National Quality Forum Environmental Scan: Regionalized Emergency Medical Care Services

EMS Performance Improvement Center
Department of Emergency Medicine
University of North Carolina at Chapel Hill

Jefferson Williams
Gregory Mears
Jane Brice
Cindy Raisor
Charles Cairns

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EXECUTIVE SUMMARY

INTRODUCTION

Using resources efficiently is paramount to providing effective, quality healthcare. The Institute of Medicine recently identified the strain on the nation's emergency medical care systems and called for analysis and improvement of these systems.[1, 2]

The concept of "regionalization" has been identified as a potential method for improving medical care through the efficient use of resources.[2] Although consensus definitions of regionalization remain under development[3, 4], for the purposes of this environmental scan, the term has been broadly defined as the concept of an established network of resources that serves to deliver specific care (e.g. protocols, definitive procedures, or higher care levels or care pathways) not universally available in the out-of-hospital setting (e.g. a physician's office) or in some acute care hospitals.

While regionalization is not a new idea to emergency medical care—trauma and pediatric centers have been in use for decades—it is increasing. For example, care for patients suffering time-sensitive emergency conditions such as stroke and acute myocardial infarction has been regionalized by geography. As the scope of emergency medical care services systems continues to expand, the healthcare system must evaluate and measure the evolution and action of these networks and services to ensure they are optimizing resource utilization and benefitting patients.

Given the healthcare system's current focus on regionalization, the National Quality Forum (NQF) is interested in the current state of standards evaluating the emergency medical care regionalization. This document, an environmental scan of projects and measures (and measure gaps) of regionalized emergency medical care services (REMCS), serves as the first part of that effort.

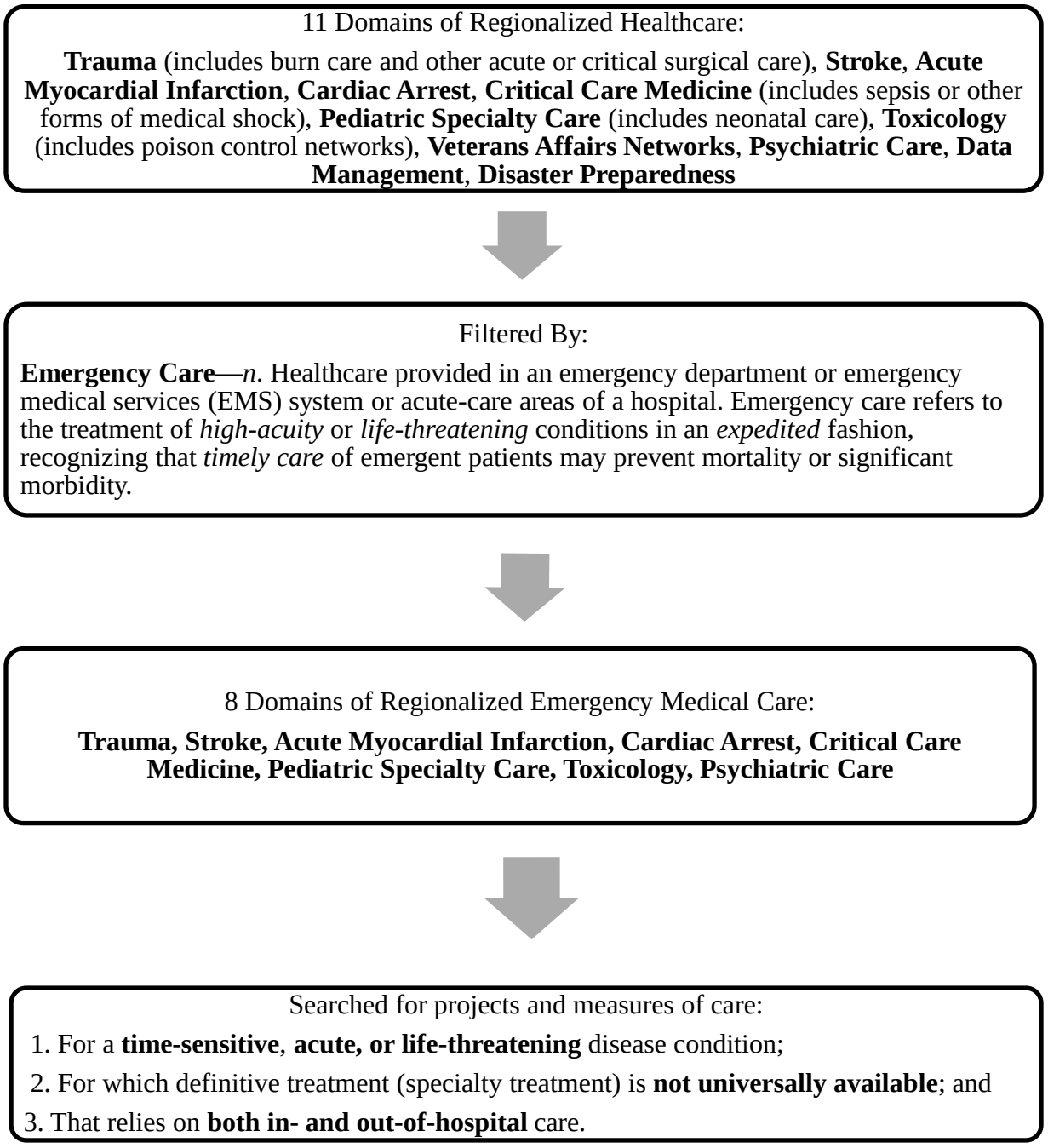
METHODS

This environmental scan identified projects and measures that evaluate both regionalized and emergency care. Several efforts have been made to introduce the concept of performance measurement for emergency department (ED) and out-of-hospital emergency medical services (EMS)-based care. This scan adds to previous efforts by identifying projects that are using established and evolving measures of emergency care from the perspective of regionalization for time-sensitive, life-threatening conditions.

To organize the scan and results, an *a priori* review of literature relating to regionalized healthcare was conducted, identifying the breadth of regionalized care. This review resulted in 11 "domains" of regionalized healthcare services. Once these 11 domains of regionalized care were identified, a filter for emergency care was applied. Specifically, emergency care was defined as care provided in an ED or EMS system or acute-care areas of a hospital. The term refers to the treatment of high-acuity or life-threatening conditions in an expedited fashion, recognizing that timely care of emergent patients may prevent mortality or significant morbidity.

The refinement to the scan to focus on emergency care within regionalized healthcare yielded eight domains comprising REMCS (see diagram below).

Figure 1: Defining Regionalized Emergency Medical Care Services



Once the eight domains were identified, a measure and project search was conducted. The search employed five strategies to identify measures and projects of regionalized emergency medical care services. The five strategies for measures and projects of REMCS included both direct and indirect measure and project searches:

1. National Library of Medicine's PubMed database literature search utilizing regionalization terminology (Appendix A);

2. PubMed search for emergency medical care performance measures and projects utilizing a disease-based approach;

3. NQF's Online Product Update System (OPUS) database key-word search for endorsed and "pipeline" measures of regionalized emergency medical care services;

4. Expert consensus search, including National Institutes of Health Emergency Research Roundtables, [20, 30, 31] documentation from the 2010 Society for Academic Emergency Medicine Consensus Conference entitled "Beyond Regionalization: Integrated Networks of Emergency Care," [3, 15-19, 21, 22, 24, 26, 27, 32-42] and the 2010 Institute of Medicine Workshop and other known reviews of regionalized emergency medical care or efforts to endorse or develop measure, targeting known published, recently published and unpublished manuscripts and reviews on the topic of regionalized emergency medical care services;[4, 9, 10, 12-14, 29] and

5. Personal communication and group analysis of current research via utilization of established national organizations, expert consensus, and structured networks, such as those developed and maintained by the UNC EMS Performance Improvement Center (EMSPIC).

Identified measures and projects were screened by inclusion and exclusion criteria to find those relating to regionalized emergency medical care services. A measure or project was included in the final analysis if it evaluated or examined emergency medical care that is regionalized. Specifically, included measures and projects must describe:

- emergency care (i.e., care that is time sensitive and of high acuity); and
- regionalized care (i.e., care within a system that facilitates delivery of care that is not universally available) .

A measure or project found by this scan was excluded from the final analysis if it described:

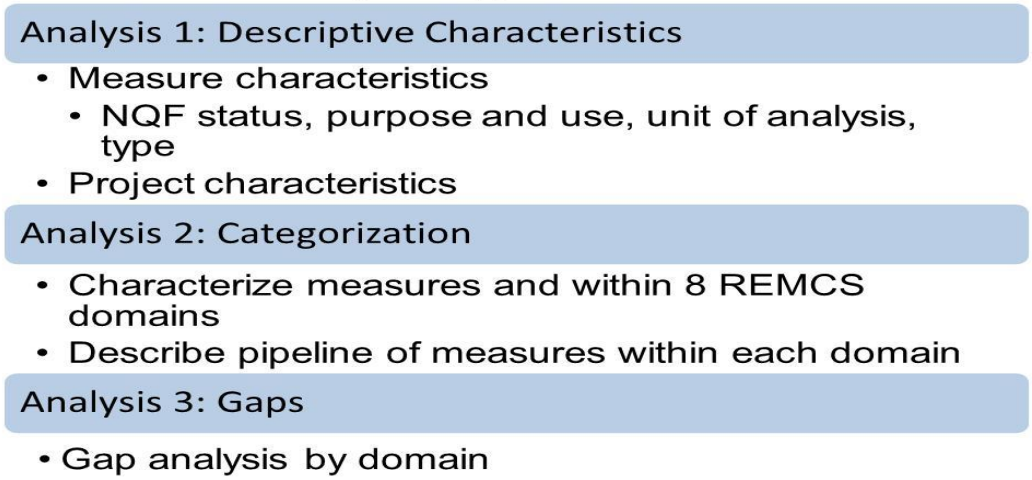
- non-emergent care (i.e., not time sensitive or of sufficient acuity to be possibly life threatening or highly morbid in a short period of time); or
- care not within a regionalized system (i.e., care that does not involve a system of both in- and out-of-hospital components, or care that is universally available).

The remaining measures and projects were subsequently described and analyzed.

FINDINGS AND ANALYSIS

The scan identified 30 measures of regionalized emergency medical care services. A three-pronged approach was used to analyze the measures (Figure 2).

Figure 2. Measure Analysis Approach



The first level of analysis described an overview of characteristics of measures and compared measures in terms of measure status, purpose and use, unit of analysis, and measure type. The second level of analysis categorized the measures by domain within regionalized emergency medical care. Doing so provided comparison across domains in terms of the relative development of performance measurement within a given domain as measured by the number of measures in a domain. This level also was used to analyze the depth of specific measure development within a given domain. Finally, the third level analyzed gaps by domain. This analysis discusses where gaps in regionalized emergency medical care services exist in the quantity as well as quality and depth of performance measures.

Analysis 1 and 2 provide a list of the identified regionalized emergency medical care services measures categorized by domain. Table 1 lists the measures by domains and briefly describes the measures purpose.

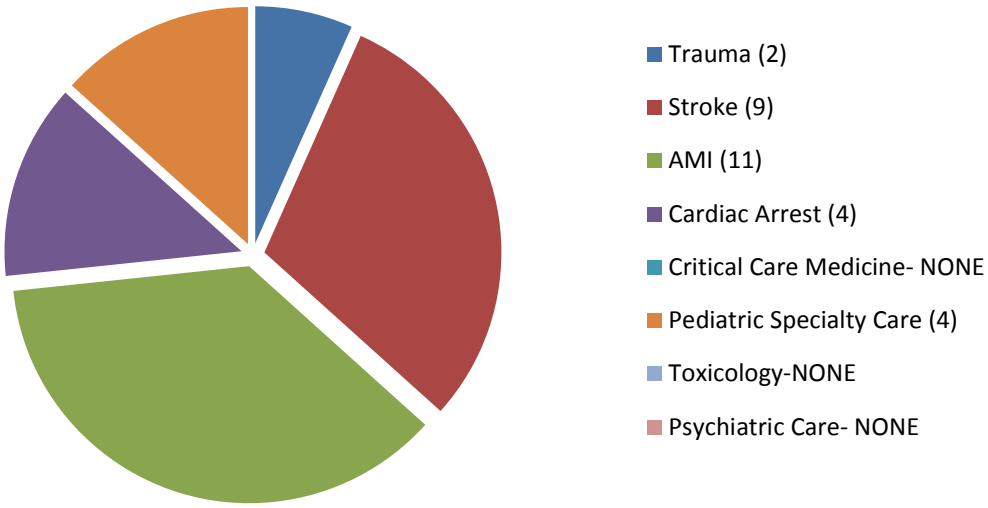
Table 1. Performance Measures of Regionalized Emergency Medical Care Services (REMCS)

Trauma (n=2)	1	Scene time less than 10 minutes for trauma (non-entrapment)
	2	Direct transport to trauma center for those meeting criteria
Stroke (n=9)	1	Tissue plasminogen activator (t-PA) considered
	2	Thrombolytic therapy administered
	3	Advance hospital notification for suspected stroke
	4	Identification of stroke in the field (via validated pre-hospital stroke screen)
	5	EMS response less than 9 minutes 90 percent of the time for suspected stroke

	6	Scene time less than 15 minutes for stroke
	7	100 percent of EMS providers minimum 2 hours of stroke continuing education per certification
	8	Use of transport destination protocols for stroke patients/transport to stroke center
	9	Code stroke CT neuroimaging in patients being evaluated for code stroke symptoms
AMI (n=11)	1	Aspirin at arrival of AMI documented
	2	Aspirin given at arrival for AMI
	3	Primary PCI within 90 minutes of hospital arrival
	4	Median time to ECG for patients with chest pain
	5	Median time to transfer to another facility for acute coronary intervention
	6	12 lead ECG performed pre-hospital and interpreted or faxed for interpretation
	7	ECG to percutaneous coronary intervention (PCI) time within 90 minutes
	8	Advance hospital notification for acute myocardial infarction (AMI)
	9	Care coordination for PCI for AMI
	10	Scene time less than 15 minutes for AMI
	11	Transport to PCI center for AMI
Cardiac Arrest (n=4)	1	Percentage of out-of-hospital cardiac arrest (OHCA) receiving bystander cardiopulmonary resuscitation (CPR)
	2	Response interval < 5 minutes for CPR and automated external defibrillator (AED) for cardiac arrest
	3	EMS cardiac arrest: survival to emergency department discharge
	4	EMS cardiac arrest: survival to hospital discharge
Pediatric (n=4)	1	Under 1500-gram infant not delivered at appropriate level of care
	2	High-risk neonates transferred to neonatal centers
	3	Direct transport to pediatric trauma center for those pediatric patients meeting criteria
	4	Unplanned admission to neonatal intensive care unit at term

The third analysis, or gap analysis, provides a summary of gaps in findings. Specifically, the environmental scan identified 30 measures, which mapped to 6 of the 8 REMCS domains. (Figure 3 illustrates measure distribution by the REMCS domains, where some domains have more or fewer measures than others.)

Figure 3: REMCS Measures by Domain



Domains that already have relatively developed systems of care in place (e.g., hospitals designated as stroke centers and chest pain centers) also have the majority of identified performance measures. Twenty of the 30 measures are in the domains of stroke and AMI. Additionally, of the 30 total measures, some systems of care clearly are relatively more developed, as evidenced not only by the number of measures within a domain, but also by the level of development of those measures (i.e., 5 of the 8 total NQF-endorsed measures are in the domain of AMI). These data indicate that some domains of regionalized emergency medical care services are already benefitting from the concepts of performance measurement, while some clearly could benefit from further identifying concepts for measures as well as further developing, testing, and consistently implementing already existing measures.

The scan also identified projects relating to regionalized emergency medical care services that were using established and evolving measures to provide a descriptive view of the landscape of regionalized emergency medical care services. Twenty-eight projects involving performance and measurement of regionalized emergency medical care services were identified. The projects mapped to the domains of trauma (3), stroke (3), AMI (3), cardiac arrest (3), and pediatrics (2). Fourteen of the projects crossed multiple domains. The 28 projects are described and classified in Table A.3 in Appendix A. This table provides context for identified measures and serves to inform future parts of the overall project, most specifically the creation of a framework for measure evaluation and development.

CONCLUSIONS

Relatively few performance measures exist in the area of regionalized emergency medical care services. Of those that do exist, the most-well developed have been endorsed by the NQF as voluntary consensus standards. The remaining identified measures in this area are early in the development or implementation process. We recommend that future measurement efforts should focus on:

1. creating or identifying measures of REMCS that focus on time-sensitive, high-acuity, or life-threatening care;
2. identifying measures that evaluate systems of care; and
3. identifying measure owners and stewards to facilitate rigorous development and testing of measures with an intentional process to ensure rigor and standardization of measures for implementation (i.e., the NQF's consensus development process).

These three efforts will improve the breadth and depth of measuring healthcare service delivery in the area of REMCS. Employing new measures that evaluate systems will enhance care coordination and introduce shared accountability for the quality of healthcare delivered. In addition, measure identification and implementation will establish a standard for healthcare quality in REMCS.

This scan comprehensively identified and analyzed current REMCS measures and projects. These measures represent the spectrum of domains, purposes, and levels of development that exists in this area of healthcare. This scan also contributes to the larger project of performance measurement of REMCS by identifying and describing current measures and their characteristics, as well as current projects that are using REMCS measures and identifies gaps in both breadth and depth of performance measurement. Future phases of the project can use the information in this scan to inform a framework for future measure development and facilitate the endorsement of identified measures.

INTRODUCTION

Context

The design and efficient use of healthcare networks is critical to delivering quality patient care. Recently, the concept of "regionalization" has been identified as a potential method for improving medical care through efficient resource use.[2] Although consensus definitions of regionalization remain under development,[3, 4] the term has been broadly defined as the concept of an established network of resources delivering specific care (e.g., protocols, definitive procedures, or higher care levels or care pathways) that is not universally available in the out-of-hospital setting (e.g., a physician's office) or in acute care hospitals. Regionalized care does not equal centralized care. While many healthcare domains may benefit from regionalization and resource coordination, one area particularly suited for improvement via regionalization is emergency services.[1, 2, 4]

Well before the current concepts of regionalization became widespread, emergency care services such as trauma, neonatal care, and poison control were being coordinated across geographic areas. More recently, care for patients suffering time-sensitive emergency conditions, such as stroke and acute myocardial infarction (AMI), has been regionalized on a statewide basis. As emergency medical care services systems continue to expand in breadth and scope, the healthcare system must evaluate their evolution to ensure they are optimizing resource use and improving patient outcomes.

An important method of evaluating healthcare, including emergency services, is performance measurement. The role of performance measurement in healthcare is well described by Pines, et al.,[5] who state: "Performance measurement… attempts to quantify the quality of care that healthcare providers or organizations deliver, with the goal of comparing and improving it. The basic principle is: 'If you can measure it, you can manage it.'"

National Quality Forum (NQF), a primary standard-setting organization for performance and quality measurement, uses a formal Consensus Development Process (CDP) to endorse healthcare quality and performance measures.[6-8] Given the healthcare system's current focus on regionalization, NQF is examining the current state of standards that evaluate the regionalization of emergency medical care. This effort serves not only to examine the measurement environment, but also to encourage measure development or provide insight into where and how to develop measures. Consensus standards would establish common criteria for evaluating regionalized emergency medical care services for all stakeholders in this area of healthcare services.

NQF has begun a multiphase project to achieve the end goal of establishing and endorsing measures of regionalized emergency medical care services (REMCS). The first phase of the project has two parts: 1) an environmental scan for projects and measures relating to regionalized emergency medical care services, and 2) a measurement framework (a commissioned paper) assessing current performance measures of regionalized emergency care services and guiding future measure development.

The environmental scan will identify both established and evolving measures of regionalized emergency care services and will use those measures to identify projects relating to REMCS to provide a descriptive view of the arena of regionalized emergency medical care services. A list of REMCS-related projects provides context for identified measures and serves to inform future parts of the overall project, most specifically a framework for evaluating and developing measures.

In addition to identifying measures and projects, the environmental scan will identify where gaps exist in projects and performance measures. As noted, the scan will serve as a primary source for the measurement framework report and provide data and context its development. The second phase of the project, if initiated, will seek to endorse measures as voluntary consensus standards.

Objectives

NQF contracted with the University of North Carolina at Chapel Hill Department of Emergency Medicine to conduct the environmental scan of performance measures and projects regarding REMCS, as described above. In general terms, the purpose of the scan is to provide an up-to-date picture of the level of development or implementation of performance measures and projects relating to REMCS. This information is important because this area of healthcare services is relatively young, and measurement of regionalized emergency systems is not currently standardized. Measurement of healthcare quality and delivery, and uses of those measures, varies widely in this area. This report will offer background information establishing the strategy for categorizing measures and projects, describing the methods for conducting the search for measures and projects, and analyzing and discussing the results of the scan.

To complete the environmental scan, we focused on a few core research questions:

a. What current performance measures or standards exist that apply to regionalized emergency care? At what level of development or implementation are these measures?
b. What current projects exist in the realm of regionalized emergency medical care services?
c. Where do gaps exist in current measures?

Background

Several efforts have been made so far to introduce the concept of performance measurement for emergency department (ED) and out-of-hospital emergency medical services (EMS)-based care. While some of these projects identified and described possible measures, none had the primary purpose of identifying or promoting performance measures or projects for systemic approaches, including regionalization.[5, 9-14] This environmental scan adds to earlier efforts by identifying measures and projects of emergency care from the perspective of regionalization of services for the care of time-sensitive, life-threatening conditions. To organize the scan and results, an *a priori* review of literature relating to the regionalization of emergency care was

conducted. The primary goal was to identify current areas and topics that define the breadth of regionalized emergency care, i.e., domains of regionalized emergency care services. Establishing the breadth of this area of healthcare informed the search for measures and projects and provided an obvious mechanism to categorize findings.

By thoroughly examining multiple reviews, reports, and expert consensus documents,[3-5, 9-29] 11 common and recurrently referenced domains across sources were identified. These 11 domains were consistently thought to be within the realm of regionalized care (Figure 1). For the purposes of this scan, a domain is a category or topic within the realm of regionalized care. It can be a disease or group of diseases, a patient population, or a type or area of healthcare.

Eight of these domains also met the definition of emergency care: healthcare that is provided in an ED or EMS system or acute-care areas of a hospital. Emergency care refers to the treatment of high-acuity or life-threatening conditions in an expedited fashion, recognizing that timely care of emergent patients may prevent mortality or significant morbidity.

The intended focus in terms of regionalization is on systems of care. This may include systems of care defined by geography or by patient population or disease; the prevailing concept of care that is the focus is on specialty care that is *not universally available* at all hospitals and in all geographic areas.

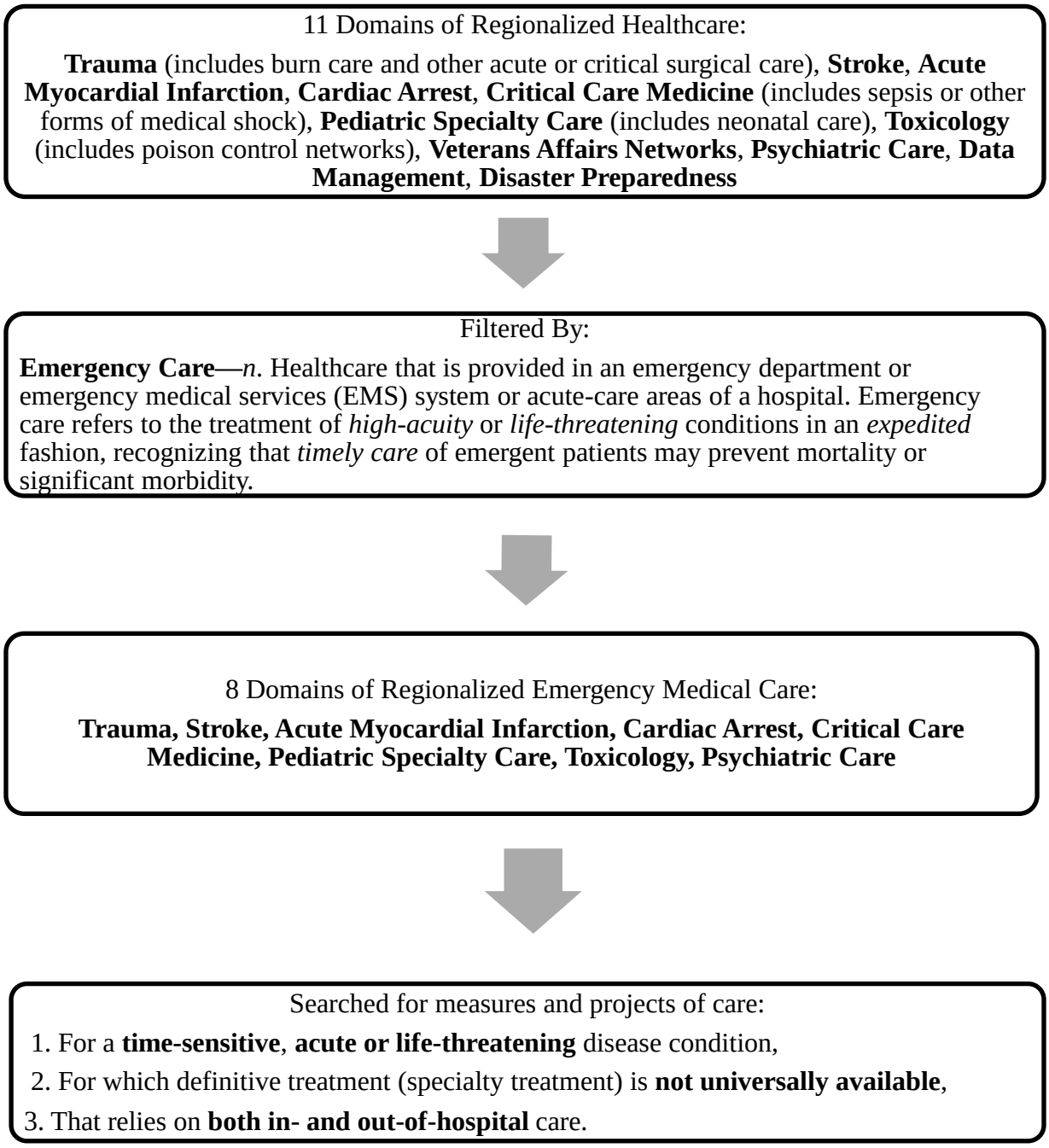
Also, inherent in the definition of REMCS is the presence of an *out-of-hospital component* of care. This may include pre-hospital (i.e., EMS) recognition of a time-sensitive condition and initiation of a system of care, or the transfer of a patient for advanced or specialty care within a system.

The eight domains, or topic areas, therefore define the breadth of REMCS. Within these domains, a rigorous search for relevant measures and projects was conducted, focusing on care that is:

1. Time sensitive for an acute or life-threatening disease condition;
2. Specialty treatment not universally available; and
3. Both in- and out-of-hospital care.

The background information and the eight domains of regionalized emergency medical care were used to ensure the scan's comprehensiveness, as well as to categorize the findings.

Figure 1: Defining Regionalized Emergency Medical Care Services



METHODS

Definitions and Scope

The products of the environmental scan are: 1) a list of performance measures, both in current use and "pipeline," for REMCS; 2) a description of existing projects related to REMCS; and 3) an analysis of measure gaps. NQF's definitions have been used, as well as definitions developed by the authors that are consistent with terms and usage found in the healthcare literature. Please see Appendix D for a list of definitions.

A "measure" was defined as a standard, a basis for comparison, a reference point for evaluation,[7] and "the numeric quantification of healthcare quality." [8] A "project" was defined as a planned, collaborative effort with defined goals and methods to achieve those goals, such as a research project or quality improvement project. Projects described in this scan focus on emergency care at the system level.

NQF's definition of "pipeline" as a continuum of separate status points was used; the pipeline starts from the point at which a measure concept is identified to the point at which NQF endorses it. According to NQF, the pipeline categories include: 1) the measure remains under development; 2) the measure is fully developed and specified; 3) measure testing has been initiated; 4) measure testing has been completed; 5) the measure is in use; 6) the measure is NQF-endorsed. Based on a review of NQF's Online Product Update System (OPUS) database, which NQF made available for this project,[6] the authors also describe measures by steward and intended use of the measure, if available.

With regard to the scope of the environmental scan and the definition of regionalization, emergency medical services care was considered from the point at which a patient is recognized to have an emergent condition to the point at which definitive treatment is provided. Identified measures and projects could either evaluate structures in place (e.g., service availability or EMS system plans and protocols), processes within regionalized systems (e.g., provision of procedures), or outcomes (e.g., cardiac arrest survival rate) from a system of care.

To complete the environmental scan, existing projects related to measure development for REMCS were described. These projects were identified by their relationship to identified measures, literature review, current research of established national organizations, expert consensus, and structured networks, such as those developed and maintained by the UNC EMS Performance Improvement Center (PIC).

Inclusion and Exclusion

Both published and unpublished consensus reports[4] suggest that standard and widely accepted definitions of emergency care "regions," "systems," and "networks" remain under development. However, as noted above, "regionalized emergency medical care" is defined by systems (with both in- and out-of-hospital components) that facilitate the delivery of emergency

care that is not universally available. This scan intended to identify and analyze measures and projects of these systems.

A measure or project was included in the final analysis if it evaluated or examined emergency medical care that is regionalized. Measures and projects included both:

- emergency care (i.e., care that is time sensitive and of high acuity); and
- regionalized care (i.e., care within a system that facilitates delivery of care that is not universally available) .

A measure or project found by this scan was excluded from the final analysis based on the accepted definitions of emergency care and regionalized care. Excluded measures and projects were:

- non-emergent care (i.e., not time sensitive or of sufficient acuity to be possibly life threatening or highly morbid in a short period of time); or
- not within a regionalized system (i.e., care that does not involve a system of both in- and out-of-hospital components, or care that is universally available).

It should also be noted that the applicability of a project to REMCS can be difficult to define. Furthermore, the number of projects of REMCS is limited compared to the number of measures, or at least potential measures. While a performance measure usually is strictly described and defined, a project may take on a broad array of forms.

For example, a research project's design and presentation may be very different from that of a quality assurance (QA) project. Also, projects that helped inform measure development could be very different from projects that tested or implemented measures. All of these types of projects were potentially within the realm of REMCS and either would identify measures or serve to inform framework development in Part 2 of the project. Therefore, projects were included if they: 1) described regionalized care and 2) described emergency care.

To be included in this environmental scan, a project must address a system of care or relate directly to the development or implementation of performance measures for systems of emergency medical services care. This criterion was used to keep the focus of the project list on systems of care. Research testing an intervention or evaluating an outcome can serve as a source to identify measures (i.e., the intervention tested in a project, or a project outcome, could be a performance measure). Nonetheless, each of these isolated, individual research studies were not necessarily considered "projects" relating to REMCS because they do not necessarily focus on systems of care. For example, a study may evaluate interventions (e.g., training programs) to improve ambulance response times in a community. Thus, while the performance measure might focus on ambulance response time, if the project focuses solely on evaluating the training intervention, it may have little to no focus on improving or evaluating a system of care.

In fact, all of the inclusion criteria are intentionally broad to ensure a wide inclusion of possible measures and projects. Nonetheless, these criteria do exclude commonly accepted measures of emergency care (that may not be regionalized). Also, based on the definitions, they are specific to "emergency systems of care," as is the goal. For example, the authors anticipated NQF-endorsed measure #0163 (Primary PCI within 90 minutes of hospital arrival for acute MI)

would be included in the results; however, NQF-endorsed measure, *Initial antibiotic within 6 hours of arrival for pneumonia* (NQF # 0151), would not be included. Antibiotics are considered "universally available" across hospital systems, and thus, this definitive treatment does not rely on a regionalized emergency system of care.

Additionally, the breadth of the criteria was intended to include measures of common, but not definitive, care that may be a critical step in a regionalized system. For example, it was anticipated *a priori* that aspirin administration and electrocardiogram (ECG) performance for acute myocardial infarction (AMI) would be included. Although these treatments or process steps are widely available across hospitals, the definitive specialty treatment (i.e., percutaneous coronary intervention) is not universally available. These are included as performance measures in this scan due to their status as integral, time-sensitive steps in a disease condition (AMI) that is conducive to regionalized care.

Finally, to be included in the final analysis, a measure or project must be reasonably well described to examine at least one component of a system of care. Many components of care within the spectrum of care, from patient identification through definitive specialty treatment, may be measured. However most of these steps within the realm REMCS likely are not currently identified as performance measures. Future phases of this project may serve to suggest the development or implementation of measures (and projects), but the purpose of this environmental scan is to find already existing measures and projects.

Clearly defining REMCS is an ongoing challenge.[3] Nonetheless, using the definitions of regionalized emergency care established for the purposes of this paper, a broad and meaningful search for projects and measures can be conducted. To ensure a complete search, the authors' strategy involved a complex search for sources, then a search for measures and projects within those sources, as described in the next section.

Search Strategy and Sample Development

A search for measures and projects of REMCS was employed using five key search strategies (see Figure 2):

1. National Library of Medicine's PubMed database literature search utilizing regionalization terminology (Appendix A);

2. PubMed search for emergency medical care performance measures and projects utilizing a disease-based approach;

3. NQF's Online Product Update System (OPUS) database key-word search for endorsed and "pipeline" measures of regionalized emergency medical care services;

4. Expert consensus search, including National Institutes of Health Emergency Research Roundtables, [20, 30, 31] documentation from the 2010 Society for Academic Emergency Medicine Consensus Conference entitled "Beyond Regionalization: Integrated Networks

of Emergency Care," [3, 15-19, 21, 22, 24, 26, 27, 32-42] and the 2010 Institute of Medicine Workshop and other known reviews of regionalized emergency medical care or efforts to endorse or develop measure, targeting known published, recently published and unpublished manuscripts and reviews on the topic of regionalized emergency medical care services;[4, 9, 10, 12-14, 29] and

5. Personal communication and group analysis of current research via utilization of established national organizations, expert consensus, and structured networks, such as those developed and maintained by the UNC EMS Performance Improvement Center (EMSPIC).

The first and second search strategies looked for sources of measures and projects via PubMed using Medical Subject Heading (MeSH) terms when possible or key words when otherwise appropriate. All PubMed searches were limited to "human" studies and "English Language." For the first search component, terms related to the regionalization of emergency care: "Emergency Medical Services," "emergency care," "regionalization," and "regionalization emergency care" were included. It should be noted that the MeSH term "Emergency Medical Services" is a broad heading that captures the concepts of "systems of care" as they relate to this environmental scan.

The second search strategy expanded the search for measures and projects by searching for those related to specific disease conditions within the domains of regionalized emergency medical care. Based on the background literature review, most emergency care performance measures were based on treatment of specific diseases. For this reason, the four disease conditions that are domains of regionalized emergency care services (trauma, stroke, acute myocardial infarction, and cardiac arrest) were searched via PubMed, combining terms for emergency medical care, performance measures, and the disease condition.

Though this strategy yielded many articles not dealing with regionalization, its purpose was to ensure the search included performance measures regarding the most commonly cited time-sensitive disease conditions already known to be treated by systems of care, i.e. trauma, stroke, AMI, and cardiac arrest.[4, 12, 17, 18, 27]

The third search strategy exhaustively searched NQF's internal OPUS database [43] of endorsed and pipeline measures to identify measures related to REMCS. This internal NQF database provides a central location for the most up-to-date identified measures. The entire database was downloaded into a spreadsheet, and a manual search was conducted for measures meeting the inclusion criteria. Measures were extracted from the entire database if their titles and brief descriptions were related to emergency care. These measures were subsequently evaluated by the inclusion criteria along with measures identified by other strategies, as described below in Figure 2. Notably, this component searched for measures directly. The other components searched first for sources that may contain measures or projects, followed by a secondary search of the identified sources for the actual measures and projects.

The fourth and fifth search strategies identified measures and projects based on full text review and manual searches of references of recent consensus work by the National Institutes of Health and the Society for Academic Emergency Medicine (cited previously). Published and non-published consensus-based projects and reviews, as well as expert discussion of measure gaps, were evaluated to identify measures. Established local, regional, and national EMS networks, as developed and maintained by the EMS PIC, were used with specific attention to personal communication via phone calls and e-mail with regional and national EMS leaders regarding EMS projects relating to standards development. As projects were identified, they were logged into a spreadsheet database for further description. Results for the fourth and fifth strategies significantly overlapped, and are therefore included together in the source search flow chart (Figure 2).

Data Collection

Once all five search strategies were completed, sources, measures, and projects were compiled using reference software and a previously developed spreadsheet. Duplicate references, measures, and projects were discarded. Two methods of data aggregation were used: a direct search method and an indirect search method (described below), based on the nature of the search components and results. For example, the measure search for Strategy 3 used NQF's OPUS database, which directly yielded measure titles and descriptions, whereas the measure search in Strategy 2 first required a peer-reviewed literature search. Identified literature was then reviewed for measure titles and descriptions (an indirect search).

Search Strategy 3 (measure search only) was a direct method that yielded measures in a single step. For this strategy, measures were screened by the inclusion and exclusion criteria, and included measures were then listed for analysis.

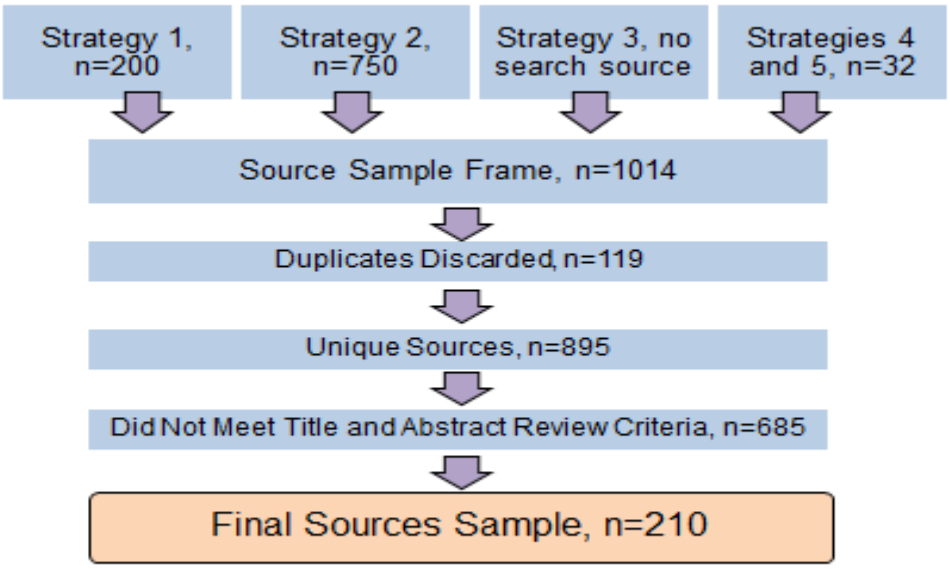
Search Strategies 1, 2, and 4 were indirect methods that searched the literature for sources of measures and projects. Once potential sources of measures and projects were found, the sources were then screened by title and abstract to determine if measures and projects of REMCS were likely to be found within the source.

Search Strategy 5 was unique in that it employed both direct and indirect methods. Personal communication with individuals and discussion with experts yielded both measures (and projects) directly, as well as potential sources for measures. For example, discussion with an expert often yielded a measure title and description, and the research team then explored other sources to find a full description of the measure and its characteristics. Additionally, discussion with an expert often yielded advice to check a particular source or review for possible measures. These expert-identified sources and reviews often overlapped with sources identified by search Strategy 4.

Search Strategies 1, 2, 4, and 5 found a sample frame of 1,014 sources, 895 of which were unique possible sources for measures and projects (Figure 2). Next, the authors reviewed the title and abstract (when available) for each source using the inclusion and exclusion criteria as described above. To remain in the sample, a source's title and abstract must have described both emergency care and regionalized care. When abstracts were unavailable and, therefore, less

information was present to make a decision, the authors erred on the side of keeping sources in the sampling frame and then subsequently reviewed full text when available to attempt to find measures and projects.

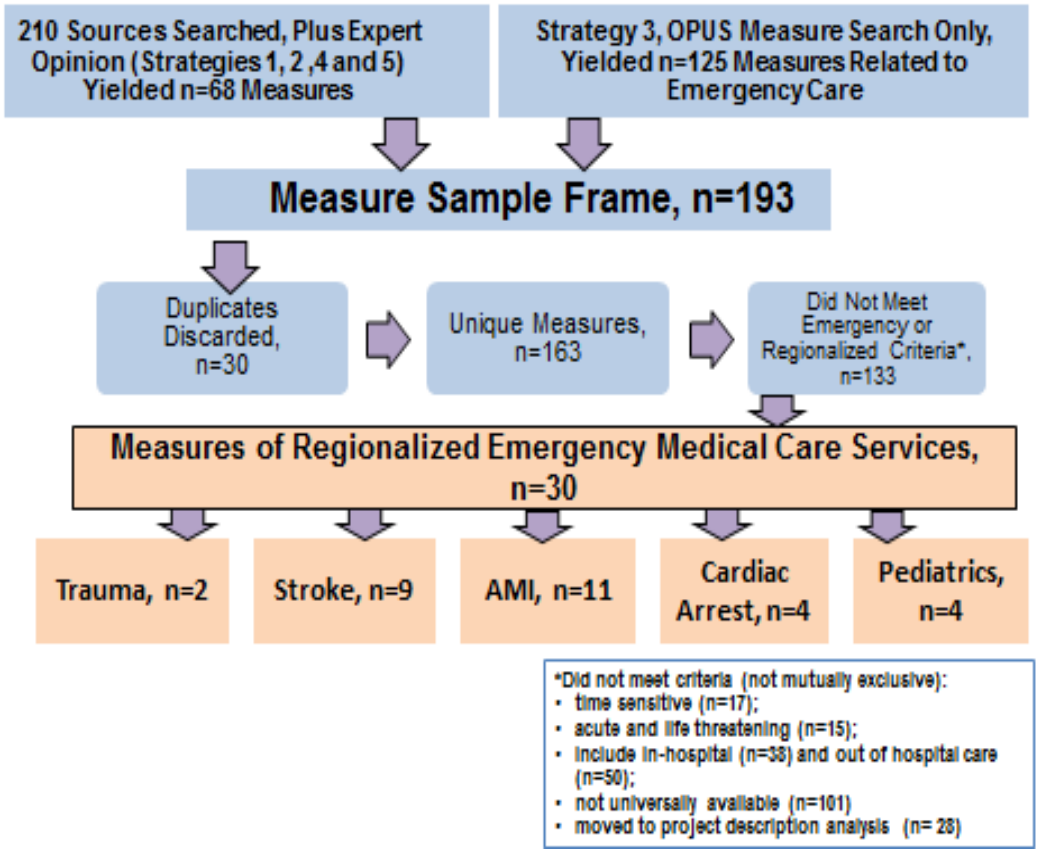
Figure 2. Search Strategy for Source Sample



After title and abstract review by inclusion and exclusion criteria, 210 potential sources of measures and projects remained in the sample. These sources then underwent a secondary search for descriptions of performance measures and projects. The secondary review was conducted using the abstract and full text to identify descriptions of performance measures and projects.

Descriptions of identified measures and projects identified by the search strategies were extracted into a spreadsheet serving as a database. Search Strategy 3, a direct search strategy, reviewed the title and description of all 1,488 measures listed in the OPUS database. To remain in the sample frame for the measure search, a measure's title and description must be potentially related to "emergency care" as defined above. After all of the direct and secondary (indirect) searches were completed, the spreadsheets listing performance measures were combined and screened using the inclusion and exclusion criteria (complete list located in Table A.1, Appendix A). By title and description, 68 measure potentially related to emergency care were identified from the indirect search and 125 measures from the direct search. These measures were extracted into a separate spreadsheet and subsequently screened by the inclusion criteria along with measures identified by other strategies to determine their applicability to REMCS (Figure 3).

Figure 3. Search Strategies for Measure Selection



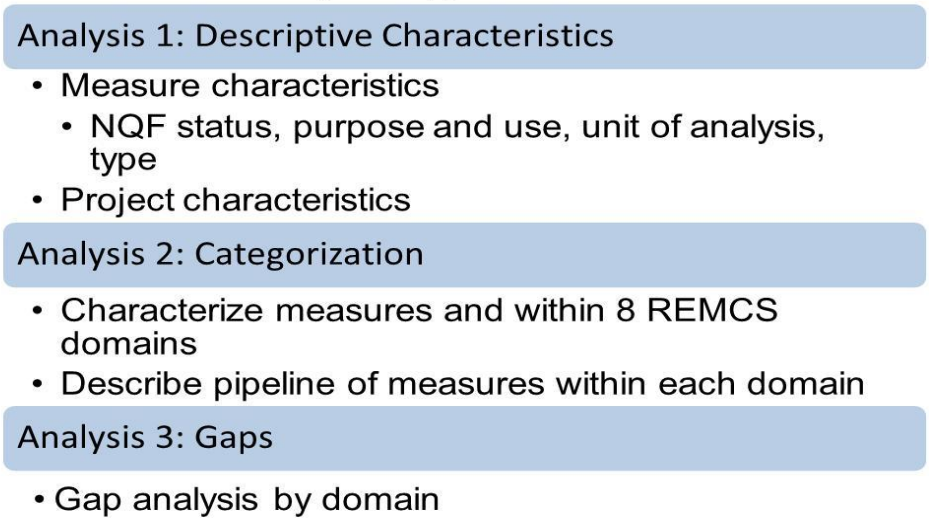
As a reminder, the inclusion criteria required measures and projects to address care that is time sensitive, life threatening, includes both in-hospital and out of hospital care, and is not universally available. Measures that remained in the combined database after this final screen were included in the analysis.

Projects, similarly to measures, were indirectly identified from sources via strategies 1, 2, and 4, and directly via strategy 5. These projects are listed and described in Table A.3, Appendix A. To ensure completeness, the final sample of measures and projects was reviewed by content experts and key informants.

Analysis

The analysis of the list of projects for regionalized emergency medical care services is descriptive. For the analysis of measures, a three-level analysis was designed, containing: 1) a descriptive analysis, 2) a categorization analysis, and 3) a gap analysis.

Figure 4. Measure Analysis Approach



The first level of analysis provides an overview of the characteristics of performance measures (Table 1) and projects (Table A.3) of REMCS. Variation between measures, in terms of measure status, use purpose, unit of analysis, and measure type were assessed. In terms of measure status, it should be noted that the un-endorsed measures did not fall neatly into the various status points along NQF's pipeline continuum. Therefore, if any evidence existed of an identified measure being used for any purpose, that measure was classified as "In Use." Measures that were identified, but were unclear in terms of use, were classified as "Under Development."

The second level of analysis categorizes the measures by domain, or topic area, within regionalized emergency medical care (Table 2). Doing so provides comparison across domains of the relative development of the idea of a given domain's performance measurement as measured by the number of measures in a domain. This level also analyzes the depth of specific measure development via measure status within a given domain.

Finally, the third level provides a gap analysis by domain. Gaps in REMCS performance measurement exist in the quantity as well as quality and depth of performance measures (Figure # __). Levels 1 and 2 of analysis are further referenced to discuss gaps, by domain, in terms of measure characteristics, such as status of development, use purpose, unit of analysis, and measure type.

FINDINGS

Search Results

The search yielded 895 unique possible sources of measures and projects. Of these, 210 sources—in which the source's title and abstract must have described both emergency care and regionalized care—were subjected to a thorough search for performance measures and projects

related to regionalized emergency medical care service. Several sources for measures and projects were identified initially as published or unpublished works via discussion with experts in the field, and then reviewed again as some of these were published in the peer-reviewed literature during the timeframe of the search. These documents included the recent NIH Emergency Medicine Research Roundtables, the 2010 Society for Academic Emergency Medicine Consensus Conference (Beyond Regionalization: Integrated Networks of Emergency Care), including reports from focused panels and breakout sessions, and other qualitative reviews of this area of the literature (all originally cited in the Methods section, above).

The scan identified 163 unique measures from the search components (Table A.1). The authors excluded 133 measures by the established exclusion criteria, for a final total of 30 measures of regionalized emergency medical care services (Table 1). Categorizing the measures by domain, it was found that 2 measure care of trauma patients, 9 measure stroke care, 11 measure care of patients with AMI, 4 measure cardiac arrest care, and 4 measure pediatric care). Please see Figure 2 (this is the first flow chart) for the specific sampling frame and Figure 3 for a measure flow chart.

Table 1. Performance Measures of Regionalized Emergency Medical Care Services

Trauma (n=2)	1	**Scene time less than 10 minutes for trauma (non entrapment)**
	2	**Direct transport to trauma center for those meeting criteria**
Stroke (n=9)	1	**Tissue plasminogen activator (t-PA) considered**
	2	**Thrombolytic therapy administered**
	3	**Advance hospital notification for suspected stroke**
	4	**Identification of stroke in the field (via validated pre-hospital stroke screen)**
	5	**EMS response less than 9 minutes 90 percent of the time for suspected stroke**
	6	**Scene time less than 15 minutes for stroke**
	7	**100 percent of EMS providers min 2 hrs of stroke continuing-education per certification**
	8	**Use of transport destination protocols for stroke patients/transport to stroke center**
	9	**Code Stroke CT neuroimaging in patients being evaluated for code stroke symptoms**
AMI (n=11)	1	**Aspirin at arrival of AMI documented**
	2	**Aspirin given at arrival for AMI**
	3	**Primary PCI within 90 minutes of hospital arrival**
	4	**Median time to ECG for patients with chest pain**
	5	**Median time to transfer to another facility for acute coronary intervention**
	6	**12 lead ECG performed pre-hospital and interpreted or faxed for interpretation**
	7	**ECG to percutaneous coronary intervention (PCI) time within 90 minutes**
	8	**Advance hospital notification for acute myocardial infarction (AMI)**
	9	**Care coordination for PCI for AMI**
	10	**Scene time less than 15 minutes for AMI**
	11	**Transport to PCI center for AMI**
Cardiac Arrest (n=4)	1	**Percentage of out-of-hospital cardiac arrest (OHCA) receiving bystander cardiopulmonary resuscitation (CPR)**
	2	**Response interval < 5 minutes for CPR and automated external defibrillator (AED) for cardiac arrest**
	3	**EMS cardiac arrest: survival to emergency department discharge**
	4	**EMS cardiac arrest: survival to hospital discharge**
Pediatric (n=4)	1	**Under 1500-gram infant not delivered at appropriate level of care**
	2	**High-risk neonates transferred to neonatal centers**
	3	**Direct transport to pediatric trauma center for those pediatric patients meeting criteria**
	4	**Unplanned admission to neonatal intensive care unit at term**

The scan identified 28 projects involving REMCS. These projects are described and classified in Table A.3. The projects identified mapped to the domains of trauma (n=3), stroke

(n=3), AMI (n=3), cardiac arrest (n=2), and pediatrics (n=22). Fourteen of the projects crossed multiple domains. Often, these 14 were the projects that described or evaluated performance measures in the realm of REMCS from a system perspective.

There was not an obvious pattern regarding which projects crossed which domains. However, the projects that referenced multiple domains typically were EMS-based (i.e., out-of-hospital data collection or performance measurement for EMS systems). For example, the National EMS Assessment project references the domains of trauma, AMI, stroke, cardiac arrest, and pediatrics. Likely, EMS-based projects cross multiple domains because these projects focus on evaluating the system or provider (e.g., how well an EMS system works and responds as a whole) rather than on care of a particular disease. Projects that evaluated care or dealt with performance measurement from the perspective of the EMS system may have crossed multiple domains because the perspective taken is that of the system's response to calls for service, regardless of in which domain that service is.

Analysis

The measure analysis used three levels of analysis as previously described. The first level describes the characteristics of the 30 REMCS performance measures, including the variation between the measure's NQF pipeline status, use purpose, unit of analysis, and type, as shown in the Table 2, below.

Table 2. Measure Analysis Findings

REMCS Measures (N=30)	Trauma (n=2)	Stroke (n=9)	AMI (n=11)	Cardiac Arrest (n=4)	Critical Care Medicine (n=0)	Pediatric Specialty Care (n=4)	Toxicology (n=0)	Psychiatric Care (n=0)
Measure Status (pipeline)								
NQF Endorsed		2	5			1		
In Use	2	7	4	2		3		
Under Development			2	2				
Measure Use Purpose								
Payment		1	2					
Quality Assurance	2	8	7	2		4		
Unknown			2	2				
Measure Level of Analysis								
Physician		1						
EMS Agency	1	4	4			1		
Hospital		2	6					
System	1	2	1	4		3		
Measure Type		4						
Structure	1	4	3			2		
Process	1	5	8	1				
Outcome				3		2		

Measure (NQF Pipeline) Status: Eight measures are NQF endorsed (2 stroke measures, 5 AMI measures, and 1 pediatrics); 18 are in use at some level (2 trauma, 7 stroke measures, 4 AMI, 2 cardiac arrest, and 3 pediatrics); and 4 measures are under development (2 AMI measures and 2 cardiac arrest measures). For the measures that were not NQF endorsed, classifying measures by the previously defined NQF pipeline framework was challenging. Measures did not readily fit the pipeline continuum.[6] For example, while a majority of the proposed measures were in use in some way (e.g., for EMS agency quality assurance), there were no data to ensure meeting all of NQF's conditions for consideration, nor data to suggest that the measures had been tested. Thus, it appears that many of these measures had not been tested, which is a step of the NQF pipeline continuum that occurs before putting a measure in use.

Measure Use Purpose: Three measures are used for payment purposes (1 stroke, 2 AMI), and 23 are used for QA purposes (2 trauma measures, 8 stroke, 7 AMI, 2 cardiac arrest, and 4 pediatrics). For 4 measures (2 AMI and 2 cardiac arrest), the use purpose was unclear from the source data. Expert consensus among the author group concluded that the intended purpose of these four measures is likely for QA although classifying measures by use is difficult because many of them serve multiple purposes and may have different uses in different geographic areas or different networks of care. Almost by definition, a performance measure can be used for QA within an organization, as measuring and meeting the standard (or not) may identify an area of focus on quality improvement for the organization.

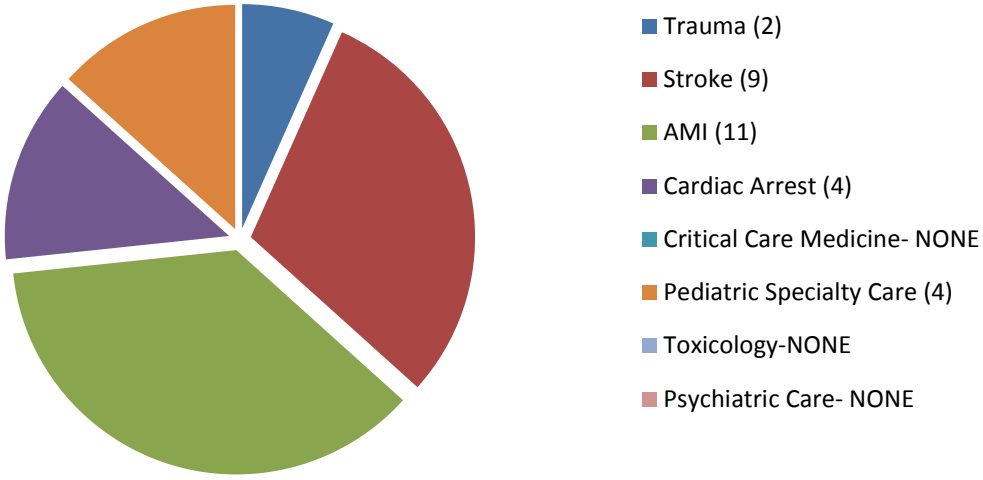
Measure Unit of Analysis: One measure evaluated physician decision making (for stroke); 10 evaluated the EMS agency (1 trauma, 4 stroke, 4 AMI, 1 pediatrics); eight evaluated the hospital (2 stroke measures and 6 AMI measures); and 11 evaluated care at the system level (1 trauma, 2 stroke, 1 AMI, 4 cardiac arrest, and 3 pediatrics). This suggests that the scan appropriately focused on care above the physician level (i.e., evaluating systems of care). The one measure (consideration of tissue plasminogen activator for stroke) that was a physician-level measure also relies on system-level information (i.e., EMS as well as in-hospital collaboration with other data and providers). The other 29 measures all evaluated care above the level of the individual physician.

Furthermore, these measures are not necessarily limited to evaluating only their designated unit in this scan. For example, while care coordination for percutaneous coronary intervention (PCI) for AMI is designated as a hospital-level measure, extending care coordination for PCI from the first contact with pre-hospital healthcare providers could serve to measure emergency care system performance for AMI.

Measure Type: Ten measures addressed structural measures (1 trauma, 4 stroke, 3 AMI, 2 pediatrics); 15 were process measures (1 trauma, 5 stroke, 8 AMI , 1 cardiac arrest); and 5 were outcome (intermediate and patient) measures (3 cardiac arrest and 2 pediatrics).

The second level of analysis categorized the measures by domain within regionalized emergency medical care (Figure 4). In doing so, a comparison across domains in terms of the relative development of performance measurement within a domain is provided. Also included in this analysis is discussion about the depth and breadth of the measures and their current measure status.

Figure 4: REMCS Measures by Domain



The scan identified 2 trauma measures, 9 stroke measures, 1 AMI measures, 4 cardiac arrest measures, and 4 measures of pediatric care (Figure 5). Domains that already have relatively developed systems of care in place (e.g., hospitals designated as "stroke centers" and "chest pain centers") also have the majority of identified performance measures. Twenty of the 30 measures are in the domains of stroke and AMI. Additionally, of the 30 total measures, there are clearly systems of care that are relatively more developed, as evidenced not only by the number of measures within a domain, but also by the level of development of those measures (i.e., 5 of the 8 total NQF-endorsed® measures are in the domain of AMI).

These findings indicate that within the domains of stroke and AMI, performance measurement is embraced and in use, while within the domains of trauma, cardiac arrest, critical care medicine, pediatrics, toxicology, and psychiatric care, there is an imperative need to foster the development and implementation of performance measurement efforts. This includes encouraging the development, testing, and consistent implementation of already existing measures. The gap analysis section will offer further exploration of this concept.

The third level of analysis provides a measure gap analysis by domain. In this analysis, gaps in REMCS measurement are discussed by examining both the quantity and the quality of identified performance measures. The gaps will refer to the previous two analyses and by domain discuss the measure characteristics, such as measure status (along the NQF pipeline), use purpose, unit of analysis, and type.

The eight REMCS domains are trauma, stroke, AMI, cardiac arrest, critical care, pediatrics, toxicology, and psychiatric care. The results indicate that endorsed, under-development, and in-use measures are not distributed equally among these domains. While some domains may have a reasonable proportion of identified measures, these measures may be in the very early stages of development.

Many of the identified measures evaluate relatively narrow aspects of care (e.g., time to a procedure or time on a scene). One of the goals of this scan was to focus on care at the system

level. It seems clear that most of the measures existing within each domain tend to measure pieces of a system rather than the system as a whole. There were only 11 measures that had "system" as a unit of analysis, and only one of those is NQF-endorsed (Under 1500-gram infant not delivered at appropriate level of care). Others are in use, but, as discussed above, they are not necessarily tested rigorously or in use in the same manner across the country, or at least no data from this scan exist to indicate level of testing or testing procedures. For example, all of the system measures in use are used for QA purposes. Anecdotal evidence and discussion with experts indicates these QA methods, purposes, and plans may vary greatly across jurisdictions, states, and regions. Because a measure is used for QA does not mean that it utilizes standard data collection methods, subject to uniform analysis or impact management across systems of emergency care.

In general, coordination of these systems of care is a major overall gap in REMCS. Future efforts at measure development should focus on how to measure care truly at the system level. The first steps may be to develop composite measures evaluating several pieces of the system in an attempt to measure the whole system, or to identify or create measures that do in fact evaluate care of an entire system. These topics should be considered as each domain is reviewed.

1. **Trauma** (includes burn care and other acute or critical surgical care)—Two of 30 measures are within this domain. These two are in use but are not NQF endorsed, and no measures under development were identified. Both measures are used for QA efforts. One is a system-level measure, and the other an EMS agency-level measure. Neither was an outcome measure, with one being classified as a structural measure and one a process measure. Despite "trauma" regionalization having historical status as a model of a system of care, very few performance measures exist to measure this domain, at least from a system standpoint. While destination and scene time measures are well defined, they are early in the development process. Furthermore, trauma measures currently are limited to structure and process measures. Just because measures are in place to ensure trauma patients have a timely arrival at a specific destination does not necessarily mean they have received quality care. Patient-oriented outcome measures, and measures ensuring that time-dependent processes of trauma care are applied across regions and populations, are needed.

2. **Stroke**—Nine of 30 measures are within this domain. Two are NQF endorsed, seven are in use but not NQF endorsed, and no measures under development were identified. Eight of the nine measures are used for QA efforts, with one measure used for payment. Two are system-level measures, two measure hospital-level of care, four are EMS agency level measures, and the only physician level measure is in this domain. None is an outcome measure, with four being classified as structural measures and five as process measures. Endorsed measures essentially evaluate emergency department-based care. The pre-hospital components of regionalized stroke care are reasonably well defined but also are early in the development process. As with trauma, future measure development should examine how to evaluate the system as a whole, rather than just pieces of the system. Given the exquisite time sensitivity of treatment for stroke (tPA), measures addressing patient care from the time of symptom onset to definitive treatment are needed.

3. **Acute Myocardial Infarction**—Eleven of 30 measures fall within this domain. Five are NQF endorsed, four are in use but not NQF endorsed, and two are under development. Seven measures are used for QA efforts, two are used for payment, and the use was unknown for two measures (these likely are QA). One is a system-level measure, six measure hospital-level care, and four are EMS agency-level measures. None is an outcome measure, with three being classified as a structural measure and eight as process measures. AMI measures are relatively well developed, including the few that attempt to measure system-level care. Again, the pre-hospital components of care are reasonably well defined but early in the development process. Additional integration of AMI care across settings is needed. Given the exquisite time sensitivity of treatment for AMI (PCI), measures are needed to address patient care from the time of symptom onset to definitive treatment.

4. **Cardiac Arrest**—Four of 30 measures fall within this domain. Two are in use but not NQF endorsed, and two measures under development were identified. Two measures are used for QA efforts, and the other two have unknown uses, though their use likely is for QA efforts per expert consensus. All four can be used as system-level measures. Three are outcome measures and one a process measure. In particular, out-of-hospital cardiac arrest inherently is a difficult disease to measure. While many time-sensitive interventions (such as early defibrillation or hypothermia) are known to improve outcomes or save lives, these are often not yet consensus-based or widely accepted enough to be suggested as performance measures. Notably, this domain yielded three of the five outcome measures, and all four cardiac arrest measures had "system" as the unit of analysis. The alternative consideration to cardiac arrest care is that while individual components may be difficult to measure across care settings, the outcome is relatively simple: Patients either die or survive with some level of function. These reasons are probably why all four identified cardiac arrest measures are system-level measures: If the pieces of care are difficult to separate and measure, only the overall outcome remains. Thus, cardiac arrest care measures may represent the best current example of evaluating the emergency care system as a whole.

5. **Critical Care** (including sepsis)—No performance measures of regionalized emergency medical care services were identified within this domain. Defining performance measures as well as goals of regionalization are the current focuses of this domain. Similar to cardiac arrest, while many time-sensitive interventions are pieces of this care (early goal-directed therapy) and are individually known to improve outcomes, these are often not yet consensus-based or widely accepted enough to be suggested as performance measures.

6. **Pediatric specialty care** (includes neonatal care)—Four of 30 measures are within this domain. Three of these are in use but not NQF endorsed, and one is NQF endorsed. No measures under development were identified. All four measures are used for QA efforts. Three are system-level measures, and the other is an EMS agency-level measure. Two are outcome measures, with the other two being classified as structural measures. This domain is similar to trauma in that some components of pediatric care have been regionalized over the past 30 years. Nonetheless, performance measure development in

this domain has been essentially limited to whether or not neonates and trauma patients are transported to specialty centers. Also similar to trauma, future efforts at measure development should evaluate the quality of that care in time-sensitive, life-threatening conditions.

7. **Toxicology** (includes poison control networks)—No REMCS measures were identified within this domain. While patients may require time-sensitive evaluation and specific therapies (antidotes) for toxicologic emergencies, they are potentially "universally available" given the robust poison control telephone network. Efforts at measure development are needed to establish appropriate structural, process, and outcome measures to better coordinate toxicology care across the diverse range of regional and state services.

8. **Psychiatric care**—No REMCS measures were identified within this domain. While patients may require time-sensitive evaluation and therapies for psychiatric emergencies, the emergent stabilization of such patients typically is considered universally available. The recognized problems regarding ultimate psychiatric patient hospitalization and outpatient disposition are not emergent and are considered outside the scope of REMCS for this environmental scan. Nonetheless, emergency care systems often are the point of entry to healthcare for psychiatric patients and may relate to regionalization in terms of the geography of psychiatric specialists and hospitals. A particular area of focus could be in the area of geriatric psychiatry, where the differentiation between time-sensitive medical conditions (delirium) and behavioral disorders may be difficult to make. Future measure development should begin with structure measures to ensure that protocols are in place to receive, stabilize, and then appropriately hospitalize, discharge, or transfer these patients.

DISCUSSION

Considerations

As evidenced by the review of the literature, NQF's measure resources (e.g., the OPUS database), and these results, the majority of performance measures in use do not directly evaluate emergency systems of care, much less regionalized systems of emergency medical care services. Nonetheless, evaluating the systems of emergency care is critical to healthcare in the United States.[1, 2, 4] Thus, an important step in this evaluation process will be the development of standard performance measures, with adequate reliability and validity testing, and their consistent implementation and use.

The results indicate there is a paucity of performance measures in use in REMCS. Many sources described facets of care or steps in care processes but did not denote them as performance measures. Additionally, many sources discussed regionalization concepts without proposing actual measures. Finally, a major gap in performance measures for REMCS is the idea of evaluating the system as a whole—not just its pieces.

Along these lines, it is notable that outcome measures are not yet a major part of REMCS. Importantly, there are relatively easy opportunities to define universally recognized important outcomes in emergency care (i.e., birth, life, death), especially in conditions such as cardiac arrest. This dearth of outcome measures likely represents the relative infancy of measuring outcomes at the system level of regionalized emergency medical care. For a system to be measured by outcomes, all of the stakeholders and parts of a system must collaborate at a high degree. That level of agreement and collaboration may not yet exist in REMCS.

Primarily, there is a need for a greater number of performance measures for REMCS. As measures are created and identified within systems, measure developers can take the secondary step of ensuring measure ownership and stewardship. When "standards" or performance measures are described, often no one organization or group "owns" the measure. Thus, while ownership of a measure does not ensure its standard implementation, without ownership the likelihood of measure use in slightly different iterations by different organizations is high. For performance measures of REMCS to develop further, national organizations and federal and state regulatory bodies may need to take charge and "own" a given measure and its development. For example, the National Association of State EMS Officials (NASEMSO) suggests that state offices of EMS might be appropriate for oversight and coordination of EMS regionalization efforts.[44] Measure stewardship and ownership can facilitate a central place for measure users to go for questions and instructions and a source for updates and measure maintenance. Measure stewards also should serve to shepherd a measure through the rigorous consensus development process with the end result of NQF endorsement as a voluntary consensus standard.

Limitations

The environmental scan of regionalized emergency medical services may have been limited due to the nature of the search process. First, some degree of specificity and reliability may have suffered due to the necessary breadth of the search for appropriate performance metrics and projects. The authors were tasked with identifying and cataloguing measures and projects of REMCS. Within this broad area of healthcare, they looked for a diverse group of entities. For example, measures and their descriptions took many forms and were available in many formats. Specifically, some measures were extracted from the text of relatively narrow research studies, some were extracted from published works specific to measure development, and some were pulled directly from a database of measures without accompanying context. In addition, descriptions of projects often were pulled from various sources and relied in no small part on known content experts in the field.

In addition, to ensure a comprehensive search, two types of searches were conducted. Measures and projects were searched directly from databases and lists and indirectly from "sources" (i.e., primary research projects and literature reviews), which were searched for measure and project identifications and descriptions. Because of the search's complexity, some measures and projects that some may not consider evaluative of REMCS may be included. For example, some of the projects include topics dealing with both regionalized medicine and non-

regionalized medicine, and some contain lists of measures including those of regionalized emergency medical care services and others.

Further, the search was not a simple extraction of the existing medical literature and included a review of conceptual and unpublished reports. Thus, replicating, or limiting, the reliability of the scan may be difficult given that the definitions of emergency care "regions," "systems," and "networks" remain under development.[2-4] The relative infancy of the idea of REMCS limits the depth of current widely accepted policy in this sector of healthcare and therefore makes a replicable search for measures and projects difficult. Nonetheless, the five search strategies used for this scan were both diverse and targeted to known and accepted sources for healthcare information, and they served to complete a comprehensive search for measures and projects of REMCS.

Another limitation of the scan specifically regards the measures identified for REMCS. Despite some measures (8 of 30) being NQF endorsed, and therefore standards of known content, most measures were not NQF endorsed. The implications of this fact are that the measures were not necessarily described similarly, and their sources may have had different levels of information available. For example, some measures explicitly described their status, intended use, or type or unit of analysis, while this information may have been sparse or lacking completely for other measures. In an effort to be comprehensive and include all available information, misclassification for some measure elements, depending on how a measure is used in a particular system, may have occurred. For example, some institutions or jurisdictions may use a measure for QA purposes, while others may use the same measure for a different purpose or not at all. Further, some measures may be in use for a given institution or agency and only under development in others. The level or methods of testing rarely were available, as per the NQF pipeline continuum. For these reasons, the scan is limited in terms of the validity of the measure descriptions for non-endorsed measures. Nonetheless, the environmental scan did serve to identify measures at various levels of development or implementation. This information is important to informing the next phases of the overall regionalized emergency medical care project.

CONCLUSIONS

Relatively few performance measures exist in the area of REMCS. Of those that do exist, NQF has endorsed the most well-developed as voluntary consensus standards. The remaining identified measures in this area are early in the development or implementation process. Future measurement efforts should focus on:

1. creating identifying measures of REMCS that focus on time-sensitive, high-acuity or life-threatening care;
2. identifying measures that evaluate systems of care; and
3. identifying measure owners and stewards to facilitate rigorous measure development and testing with an intentional process to ensure rigor and standardization of measures for implementation (i.e., NQF's consensus development process).

These three efforts will improve the breadth and depth of measurement of healthcare service delivery in the area of REMCS. Employing new measures that evaluate systems will enhance care coordination and introduce shared accountability for the quality of healthcare delivered. In addition, identifying and implementing measures will establish a standard for healthcare quality in REMCS.

Leading healthcare organizations have recognized the importance of REMCS measure development, as demonstrated by the many ongoing projects in this area. This analysis suggests there are many measures that have been proposed by various organizations and projects; it is possible these projects will serve to develop such measures into consensus standards.

This environmental scan provides a comprehensive identification and basic analysis of currently identified measures and projects of REMCS. The measures analyzed represent the spectrum of domains, purposes, and levels of development or implementation that exists in this area of healthcare. This scan contributes to the larger project of REMCS performance measurement by identifying current measures and their characteristics, as well as gaps in both breadth and depth of performance measurement. Future phases of the project will benefit by using the information in this scan to inform a measurement framework and potentially lead to future measure endorsement efforts in the area of regionalized emergency medical services.

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APPENDIX A: PROJECT AND MEASURE DESCRIPTION EXPANDED TABLES

Table A.1. Unique Measures Identified

		Reasons for Exclusion					
Measure Title	**Included**	**Excluded**	**Not time sensitive**	**Not acute, life threatening**	**No in-hospital component**	**No out-of-hospital component**	**Universally available**
12 lead ECG performed pre-hospital and interpreted or faxed for interpretation	**1**						
Acute otitis externa: pain assessment		1		1			1
Administration of a beta agonist for asthma		1			1		1
Administrative communication		1		1			1
Admit decision time to ED departure time for admitted patients		1				1	
Adult(s) with community-acquired bacterial pneumonia that had a CXR		1				1	1
Advance hospital notification for myocardial infarction	**1**						
Advance hospital notification for suspected stroke	**1**						
All EMS providers receive minimum 2 hours of stroke education per certification period	**1**						
Annual turnover rate		1	1		1		1
Antibiotics for sinusitis		1	1	1			
Anticoagulation for acute pulmonary embolus patients		1				1	1
Appropriate antibiotics for community-acquired bacterial pneumonia (CAP)		1					1
Appropriate cervical spine radiography and CT imaging in trauma		1				1	
Appropriate head CT imaging in adults with mild traumatic brain injury		1		1		1	
Appropriate testing for children with pharyngitis		1					1
Appropriate treatment for children with upper respiratory infection (URI)		1	1				1
Aspirin at arrival of AMI documented	**1**						
Aspirin given at arrival for acute myocardial infarction (AMI)	**1**						
Assessment mental status for community-acquired bacterial pneumonia		1					1
Assessment of oxygen saturation for community-acquired bacterial pneumonia		1					1
Assessment to reduce testing in healthy patients with chest pain or shortness of breath		1				1	1
Average time to defibrillation		1			1		1
Average time to rhythm analysis		1			1		1
Avoid antihistamines with anticholinergic properties in the elderly		1					1
Benzodiazepine use for status epilepticus		1			1		1
Beta blocker at arrival for AMI		1					1
BiPAP preferred over endotracheal intubation for pulmonary edema		1					1
Blood administration documentation		1					1
Blood cultures for patients transferred to the ICU		1				1	
Blood cultures performed in the ED prior to initial antibiotic received in hospital		1				1	1
Blood glucose measurement in seizure patients		1			1		1
Call complaint distribution		1	1		1		1
Care coordination for percutaneous coronary intervention	**1**						
Central line bundle compliance		1				1	
Central line catheter-associated blood stream infection rate for ICU and high-risk nursery		1				1	
Central venous catheter-related bloodstream infections (adult)		1				1	
Central venous catheter-related bloodstream infections (pediatric)		1				1	
Code stroke neuroimaging in patients with stroke symptoms	**1**						
Confirmation of endotracheal tube placement		1					1

COPD: inhaled bronchodilator therapy		1				1	
COPD: spirometry evaluation		1				1	
Corticosteroid use in patients hospitalized with acute bronchiolitis		1				1	
Delay causing crash rate per 1000 EMS responses		1			1		1
Direct transport to pediatric trauma center for those pediatric patients meeting criteria	**1**						
Direct transport to trauma center for those meeting criteria	**1**						
Door to diagnostic evaluation by a qualified medical personnel		1				1	
Drugs to be avoided in the elderly		1					1
DSC STROKE-7: dysphagia screening		1					1
ED length of stay		1				1	
ECG for non-cardiac chest pain		1				1	1
ECG in the ED for atrial fibrillation		1				1	1
ECG in the ED for non-traumatic chest pain		1				1	1
ECG to PCI time within 90 minutes	**1**						
ECG performed for syncope		1					1
EMD impact on response level		1			1		1
EMD impact on response mode		1			1		1
EMD type		1	1		1		1
Empiric antibiotic for community-acquired bacterial pneumonia		1					1
Empiric antibiotics for community acquired pneumonia		1					1
EMS call complaint rate		1	1		1		1
EMS cardiac arrest survival to ED discharge	**1**						
EMS cardiac arrest survival to hospital discharge	**1**						
EMS crash death rate per 100,000 fleet miles		1			1		1
EMS crash injury rate per 100, 000 fleet miles		1			1		1
EMS crash rate per 100,000 fleet miles		1			1		1
EMS pain relief rate		1			1		1
EMS pain unchanged rate		1			1		1
EMS pain worsening rate		1			1		1
EMS response less than 9 minutes 90 percent of the time for suspected stroke	**1**						
Fibrinolytic therapy received within 30 minutes of ED arrival		1					1
Frequent return to emergency room for similar condition		1	1	1		1	1
Gastroenteritis admission rate (pediatric)		1				1	
High risk neonates transferred to neonatal centers	**1**						
Iatrogenic pneumothorax (PSI 6) (risk adjusted)		1				1	
Iatrogenic pneumothorax in non-neonates (PDI 5) (risk adjusted)		1				1	
Identification of stroke in the field	**1**						
Inappropriate antibiotic treatment for adults with acute bronchitis		1		1			
Initial antibiotic received within 6 hours of hospital arrival		1				1	1
LBP: advice against bedrest		1	1		1		1
LBP: advice for normal activities		1	1		1		1
LBP: patient education		1	1		1		1
LBP: recommendations for exercise		1	1		1		1
LBP: repeat imaging studies		1	1		1		1
LBP: shared decision making		1	1		1		1
Left without being seen		1				1	
Mean emergency response interval		1			1		1

Mean emergency scene interval		1			1		1
Mean emergency transport interval		1			1		1
Median time from ED arrival to ED departure for admitted ED patients		1				1	
Median time from ED arrival to ED departure for discharged ED patients		1				1	
Median time to BMP or electrolyte results		1				1	1
Median time to CBC results		1				1	1
Median time to chest x-ray		1				1	1
Median time to ECG for patients with chest pain	**1**						
Median time to fibrinolysis for AMI		1					1
Median time to pain management for long bone fracture		1				1	
Median time to transfer to another facility for acute coronary intervention	**1**						
Medication information		1		1			1
Ninetieth percentile emergency response interval		1			1		1
Ninetieth percentile emergency scene interval		1			1		1
Ninetieth percentile emergency transport interval		1			1		1
Ninetieth percentile time to defibrillation		1			1		1
Ninetieth percentile time to rhythm analysis		1			1		1
Nitroglycerin for pulmonary edema		1					1
No systemic antibiotics for acute otitis externa		1	1	1			1
Nursing information		1		1			1
NYU ED algorithm		1				1	
Otitis media with effusion: antihistamines or decongestants—avoidance of inappropriate use		1					1
Otitis media with effusion: diagnostic evaluation—assessment of tympanic membrane mobility		1					1
Otitis media with effusion: systemic antimicrobials—avoidance of inappropriate use		1					1
Otitis media with effusion: systemic corticosteroids —avoidance of inappropriate use		1					1
Patient care satisfaction survey rate		1	1	1	1		1
Patient care survey rate		1	1	1	1		1
Patient Information		1		1			1
Patient left before being seen		1				1	
Pediatric pain assessment, intervention, and reassessment		1					1
Pediatric weight documented in kilograms		1					1
Per capita EMS agency operating expense		1	1		1		1
Percentage of EMS patients who receive a pain control intervention		1			1		1
Percentage of out of hospital cardiac arrest receiving bystander CPR	**1**						
Percentage of patients undergoing c-spine radiographs in trauma who meet exclusion criteria		1					1
Percentage of patients undergoing CT for PE who have a modified Well's score of = 4		1				1	1
Percentage of patients with AMI receiving thrombolytics within 30 mins		1					1
Pharmacologic management of migraine headaches		1					1
Physician information		1		1			1
Plasma transfusion indication		1				1	1
Platelet transfusion indication		1				1	1
Pregnancy test for female abdominal pain patients		1					1

Primary PCI within 90 minutes of hospital arrival	**1**						
Procedures and tests		1		1			1
Pulmonary CT imaging for patients at low risk for pulmonary embolism		1				1	1
Rate of appropriate oxygen use		1			1		1
Rate of undetected endotracheal esophageal intubation rate		1			1		1
RBC transfusion indication		1				1	1
Response interval less than 5 minutes for CPR and AED for cardiac arrest	**1**						
Rh immunoglobulin for Rh neg pregnant women at risk of fetal blood exposure		1				1	
Scene time less than 10 minutes for trauma (non-entrapment)	**1**						
Scene time less than 15 minutes for AMI	**1**						
Scene time less than 15 minutes for suspected stroke	**1**						
Screening for clinical depression		1					1
Severe sepsis and septic shock: management bundle		1				1	
Thrombolytic therapy administered for stroke	**1**						
Tissue plasminogen activator (t-PA) considered for suspected stroke	**1**						
Transfusion consent		1					1
Transfusion reaction (PDI 13)		1				1	
Transfusion reaction (PSI 16)		1				1	
Transport to PCI center for AMI	**1**						
Treatment of community acquired pneumonia		1					1
Troponin results for ED chest pain patients within 60 minutes of arrival		1				1	1
Ultrasound determination of pregnancy location for pregnant patients with abdominal pain		1				1	
Ultrasound guidance for internal jugular central venous catheter placement		1				1	
Under 1500g infant not delivered at appropriate level of care	**1**						
Unplanned admission to neonatal intensive care unit at term	**1**						
Urinary tract infection admission rate (pediatric)		1				1	
Use of brain CT in the ED for atraumatic headache		1				1	1
Use of transport destination protocols for stroke patients	**1**						
Ventilator bundle		1				1	1
Vital signs		1		1			1
VTE patients with heparin monitoring by protocol		1					1
Work up of community acquired pneumonia		1					1
X-Ray prior to MRI in the evaluation of low back pain		1				1	
X-Ray prior to MRI of the knee		1					1
Totals	**30**	**133**	**17**	**15**	**38**	**50**	**101**

TableA.2. Existing and Pipeline Measures for Regionalized Emergency Medical Care Services

Measure ID	Title	Domain	Description	Meas Status	Numerator	Denominator	Exclusion	Measure Steward	Level of Reporting	Data Source	Use	Unit of Analysis	Measure Type
new-TRMA-1	**Scene time less than 10 minutes for trauma (non entrapment)**	TRAUMA	Percentage of non-entrapped trauma patients who meet trauma center criteria who have an EMS scene time less than 10 minutes	IU	Number of non-entrapped trauma patients who meet trauma center criteria who have an EMS scene time less than 10 minutes	All non-entrapped trauma patients transported by EMS		None- ? State EMS	State	Admin	QA	EMS	P
new-TRMA-2	**Direct transport to trauma center for those meeting criteria**	TRAUMA	Percentage of trauma patients who meet trauma center criteria who are transported directly to a trauma center	IU	Number of trauma patients who meet trauma center criteria who are transported directly to a trauma center	All trauma patients transported by EMS in a given region or system		None- ? State EMS	State	Hybrid	QA	System	S
242	**Tissue plasminogen activator (t-PA) considered**	STROKE	Percentage of patients aged 18 years and older with the diagnosis of ischemic stroke whose time from symptom onset to arrival is less than 3 hours who were considered for t-PA administration (given t-PA or documented reasons for patient not being a candidate for therapy).	E	Patients who were considered for t-PA administration (given t-PA or documented reasons for patient not being a candidate for therapy) Definition: For purposes of this measure, patients considered for t-PA administration includes patients to whom t-PA was given or patients for whom reasons for not being a candidate for t-PA therapy are documented.	All patients aged 18 years and older with the diagnosis of ischemic stroke whose time from symptom onset to arrival is less than 3 hours.ICD9 diagnosis codes, CPT E/M service codes, CPT Category II codes, and patient demographics (age, gender, etc) are used to determine patients that are included in the measure. ICD-9-CM Codes: 433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.11, 434.91. 997.02 AND *CPT II 1065F: Ischemic stroke symptom onset of less than 3 hours prior to arrival;		American Medical Association - Physician Consortium for Performance Improvement	National	Clinical	Pay	Physician	P

						1066F: Ischemic stroke symptom onset of greater than or equal to 3 hours prior to arrival AND CPT E/M service codes: 99218, 99219, 99220 (initial observation care), OR 99281, 99282, 99283, 99284, 99285 (emergency department), OR 99221, 99222, 99223 (initial inpatient), 99251, 99252, 99253, 99254, 99255, 99291								
437	**Thrombolytic therapy administered**	STROKE	Acute ischemic stroke patients who arrive at the hospital within 120 minutes (2 hours) of time last known well and for whom IV t-PA was initiated at this hospital within 180 minutes (3 hours) of time last known well.	E	The number of patients for whom IV thrombolytic therapy was initiated at this hospital within 3 hours (= 180 minutes) of time last known well.	All patients with acute ischemic stroke whose time of arrival is within 2 hours (120 minutes) of time last known well.	Patients admitted for the performance of elective carotid endarterectomy * Time last known well to arrival in the emergency department greater than (>) 2 hours or unknown	The Joint Commission	National	Clinical	QA	Hospital	P
new-STRK-1	**Advance hospital notification for suspected stroke**	STROKE	Percentage of stroke patients who arrive by EMS in which the hospital was notified prior to EMS arrival	IU	Number of stroke patients arriving by EMS in which the hospital was notified prior to arrival	All stroke patients arriving by EMS		None	None formalized	Admin	QA	EMS	S

new-STRK-2	**Identification of stroke in the field (LAPSS or Cincinnati PSS)**	STROKE	Percentage of suspected stroke patients who have a prehospital stroke screen documented	IU	Number of suspected stroke patients who have a prehospital stroke screen documented	All stroke patients arriving by EMS		None- ? State EMS	State	Clinical	QA	EMS	P
new-STRK-3	**EMS response less than 9 minutes 90 percent of the time for suspected stroke**	STROKE	Percentage of suspected stroke patients who have an EMS response less than 9 minutes 90 percent of the time	IU	Number of suspected stroke patients who have an EMS response less than 9 minutes 90 percent of the time	All stroke patients arriving by EMS		AHA/ASA	None formalized	Admin	QA	EMS	P
new-STRK-4	**Scene time less than 15 minutes for stroke**	STROKE	Percentage of suspected stroke patients who have an EMS scene time less than 15 minutes	IU	Number of suspected stroke patients who have an EMS scene time less than 15 minutes	All stroke patients arriving by EMS		AHA/ASA	None formalized	Hybrid	QA	EMS	P
new-STRK-5	**100 percent of EMS providers min 2 hrs of stroke con-ed per certification**	STROKE	Percentage of EMS providers who have a minimum of 2 hours of stroke continuing education per certification period	IU	Number of EMS providers who have a minimum of 2 hours of stroke continuing education per certification period	All EMS providers in a given jurisdiction		AHA/ASA	State	Admin	QA	System	S
new-STRK-6	**Use of transport destination protocols for stroke patients/transport to stroke center**	STROKE	Percentage of suspected stroke patients transported to a stroke center	IU	Number of suspected stroke patients transported to a stroke center	All stroke patients arriving by EMS		AHA/ASA	State	Hybrid	QA	System	S
XOIE-014-0	**Code Stroke CT neuroimaging in patients being evaluated for code stroke symptoms**	STROKE	Recommendations for CT laboratories to conform to published acute stroke guidelines	IU	Number of code stroke CT neuroimaging done yearly for acute stroke patients from the CT laboratory that complied with recommended guidelines.	Total number of code stroke CT neuroimaging for acute stroke patients from the CT laboratory yearly.	Exclusion of CT neuroimaging done for non-code stroke reasons.	Intersocietal Accreditation Commission			QA	hospital	S

92	**Aspirin at Arrival of AMI**	AMI	Percentage of patients with an emergency department discharge diagnosis of AMI who had documentation of receiving aspirin within 24 hours before emergency department arrival or during emergency department stay	E	Patients who had documentation of receiving aspirin within 24 hours before emergency department arrival or during emergency department stay	All patients with an emergency department discharge diagnosis of acute myocardial infarction	Exclude patients for whom aspirin was not received or taken within 24 hours before emergency department arrival or during emergency department stay by reason of appropriate denominator exclusion	American Medical Association - Physician Consortium for Performance Improvement	National	Clinical	Pay	Hospital	P
132 and 286	**Aspirin at arrival for acute myocardial infarction (AMI)**	AMI	Percentage of acute myocardial infarction (AMI) patients without aspirin contraindications who received aspirin within 24 hours before or after hospital arrival	E	AMI patients who received aspirin within 24 hours before or after hospital arrival	AMI patients without aspirin contraindications (International Classification of Diseases, 9th revision, Clinical Modification [ICD-9-CM] principal diagnosis code of AMI: 410.01, 410.11, 410.21, 410.31, 410.41, 410.51, 410.61, 410.71, 410.81, 410.91)	Exclusions: *18 years of age *Transferred to another acute care hospital or federal hospital on day of or day after arrival *Received in transfer from another hospital, including another emergency department *Discharged on day of arrival *Expired on day of or day after arrival *Left against medical advice on day of or	Centers for Medicare & Medicaid Services	National	Clinical	Pay	Hospital	P

							day after arrival *Patients with comfort measures only documented by a physician, nurse practitioner, or physician assistant One or more of the following aspirin contraindications/reasons for not prescribing aspirin documented in the medical record: *Active bleeding on arrival or within 24 hours after arrival; *Aspirin allergy; *Warfarin/ Coumadin as pre-arrival medication; or *Other reasons documented by physician, nurse practitioner, or physician assistant for not giving aspirin within 24						

							hours before or after hospital arrival						
163	**Primary PCI within 90 minutes of hospital arrival**	AMI	Percentage of acute myocardial infarction (AMI) patients receiving percutaneous coronary intervention (PCI) during the hospital stay with a time from hospital arrival to PCI of 90 minutes or less	E	AMI patients whose time from hospital arrival to percutaneous coronary intervention (PCI) is 90 minutes or less.	Principal discharge diagnosis of AMI (International Classification of Diseases, 9th revision, Clinical Modification [ICD-9-CM] principal diagnosis code of AMI: 410.01, 410.11, 410.21, 410.31, 410.41, 410.51, 410.61, 410.71, 410.81, 410.91 and PCI: 00.66); and ST segment elevation or left bundle block (LBB) on the ECG performed closest to hospital arrival; and PCI performed within 24 hours after hospital arrival.	Exclusions: Pts<18 years of age *Received in transfer from another acute care hospital, including another emergency department *Patients with comfort measures only documented by a physician, nurse practitioner, or physician assistant *Patient administered fibrinolytic therapy *PCI described as non-primary by physician, nurse practitioner, or physician assistant *Patients who did not receive PCI within 90 minutes and had a reason for delay documente	Centers for Medicare & Medicaid Services	National	Hybrid	QA	Hospital	P

							d by a physician, nurse practitioner, or physician assistant (e.g., social, religious, initial concern or refusal)						
289	**Median to ECG**	AMI	Median time from emergency department arrival to ECG (performed in the ED prior to transfer) for acute myocardial infarction (AMI) or chest pain patients (with probable cardiac chest pain).	E	Continuous Variable Statement: Time (in minutes) from emergency department arrival to ECG (performed in the ED prior to transfer) for acute myocardial infarction (AMI) or chest pain patients (with probable cardiac chest pain)	Continuous Variable Statement: Time (in minutes) from emergency department arrival to ECG (performed in the ED prior to transfer) for acute myocardial infarction (AMI) or chest pain patients (with probable cardiac chest pain)	Patients < 18 years	Centers for Medicare & Medicaid Services	National	Hybrid	QA	Hospital	P
290	**Median time to transfer to another facility for acute coronary intervention**	AMI	Median time from emergency department arrival to time of transfer to another facility for acute coronary intervention.	E	Continuous variable statement: time (in minutes) from emergency department arrival to transfer to another facility for acute coronary intervention Included Populations: *ICD-9-CM Principal Diagnosis Code for AMI as defined in Appendix A, OP Table 6.1, and *E/M Code for emergency department encounter as defined in Appendix A, OP Table 1.0a, and *Patients discharged/transferred to a short-term general hospital for inpatient care, to a	Time (in minutes) from emergency department arrival to transfer to another facility for acute coronary intervention.	Patients less than 18 years of AG, patients receiving fibrinolytic administration as defined in the data dictionary	Centers for Medicare & Medicaid Services	National	Hybrid	QA	Hospital	P

					federal healthcare facility, or to a critical access hospital, and *Patients not receiving Fibrinolytic Administration as defined in the Data Dictionary, and *Patients with transfer for acute coronary intervention as defined in the Data Dictionary								
new-AMI-1	**12 lead ECG performed pre-hospital and interpreted or faxed for interpretation**	AMI	Percentage of chest pain patients or patients suspected of having an AMI who have a 12 lead ECG performed by EMS	IU	Chest pain or suspected AMI patients with an ECG	All chest pain or AMI patients		None- ? State EMS	State	Clinical	QA	EMS	P
new-AMI-2	**ECG to PCI time within 90 minutes**	AMI	Percentage of AMI patients who receive PCI within 90 minutes of diagnosis by first ECG	UD	Number of AMI patients who receive PCI within 90 minutes of first ECG	All AMI patients	Patients who meet exclusion criteria for PCI	None	None formalized	Hybrid	None	System	P
new-AMI-3	**Advance hospital notification for myocardial infarction**	AMI	Percentage of AMI patients who arrive by EMS in which the hospital was notified prior to EMS arrival	UD	Number of AMI patients arriving by EMS in which the hospital was notified prior to arrival	All AMI patients arriving by EMS		None	None formalized	Admin	None	EMS	S
new-AMI-4	**Care coordination for PCI for AMI**	AMI	Percentage of patients with ED diagnosis of STEMI by ECG who received PCI who had documentation that the ED physician initiated communication with cardiology within 10 minutes of diagnosis of STEMI	IU	patients with documentation that the ED physician initiated communication with cardiology service within 10 minutes of the diagnostic ECG	All patients with ED diagnosis of STEMI who received primary PCI		ACEP Physician Consortium for Performance Improvement/ National Committee for Quality Assurance	None formalized	Hybrid	QA	Hospital	S

new-AMI-5	**Scene time less than 15 minutes for AMI**	AMI	Percentage of patients with suspected or confirmed AMI who had an EMS scene time of less than 15 minutes	IU	Number of patients with confirmed or suspected AMI who had an EMS scene time of less than 15 minutes	All EMS patients with confirmed or suspected AMI		None- ? State EMS	State	Admin	QA	EMS	P
new-AMI-6	**Transport to PCI center for AMI**	AMI	Percentage of patients with confirmed or suspected AMI that are transported primarily to a PCI center	IU	Number of patients with confirmed or suspected AMI who were transported to a PCI center	All EMS patients with confirmed or suspected AMI		None- ? State EMS	State	Hybrid	QA	EMS	S
new-CA-1	**Percentage of OHCA receiving bystander CPR**	CARDIAC ARREST	Percentage of patients in cardiac arrest who received bystander CPR	UD	Number of patients in cardiac arrest who received bystander CPR	All patients with out of hospital cardiac arrest		None	None formalized	Hybrid	None	System	O
new-CA-2	**Response interval < 5 minutes for CPRand AED for cardiac arrest**	CARDIAC ARREST	Percentage of patients with out of hospital cardiac arrest who received bystander CPR and AED placement within 5 minutes of arrest recognition	UD	Number of patients with out of hospital cardiac arrest who received bystander CPR and AED placement within 5 minutes of arrest recognition	All patients with out of hospital cardiac arrest		None	None formalized	Hybrid	None	System	P
new-CA-3	**EMS cardiac arrest: Survival to ED discharge**	CARDIAC ARREST	Percentage of patients experiencing cardiac arrest after EMS arrival that survive to discharge from the emergency department	IU	Number of patients with out of hospital cardiac arrest after EMS arrival who survived to hospital admission	All patients with out of hospital cardiac arrest after EMS arrival		None- ? State EMS	None formalized	Hybrid	QA	System	O

new-CA-4	**EMS cardiac arrest: survival to hospital discharge**	CARDIAC ARREST	Percentage of patients experiencing cardiac arrest after EMS arrival that survive to discharge from the hospital	IU	Number of patients with out of hospital cardiac arrest after EMS arrival who survived to hospital discharge	All patients with out of hospital cardiac arrest after EMS arrival		None- ? State EMS	None formalized	Hybrid	QA	System	O
477	**Under 1500g infant not delivered at appropriate level of care**	PEDS	The number per 1,000 live births of <1500g infants delivered at hospitals not appropriate for that size infant	E	Live born infants (<1500gms but over 24 weeks gestation) at the given birth hospital	All live births over 24 weeks gestation at the given birth hospital		California Maternal Quality Care Collaborative	National	Hybrid	QA	System	O
new-PED-1	**High risk neonates transferred to neonatal centers**	PEDS	Percentage of neonates defined as high risk who are transferred to neonatal centers	IU	Number of neonates defined as high risk who are transferred to neonatal centers	All high risk neonates	Unknown	None	None formalized	Hybrid	QA	System	S
new-PED-2	**Direct transport to pediatric trauma center for those pediatric patients meeting criteria**	PEDS	Percentage of pediatric trauma patients meeting trauma center criteria who are transported to a pediatric trauma center	IU	Number of pediatric trauma patients meeting trauma center criteria who are transported to a pediatric trauma center	All pediatric trauma patients meeting trauma center criteria		None	State	Hybrid	QA	EMS	S

PSM-038-10	**Unplanned admission to neonatal intensive care unit at term**	PEDS	The rate of admission to the neonatal intensive care unit (NICU) (or transfer to another institution in hospitals that do not provide NICU care) for more than 24 hours of live inborns at => 37 weeks gestation and => 2500 grams.	IU	Inborns only BW 2500 grams, GA 37 weeks, and NICU admission (day or charge) within one day of birth for greater than a day. Excludes cases with congenital anomalies (DX codes 740-759.9) and fetal hydrops (DX code 778.0), OR (Inborns with BW 2500 grams and GA 37 weeks AND transferred to another hospital (UB92/UB04 disp=02 or =05) within 1 day of birth and excluding cases with congenital anomalies DX codes 740-759.9) or fetal hydrops (DX code 778.0)	All live inborn infants during period of evaluation; For the AOI and WAOS: DRG 370-375 or MS DRG 765-768 and 774-775	Excluding those with congenital anomalies or fetal hydrops	Department of OB/Gyn Beth Israel Deaconess Medical Center	Regional	Hybrid	QA	System	O

Table A.3. Existing Projects in the Area of Regionalized Emergency Medical Care Services

Project Title	Description	Organization/Contact	Domain	Project Goals	Measure Development
Regional Approach to Cardiovascular Emergencies (RACE)	A ST Elevation Myocardial Infarction based Regionalized Emergency Care System established within North Carolina. This system is the most formalized in the US with multiple performance measures involving out-of-hospital and hospital based emergency care.	Duke University, Dr. Chris Granger, PI	AMI	Improve the outcome of ST Elevation Myocardial Infarction (STEMI) patients through the implementation of a Regionalized STEMI System of Care.	Multiple EMS and Emergency Care Measures with 5 years of ongoing performance and process measures improvement.
Regional Approach to Cardiovascular Emergencies: Cardiac Arrest Resuscitation System (RACECARS)	Every North Carolinian who suffers out-of-hospital cardiac arrest will receive life-saving, state-of-the-art care at the scene, en route, and in the hospital.	Duke University, Dr. James Jollis, PI	Out of Hospital Cardiac Arrest	North Carolina HeartRescue Specific Aim: Lower out-of-hospital cardiac arrest mortality by 50 percent over 5 years through: 1. the systematic and coordinated application of resuscitation and post-arrest care and 2. increased bystander cardiac resuscitation	Multiple process measures as well as Survival from Out of Hospital Cardiac Arrest

EMS Performance Improvement Toolkits	An EMS Performance Improvement Toolkit is a web-based reporting system focusing on specific areas or patient care areas within EMS.	EMS Performance Improvement Center, Dr. Greg Mears, PI	Trauma, Cardiac Arrest, Stroke, AMI, Pediatrics	The goal of each EMS Toolkit is to apply knowledge, data, and experience to evaluate and improve EMS service delivery, personnel performance, and clinical care. A special emphasis is placed on assisting local and state EMS agencies regardless of their knowledge or expertise in performance improvement. Suggestions for improvements (interventions) are generated based on the Toolkit results. Each EMS Toolkit is designed to measure and adjust performance over time	Scene times, EMS professional performance, patient outcomes, destination protocols, process measures
National EMS Assessment	A national EMS assessment funded by NHTSA to describe the EMS industry across a wide range of components. Over 300 data points have been identified and are currently being analyzed.	EMS Performance Improvement Center, Dr. Greg Mears, PI	Trauma, AMI, Stroke, Pediatrics, Disaster Management, Cardiac Arrest	Describe the EMS industry at the local, state, and national level using the EMS Agenda for the Future as well as Disaster Preparedness components.	Resource demographics by population and geography, EMS professional level of service/care (skills, medication, capability), Times (Response, Scene, Transport), Protocol use, process measures in place
NEMSIS and the National EMS Database	The National EMS Information System (NEMSIS) defines over 400+ standardized EMS data points for planning, evaluation and performance improvement. Currently the National EMS Database housed within the NEMSIS Technical Assistance Center contains data from over 30 states with over 8 million events.	NEMSIS Technical Assistance Center, Clay Mann, PI with Greg Mears, Co-PI	Trauma, Stroke, AMI, Pediatrics, Cardiac Arrest.	A National EMS Standard and Database used to describe, support, and promote EMS at the local, state, and national level.	The NEMSIS TAC and the National EMS Database provides multiple standardized reports focusing on performance improvement. These reports serve as a design template for local and state use. NEMSIS Version 3 has defined over 150 data elements important to EMS at the state and national level from a performance improvement perspective.
ANGELS (antenatal & neonatal guidelines, education, and learning system)	Statewide telemedicine and clinic network, education and support program for obstetric providers, case management services, 24-hour call center, and evidence based guidelines development and distribution network.	Univ of Arkansas	Neonatal care (Pediatrics)	provide access to real-time clinical support, consultation, or direct care to patients	A series of process measures are used to track the effects of ANGELS on access to high-quality perinatal care in Arkansas. These measures include: 1) the volume of MFM telemedicine consults provided to obstetrical patients in rural areas; 2) the volume of case management calls processed through the ANGELS Call Center from obstetrical providers and patients; 3) the volume of high-risk maternal transports received at UAMS; and 4) the volume of evidence-based guidelines distributed to obstetrical providers around the state; 5) the volume and proportion of LBW and VLBW births delivered at UAMS and other tertiary hospitals.
EMS Performance Measures Project	Seeks to create a set of performance indicators and attributes that can begin to be used to better explain EMS to outside world, including those who use and fund services	National Association of State EMS Officials	EMS Systems (multiple)	20-30 EMS performance measures	Multiple across the gamut of out-of-hospital EMS service delivery and care.

DEEDS (Data Elements for Emergency Department Systems)	A national effort to develop uniform specifications for data entered in emergency department (ED) patient records	National Center for Injury Prevention and Control/CDC	Emergency Data Systems (Multiple)	If the data definitions, coding conventions, and other recommended specifications are widely adopted, then incompatibilities in ED records can be substantially reduced. Further, because the recommendations incorporate national standards for electronic data interchange, implementation of DEEDS, Release 1.0 in computer-based record systems can facilitate communication and integration with other automated information systems.	Enables multiple process measures to be standardized using the dataset.
Emergency ID Net	NIH Roundtable: *Focus on syndromic surveillance and research of emerging infections in the US, compromises 12 geographically diverse Eds.*		Emergency Data Systems (Multiple)		
Emergency Medicine Network (EMNet)	NIH Roundtable: *Began as the multicenter airway research collaboration (MARC), with a focus on resp/allergy, but expanded focus to include health policy, 204 medical centers*	http://www.emnet-usa.org	Multiple		
Neurologic Emergency Treatment Trials (NETT)	NIH Roundtable: *Focus is interventional trials on acute neurologic disorders, organized around a clinical coordinating center with 10-20 clinical 'hubs.'*	http://nett.umich.edu/nett/welcome	Neurologic Emergencies, including stroke		
Pediatric Emergency Care Applied Research Network (PECARN)	NIH Roundtable: *Focus is observational and RCTs for acute illness and in children, comprises 4 research 'nodes' with 22 participating sites*.	http://www.pecarn.org	Pediatrics		
Resuscitation Outcomes Consortium (ROC)	NIH Roundtable: *Focus is on OOH research in mgmt of cardiac arrest and severe trauma being conducted in more than 10 regional centers across North America*.	http://roc.uwctc.org/tiki/tiki-index.php	Cardiac Arrest		
US critical illness and injuries trial group (USCIITG)	NIH Roundtable: *Focus is to establish priorities for critical illness injury research*.	http://public.wudosis.wustl.edu/USCIITG/default.aspx	Critical Illness, Trauma		
Mission: lifeline	National initiative to develop systems of care to increase number of stemi patients receiving prompt PCI	Available at: http://www.heart.org/HEARTORG/HealthcareProfessional/Mission-Lifeline-Home-Page_UCM_305495_SubHomePage.jsp.	AMI	Improve the outcome of ST Elevation Myocardial Infarction (STEMI) patients through the implementation of a Regionalized STEMI System of Care.	Multiple process and performance measures associated with the care of AMI in both the out-of-hospital and hospital environments. Focus on patient outcome.

North Carolina Stroke Collaborative	CDC funded Paul Coverdell National Acute Stroke Registry, collects data on stroke care occurring within 55 North Carolina emergency departments and hospitals.	North Carolina Stroke Collaborative, Wayne Rosamond	Stroke	Improve the service delivery and patient care associated with acute stroke	Multiple process and performance measures associated with out-of-hospital, hospital, and regionalized system of care for stroke.
National Fire Incident Reporting System (NFIRS)	Data system developed and in use within fire departments nationwide. Data describes all activity within a fire department, including Emergency Medical Services (EMS).	US Fire Administration within the Department of Homeland Security. URL = http://nfirs.fema.gov/	Fire Operations, Trauma, AMI, Pediatrics, Stroke, Cardiac Arrest, EMS Service Delivery	The national data collection system for the fire service. Information collected is used to describe fire service needs as well as drive service delivery and operations.	Multiple fire and EMS service delivery and operations including patient care, destination, and performance improvement.
CDC-ACS Trauma Triage Guideline	A guideline to assist the identification of severely injured patients with a decision tree to direct their care to verified trauma centers.	Centers for Disease Control and Prevention and the American College of Surgeons Committee on Trauma	Trauma	Improve patient outcomes through a regionalized trauma system of care.	Trauma performance improvement, destination decision making.
NAEMSP Airway Management Performance Measures and Dataset	A recommended dataset and performance improvement program for airway management in the out-of-hospital emergency care setting.	National Association of EMS Physicians	Airway management associated with any critically ill or injured patient (Multiple)	Improve airway management associated with critically ill or injured patients	Airway management
American Heart Association STEMI Care Guidelines	Recommended treatment guidelines for acute myocardial infarction	American Heart Association	AMI	Improve the outcomes of victims of acute myocardial infarction	AMI performance measures
American Heart Association Stroke Care Guidelines	Recommended treatment guidelines for acute stroke care	American Heart Association	Stroke	Improve the outcomes of victims of acute stroke	Stroke performance measures
American Heart Association Cardiac Arrest Care Guidelines	Recommended treatment guidelines for cardiac arrest care	American Heart Association	Cardiac Arrest	Improve the outcomes of victims of cardiac arrest	cardiac arrest performance measures
NHTSA Minimum Uniform Crash Criteria Dataset (MUCC)	A standardized dataset associated with all motor vehicle crashes occurring on public roadways.	National Highway Traffic Safety Administration	Trauma	Improve the outcome of motor vehicle crash related trauma	

Eagles EMS Performance Measures	Consensus based EMS performance measures published by the EMS Medical Directors of the Eagles Coalition. The U.S. Metropolitan Municipalities EMS Medical Directors Consortium (The "Eagles" Coalition) is comprised of most of the jurisdictional EMS Medical Directors for the nation's 20 - 25 largest cities 9-1-1 systems as well as the FBI and the U.S. Secret Service.	Eagles Coalition, Brent Myers, MD	Multiple	AMI, CHF, Asthma, Seizure, Trauma, Cardiac Arrest	Out-of-Hospital EMS Performance Measures
North Carolina EMS Performance Improvement Guideline	A guideline developed by the North Carolina College of Emergency Physicians and the North Carolina Office of EMS to promote ongoing EMS performance improvement and peer review.	NC Office of EMS, Greg Mears, MD	Trauma, Stroke, AMI, Pediatrics, Cardiac Arrest, Airway Management	Improve the EMS service delivery and patient care through an ongoing performance improvement program.	60 process and performance measures defined involving out-of-hospital EMS service delivery and patient care.
North Carolina State Medical Asset Resource Tracking Tool (SMARTT)	A web-based application monitoring hospital, EMS, and other resources from a disaster preparedness and operational perspective. This system is currently in use in NC, SC, WV, and MS.	EMS Performance Improvement Center, Dr. Greg Mears, PI	Trauma, Stroke, AMI, Pediatrics, Cardiac Arrest, Airway Management, and Disaster Preparedness	Improve Hospital and EMS disaster preparedness, coordination, collaboration, communication, service delivery, and patient care within regionalized systems of care.	Multiple process based measurements with extensive reporting and communications capability.
Fire Service Performance Measures	A list of performance measures associated with the fire service from a public safety perspective.	US Fire Administration within the Department of Homeland Security.	Any time dependent illness or injury (Multiple)	Improve and standardize the service delivery within the Fire Service.	Multiple process based measurements associated with the fire service.
National Trauma Data Bank (NTDB)	The national standard for trauma registry data. Maintained by the American College of Surgeons Committee on Trauma. The National Trauma Data Bank contains information from all of the ACS verified trauma centers within the US.	American College of Surgeons Committee on Trauma	Trauma	Improve the care and outcome associated with trauma.	Multiple process and performance measurements associated with trauma. These include out-of-hospital, trauma center, and regionalized system of care measures.

APPENDIX B: LITERATURE SEARCH STRATEGIES

1. All searches were conducted between July and December 2010.

2. The MeSH term “Emergency Medical Services” (EMS) includes all terms related to emergency medical care services and emergency medical care systems, including pre-hospital, emergency department, and hospital-based care; all related terms map to this MeSH term.

3. For the disease specific trauma search, the term “trauma” was too broad (returning more than 1500 abstracts), so two sub-strategies were used: including “trauma center” without “regionalization,” and then adding “regionalization” to “trauma.”

Strategy 1: Broad Search for Regionalization of Emergency Care Concepts using Regionalization Terminology:

(["Emergency Medical Services"{Mesh} OR "emergency care"] AND regionalization) OR regionalization emergency care

= 173 articles found, duplicates discarded

("Emergency Medical Services"[Majr] OR "Emergency Medical Technicians"[Majr] OR "first responders"[All Fields] OR "paramedics"[All Fields] OR "prehospital"[All Fields]) AND ("performance measures"[All Fields] OR "process measures"[All Fields] OR "performance measurements"[All Fields] OR "process measurements"[All Fields] OR "performance measurement"[All Fields] OR "process measurement"[All Fields] OR "Quality Assurance, Health Care"[Mesh] OR "Quality Indicators, Health Care"[Mesh] OR "Outcome and Process Assessment (Health Care)"[Mesh]) AND ("humans"[MeSH Terms] AND English[lang]) AND "regionalization"

= 27 articles found, duplicates discarded

Strategy 2: Disease-based searches for Regionalization of Emergency Care Concepts:

1. Combined terms for EMS, Performance Measures, and Trauma

("Emergency Medical Services"[Majr] OR "Emergency Medical Technicians"[Majr] OR "first responders"[All Fields] OR "paramedics"[All Fields] OR "prehospital"[All Fields]) AND ("performance measures"[All Fields] OR "process measures"[All Fields] OR "performance measurements"[All Fields] OR "process measurements"[All Fields] OR "performance measurement"[All Fields] OR "process measurement"[All Fields] OR "Quality Assurance, Health Care"[Mesh] OR "Quality Indicators, Health Care"[Mesh] OR "Outcome and Process Assessment (Health Care)"[Mesh]) AND "trauma" AND "regionalization"

= 20 found, duplicates discarded

("Emergency Medical Services"[Majr] OR "Emergency Medical Technicians"[Majr] OR "first responders"[All Fields] OR "paramedics"[All Fields] OR "prehospital"[All Fields])) AND ("performance measures"[All Fields] OR "process measures"[All Fields] OR "performance measurements"[All Fields] OR "process measurements"[All Fields] OR "performance measurement"[All Fields] OR "process measurement"[All Fields] OR "Quality Assurance, Health Care"[Mesh] OR "Quality Indicators, Health Care"[Mesh] OR "Outcome and Process Assessment (Health Care)"[Mesh]) AND ("humans"[MeSH Terms] AND English[lang]) AND "trauma center"

= 377 found, duplicates discarded

2. Combined terms for EMS, Performance Measures, and Stroke

("Emergency Medical Services"[Majr] OR "Emergency Medical Technicians"[Majr] OR "first responders"[All Fields] OR "paramedics"[All Fields] OR "prehospital"[All Fields]) AND ("performance measures"[All Fields] OR "process measures"[All Fields] OR "performance measurements"[All Fields] OR "process measurements"[All Fields] OR "performance measurement"[All Fields] OR "process measurement"[All Fields] OR "Quality Assurance, Health Care"[Mesh] OR "Quality Indicators, Health Care"[Mesh] OR "Outcome and Process Assessment (Health Care)"[Mesh]) AND ("humans"[MeSH Terms] AND English[lang]) AND "stroke"[All Fields]

= 224 found, duplicates discarded

= 28 possibly relevant to regionalization by title/abstract

3. Combined terms for EMS, Performance Measures, and MI

("Emergency Medical Services"[Majr] OR "Emergency Medical Technicians"[Majr] OR "first responders"[All Fields] OR "paramedics"[All Fields] OR "prehospital"[All Fields])) AND ("performance measures"[All Fields] OR "process measures"[All Fields] OR "performance measurements"[All Fields] OR "process measurements"[All Fields] OR "performance measurement"[All Fields] OR "process measurement"[All Fields] OR "Quality Assurance, Health Care"[Mesh] OR "Quality Indicators, Health Care"[Mesh] OR "Outcome and Process Assessment (Health Care)"[Mesh]) AND ("humans"[MeSH Terms] AND English[lang]) AND "myocardial infarction"[All Fields]

= 517 found, duplicates discarded

= 117 possibly relevant to regionalization by title/abstract

4. Combined terms for EMS, Performance Measures, and Cardiac Arrest

("Emergency Medical Services"[Majr] OR "Emergency Medical Technicians"[Majr] OR "first responders"[All Fields] OR "paramedics"[All Fields]) AND ("performance measures"[All Fields] OR "process measures"[All Fields] OR "performance measurements"[All Fields] OR "process measurements"[All Fields] OR "performance measurement"[All Fields] OR "process

measurement"[All Fields] OR "Quality Assurance, Health Care"[Mesh] OR "Quality Indicators, Health Care"[Mesh] OR "Outcome and Process Assessment (Health Care)"[Mesh]) AND "humans"[MeSH Terms] AND English[lang] AND ("Heart Arrest"[Majr] OR "Death, Sudden, Cardiac"[Majr] OR "cardiac arrest"[All Fields])

= 575 found, duplicates discarded, and hand-searched by title and/or abstract for relevance to "performance measures" and "regionalization"

= 208 possibly relevant to regionalization by title/abstract

APPENDIX C: SOURCES FOR MEASURES AND PROJECTS

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APPENDIX D: GLOSSARY AND TABLE LEGENDS

GLOSSARY

A glossary of key and recurring terms used in the environmental scan is included here for the purposes of clarity and consistency. Definitions of terms and descriptions of how they are used were developed by the authors, with assistance from NQF staff and resources. Descriptions of NQF processes and procedures, including those referenced throughout the scan, can be found at: http://www.qualityforum.org .

Domain—*n*. A category or topic area within the broad realm of regionalized care. For the purposes of this scan, a domain may be a disease or group of diseases (e.g., cardiac arrest, stroke, trauma) or a patient population (e.g., pediatric patients, psychiatry patients) or a type or area of healthcare (e.g., critical care, healthcare data management, disaster preparedness).

Emergency Care—*n*. Healthcare that is provided in an emergency department or emergency medical services (EMS) system or acute-care areas of a hospital. Emergency care refers to the treatment of high-acuity and/or life-threatening conditions in an expedited fashion, recognizing that timely care of emergent patients may prevent mortality or significant morbidity.

Measure—*n*. A standard; a basis for comparison; a reference point against which other things can be evaluated.

Pipeline—*n*. A term used to describe the system of categories of NQF endorsement for measures. The pipeline is a continuum of separate status points, from the point at which a measure is identified to the point at which it is endorsed by the NQF. The categories include: 1) the measure remains under development; 2) the measure is fully developed and specified; 3) testing has been initiated on the measure; 4) testing has been completed on the measure; 5) the measure is in use, and 6) NQF has endorsed the measure.

Project—*n*. Context: "project of regionalized emergency care services." For the purposes of this scan, a project is a planned, collaborative effort with defined goals and methods to achieve those goals. Examples include research projects, QAprojects, and other administrative efforts with defined methods and goals. Projects in this environmental scan focus on emergency care at the system level.

Regionalization—*n*. Context: "regionalized system of care." For the purposes of this scan, regionalization refers to the concept of an established network of resources that delivers specific care (e.g., protocols, definitive procedures, higher care levels or care pathways) that is not universally available in the out-of-hospital setting (e.g., a physician's office) or in some acute-care hospitals. Regionalized care does not equal centralized care.

System—*n*. Context: "system of care." For the purposes of this scan, a "system" or "system of care" is a coordinated chain of healthcare providers and associated infrastructure, including both in-hospital and out-of-hospital components, that delivers care to patients with specific emergent medical or surgical needs.[2, 3] A "system of care" may exist to serve a particular geographic area,

patient population, or disease condition. The "out-of-hospital" component may be represented by the pre-hospital (i.e., Emergency Medical Services [EMS]) recognition of a time-sensitive condition and initiation of a system of care, or could also be represented by the transfer of a patient for definitive care within a regionalized network.

LEGENDS FOR TABLES OF MEASURE DESCRIPTIONS

Table 2

Column 1—Measure ID: Measure identifier, either created by the authors of this scan for unendorsed measures or the NQF number for endorsed measures.

Column 2—Title: Measure title.

Column 3—Domain: Category of measure within the realm of regionalized emergency medical care services. See glossary above.

Column 4—Description: Description of the measure.

Column 5—Measure Status: Where along the NQF endorsement continuum the measure currently lies. See "pipeline" in the glossary above. Can be endorsed (E), in use (IU), or under development (UD). It should be noted that the unendorsed measures did not fall neatly into the various status points along NQF's pipeline continuum. Therefore, if an identified measure had evidence of being used for any purpose, it was classified as "in use." Measures that have been identified but are unclear in terms of use were classified as "under development."

Table 3

Column 1—Measure ID: Measure identifier, either created by the authors of this scan for unendorsed measure, or the NQF number for endorsed measures.

Column 2—Title: Measure title.

Column 3—Domain: Category of measure within the realm of regionalized emergency medical care services. See glossary above.

Column 4—Description: Description of the measure.

Column 5—Measure Status: Where along the NQF endorsement continuum the measure currently lies. See "pipeline" in the glossary above.

Column 6—Numerator: For measure result calculation, fractions are created with a numerator and denominator meeting the listed criteria for each.

Column 7—Denominator: For measure result calculation, fractions are created with a numerator and denominator meeting the listed criteria for each.

Column 8—Exclusion: A description of patients, instances, or situations that should not be included in the numerator or denominator when calculating the measure.

Column 9—Measure Steward: The organization that owns or maintains the measure or that shepherds a measure through the development process to endorsement.

Column 10—Level of Reporting: Governmental or administrative level at which the measure is reported. Can be regional (R), state (S), or national (N).

Column 1—Data Source: Type or nature of records from which the measure information is derived and calculated. Can be administrative (A), clinical (C), or hybrid (H).

Column 12—Use: If the measure is in use, for what purposes the is measure used. If the measure is not in use, what are current proposals for its use? Can be QA(QA), pay for performance (Pay), or "none" if there was no or minimal information regarding a measure's use.

Column 13—Unit of Analysis: The "what" or "who" the measure is analyzing and evaluating. Can be system, hospital, physician, or EMS.

Column 14—Measure Type: The classification of each measure, i.e., structure (S), process (P), or outcome (O).