reporting satisfaction with participation in the shared learning collaborative/cohort
• # and % of EMS agencies and the # of their staff participating at each meeting and/or event
• # and % of EMS agencies sharing best practices and the # of best practices shared
• # and % of participating EMS agencies implementing the identified intervention
• # and % of EMS agencies consistently reporting data on project implementation and outcomes throughout the project lifecycle

TABLE 2: Example Outcome Measures for Billing Improvement Initiatives (Capacity Building)

Theory of Change: A key element of EMS sustainability involves ensuring that EMS agencies have the capacity to bill for and collect revenues generated by their operations. This may involve improving their billing and coding capacity, ensuring that each agency has an appropriate billing system in place (either directly or through a contracted billing service), improving their collection of data (e.g., demographic and insurance information), and improving their ability to use financial and billing data for performance improvement. Improving revenue cycle capacity and providing training to dedicated personnel to become Certified Ambulance Coders or contracting with a professional billing service can reduce denied claims, increase revenue, and avert unintentional violations of regulations for ambulance-service billing.

Outcome Measures		
Short-Term	**Intermediate**	**Long-term**

• Improvement in the:
  • # and % of agencies with appropriate billing and collection capacity
  • # and % of agencies able to bill third party payers and patients for services rendered
  • % of runs for which billing, demographic, and insurance information was collected
• % reduction in errors in financial and billing data collected for each run
	• % reduction in claims processing time
	• % reduction in denied claims
	• % increase in clean claims rate
	• % reduction in registration errors
	• % reduction in days to collection
	• % reduction days in accounts receivable (AR)
	• % reduction in AR over 60, 90, and 120 days
	• % increase in net collections
	• % increase in net and gross revenue per transport
	• % increase in net transport revenue compared to total transport revenue
	• % reduction in bad debt expense compared to total transport revenues
	• % reduction in total uncompensated care compared to total transport revenues
	• % decrease in bad debt/uncollected revenues
		• # and % of EMS agencies with improved financial stability based on key financial indicators:[5]
		  • Improvement in the % of expenses covered by patient/transport revenues (net revenues per transport)
		  • Reductions in the % of expenses covered by other revenue sources (e.g., local tax revenues, grants, revenues)
		  • Improvements in days cash on hand (with a target goal of 30 to 60 days)

TABLE 3: Outcome Measures for Improvements in Data Reporting and Quality of Reporting (Capacity Building and Quality Improvement)

Theory of Change: State EMS authorities require EMS agencies to submit run reports documenting the results of all ambulance transports and services, generally within 24 hours. Despite this requirement, not all rural EMS agencies comply with these requirements. Rural agencies also have trouble submitting accurate reports. These gaps in the accuracy and timeliness of run reports subject rural EMS agencies to legal liability, compromise the ability to document services for reimbursement, hamper the ability of state EMS authorities to oversee the scope and quality of EMS activities, and hinder the ability to use the data for quality improvement. Improving rural EMS agency data reporting and quality improvement capabilities are an important capacity building exercise. Initiatives to improve EMS data capabilities include activities to assess the gaps in EMS data capacity as well as targeted training and technical assistance to fill those gaps. These initiatives can improve the accuracy of run data input, reporting, and use. Additional activities include connecting and standardizing data systems and reporting platforms [e.g., health information exchanges (HIEs) or the National EMS Information System (NEMSIS)] as well as promoting the sharing of data between rural EMS agencies and hospitals. Improvement in EMS data capacity and use provides a foundation to evaluate patient outcomes, EMS response times, use of advanced life saving techniques, EMS staff training, and system performance.[9-13]

Outcome Measures

Short-Term	Intermediate	Long-term
• Increase in the # and % and of EMS providers, medical directors, and administrators trained on state run reporting systems • # reductions in the number of errors in run data • Increase in the # of data sharing arrangements between EMS providers and CAHs • # of data bridges established between EMS data systems and state (e.g., health information exchanges) or national initiatives (e.g., National EMS Information System or NEMSIS) • Increased # and % of EMS agency administrators and medical directors running quality data reports	• Increase in the # and % of rural EMS agencies submitting accurate run reports and data for 100% of required transports and encounters • Increase in the # and % of rural EMS agencies submitting run reports within mandated time limits • Increase in the consistency and accuracy of run report data submitted to NEMSIS by the state EMS authority • Increase in the # and % of EMS agencies utilizing EMS data for quality and performance improvement	• Improvement in the # and % of rural EMS agencies exhibiting improved quality performance based on agreed upon quality metrics

TABLE 4: Outcome Measures for Improvement in Time Critical Diagnoses and Patient Survival (Improving Systems of Care)

Theory of Change: Improvement in Time Critical Diagnoses (TCD) response times and patient survival requires a comprehensive EMS system with personnel trained in best practice guidelines and dispatch protocols, proper equipment, familiarity with the receiving hospital's services to transfer patients appropriately, and an understanding of systems resources and capacity. SFPs can work with a cohort of agencies to create shared learning collaborative/cohort-based interventions to train staff on the national guidelines for STEMI, stroke, and trauma; create protocols for routine evaluation of compliance to those standards; build communication loops between tertiary hospitals and the EMS system to collaboratively improve system performance (by debriefing after TCD events); establish and implement EMS prehospital treatment and transfer protocols; and establish and monitor system performance targets (e.g., optimal time frames for successful treatment and transport).[3-7]

Outcome Measures

Short-Term	Intermediate	Long-term

• Improvement in the:
  • # and % of EMS agencies equipped to perform 12-lead EKGs and diagnose STEMIs
  • # and % of staff with training on recognition of STEMI and stroke
  • # and % of staff with training on trauma/field triage protocols for all ages
  • # and % of agencies using the American Heart Association's (AHA's) Mission: Lifeline Guidelines (STEMI)
  • # and % of agencies using protocols meeting current American Stroke Association/AHA guidelines for stroke care
  • # and % of agencies using the Center for Disease Control and Prevention's (CDC) Guidelines for the Field Triage of Injured Patients (trauma) of all ages
  • # and % of agencies with emergency dispatch protocols
	• Changes in these measures should be tracked for agencies participating in the interventions:
	  • # and % increase in the use of regional protocols to improve early notification times
	  • # and % increase in patients receiving percutaneous coronary intervention within 90 minutes from first medical contact for STEMI
	  • # and % decrease in median time to transfer to another facility for acute coronary intervention
	  • # and % increase in patients arriving at hospital within 120 minutes of stroke onset and receiving fibrinolytic therapy within 180 minutes of stroke onset
	  • # and % decrease in time to first medical contact for trauma
	  • # and % decrease in time to arrival at trauma center
		• Improvement in the # and % of agencies functioning as part of an integrated system of emergency care
		• Reduction in the inpatient mortality rate of patients treated for TCD by participating EMS agencies

CONCLUSION

Outcome measurement must be firmly grounded in a clear theory of change that describes how a set of project interventions will contribute to the achievement of long-term goals. Rural EMS agencies operate in a complex environment and no single intervention, education program, webinar, or technical assistance program will have a direct impact on high-level rural EMS agency or systems of care issues.

Improvements in EMS performance can best be achieved through a set of strategic interventions begin with training, technical assistance, and peer learning through a shared learning collaborative/cohort; assessment of state and local EMS needs; and building EMS billing, run reporting, and/or quality improvement capacity. SFPs can build on these foundational activities to implement interventions to improve rural EMS agency or systems of care performance (e.g., improving stroke response or reducing door to balloon time for patients with ST-Elevation Myocardial Infarction) as well as monitoring and revising their interventions data provided by their short and intermediate-term outcome measures.

As discussed earlier, it is important to think of these efforts as a causal pathway with subsequent activities building on early activities to move toward desired long-term goals. This brief provides examples of capacity building and performance improvement interventions and related outcome measures to assist SFPs with their efforts to improve rural EMS performance under Program Area 4.

REFERENCES

1. Federal Office of Rural Health Policy, Health Resources and Services Administration. Medicare Rural Hospital Flexibility Program. Notice of funding opportunity FY 2019. FORHP;2019. HRSA-19-024, CFDA No. 93.241. Accessed July 1, 2020. https://grants.hrsa.gov/2010/Web2External/Interface/Common/EHBDisplayAttachment.aspx?dm_rtc=16&dm_attid=e215d1f4-efe3-4bec-8d29-05b24290b235

2. Federal Office of Rural Health Policy. Medicare Rural Hospital Flexibility Program Structure for FY 2019 - FY 2023. Version 1.0. FORHP;2018 December 4. Accessed August 5, 2021. https://www.ruralcenter.org/sites/default/files/Flex%20Program%20Structure%20for%20FY%202019%20-%20FY%202023%20v1.0.pdf

3. Gale J, Jewell C, Kahn-Troster S, First, N. Evaluation of the Use of CAH Cohorts for Quality Improvement Activities. Accessed June 29, 2023. https://www.flexmonitoring.org/sites/flexmonitoring.umn.edu/files/media/fmt-pb58-cohorts_2021.pdf

4. Gale J, Loux S, & Coburn A. Creating Program Logic Models: A Toolkit for State Flex Programs. Accessed June 29, 2023. https://www.flexmonitoring.org/sites/flexmonitoring.umn.edu/files/media/fmt-program-logic-model-2006.pdf

5. Minge A. 3 Critical Financial Indicators to Watch. Accessed: June 28, 2023. https://www.ems1.com/ems-products/consulting-management-and-legal-services/articles/3-critical-financial-indicators-to-watch-hUeqJKJVBv3a7jD5/

6. Quality Improvement Abstracts from the 2023 National Association of EMS Physicians Annual Meeting. *Prehosp Emerg Care*. 2022:1-9. doi:10.1080/10903127.2022.2138656

7. Gale J, Pearson K, Kahn-Troster S. *Year two evaluation of the Flex EMS supplemental funding projects: Building an evidence base through outcome measurement.* 2022. May. Accessed May 2, 2022. https://www.flexmonitoring.org/sites/flexmonitoring.umn.edu/files/media/Yr2EvaluationEMSSupplement.pdf

8. Lincoln EW, Reed-Schrader E, Jarvis JL. *EMS Quality Improvement Programs*. StatPearls Publishing; 2022.

9. Gale JA. *Developing regional STEMI systems of care: A review of the evidence and the role of the Flex Program.* 2011. Briefing Paper No. 29. Accessed January 12, 2023. https://www.flexmonitoring.org/publication/developing-regional-stemi-systems-care-review-evidence-and-role-flex-program-briefing

10. Coccolini F, Kluger Y, Moore EE. Trauma quality indicators: internationally approved core factors for trauma management quality evaluation. *World J Emerg Surg* 2021;16(6)doi:10.1186

11. Reeves M, Parker C, Fonarow G, Smith E, Schwamm L. Development of Stroke Performance Measures: Definitions, Methods, and Current Measures *AHA Journals*. May 20 2010;41:1573–1578. doi:10.1161

12. Sherman Jollis MM, Jollis JG. Time to Reperfusion, Door-to-Balloon Times, and How to Reduce Them. Springer Singapore; 2018:289-306.

13. Vanderwah T. Spotlight on Time Critical Collaboratives, May 2019. Minnesota Department of Health. Minnesota Department of Health. Accessed February 17, 2023, https://content.govdelivery.com/accounts/MNMDH/bulletins/2456800

APPENDIX: Flex Monitoring Team Emergency Medical Services Evaluation Resources

Title (with hyperlinks to the documents)	Authors	Date
Year Two Evaluation of the Flex EMS Supplemental Funding Projects: Building an Evidence Base through Outcome Measurement	John Gale, Karen Pearson, Sara Kahn-Troster	May 2022
Implementation of Flex EMS Supplemental Funding Projects: Year One Activities	Karen Pearson, John Gale, Sara Kahn-Troster	Oct 2020
Exploring State Data Sources to Monitor Rural Emergency Medical Services Performance Improvement	John Gale, Karen Pearson, Yvonne Jonk	Mar 2020
Improving Rural Systems of Care for Time Critical Diagnoses (Briefing Paper #41)	John Gale, Karen Pearson	Jan 2019
State Flex Program Rural EMS Assessment Strategies (FMT Policy Brief #46)	Karen Pearson, John Gale, Sara Kahn-Troster, Andrew Coburn	Nov 2017
Developing Program Performance Measures for Rural Emergency Medical Services	John Gale, Andrew Coburn, Karen Pearson, Zach Croll, George Shaler	Sep 2016
The Evidence for Community Paramedicine in Rural Areas: State and Local Findings and the Role of the State Flex Program (Briefing Paper #34)	Karen Pearson, John Gale, George Shaler	Feb 2014
Emergency Transfers of the Elderly from Nursing Facilities to CAHs (Policy Brief #32)	Karen Pearson, Andrew Coburn	Jan 2013
Developing Regional STEMI Systems of Care: A Review of the Evidence and the Role of the Flex Program (Policy Paper #29)	John Gale	Nov 2011
Emergency Medical Services (EMS) Activities Funded by the Medicare Rural Hospital Flexibility Program (Briefing Paper #8)	P. Daniel Patterson, John Gale, Stephanie Loux, Anush Yousefian, Rebecca Slifkin	Feb 2006