March 2020

Specialty Systems of Care

An Analysis of Statewide Practices Related to Time Sensitive Emergencies

National Association of State EMS Officials
WWW.NASEMSO.ORG

DISCLAIMER

This document was produced with support from the US Department of Transportation, National Highway Traffic Safety Administration (NHTSA), Office of Emergency Medical Services (OEMS) through cooperative agreement DTNH2216H00016.

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BACKGROUND

In 1966, a multi-organizational, multidisciplinary team assisted the National Academy of Sciences with the publication and dissemination of *Accidental Death and Disability: The Neglected Disease of Modern Society*[1]. This visionary document outlined the importance of a robust infrastructure and the need for local, regional, state, and national collaboration to prevent injuries and improve trauma care. Early trauma systems were built on a model that included the voluntary categorization of facilities and resources based on that report.

Four decades later in June 2006, the Institute of Medicine (IOM, now known as the National Academy of Medicine) concurrently released three reports on the Future of Emergency Care in the United States Health System[2], noting that while some progress had been made, "the nation should develop a 'regionalized, coordinated, and accountable' system of emergency care." Several scientific papers began to emerge that described a patient care delivery system as an interdependent relationship among all system participants that was crucial to improving outcomes. In 2009, evidenced-based recommendations on field triage[3] from the Centers for Disease Control and Prevention (CDC) were used to empower EMS personnel to deliver trauma patients to designated hospitals to receive expert care from specialists. (Of note, in 2017 the CDC also provided an evidence summary on state laws to enhance prehospital stroke care.[4])

The IOM's messaging was reinforced in the 2010 *Academic Emergency Medicine* (*AEM*) consensus conference "Beyond Regionalization: Integrated Networks of Emergency Care[5]," at the center of emergency medicine's (EM's) health policy research agenda. Participants were encouraged to discuss the barriers to creating fully developed systems of care in an effort to maximize the value and utilization of existing technology with emerging therapies. An expert panel specifically highlighted sepsis, cardiac arrest, STEMI, and stroke as high-risk conditions with widely disparate resource requirements in need of urgent intervention, and that early recognition and a timely response were essential components of a successful, multidisciplinary structure. The entire proceedings were

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[1] National Academy of Sciences and National Research Council. 1966. Accidental Death and Disability: The Neglected Disease of Modern Society. Accessed March 10, 2020 at https://www.nap.edu/catalog/9978/accidental-death-and-disability-the-neglected-disease-of-modern-society.

[2] Institute of Medicine. IOM Report: The Future of Emergency Care in the United States Health System. Acad Emerg Med. Oct 2006;13(10):1081-1085. Accessed February 15, 2020 at https://doi.org/10.1197/j.aem.2006.07.011.

[3] Centers for Disease Control and Prevention. Guidelines for Field Triage of Injured Patients. MMWR 2009;58(No. RR-1). https://www.cdc.gov/mmwr/pdf/rr/rr5801.pdf.

[4] Centers for Disease Control and Prevention. Division for Heart Disease and Stroke Prevention. What is the Evidence for Existing State Laws to Enhance Pre-hospital Stroke Care? Atlanta, GA: Centers for Disease Control and Prevention; 2017. Accessed January 20, 2020 at https://www.cdc.gov/dhdsp/pubs/docs/Stroke-PEAR-508.pdf.

[5] Carr, Brendan G., et al. "Regionalized Care for Time-Critical Conditions: Lessons Learned From Existing Networks." Academic Emergency Medicine, vol. 17, no. 12, 2010, pp. 1354–1358., doi:10.1111/j.1553-2712.2010.00940.x.

published in an open-access edition of *Academic Emergency Medicine* that remains available at https://onlinelibrary.wiley.com/toc/15532712/2010/17/12.

Based upon a member-identified need for networking and resources to assist states identify and manage systems integration issues, the National Association of State Emergency Medical Services Officials (NASEMSO) established the Specialty Systems of Care (SSoC) Committee in 2017. Attendees at the inaugural meeting discussed several common/desirable elements involved in systems of care integration at the state level that includes:

1. Condition is frequently encountered/transported by EMS personnel
2. Model clinical guidelines are used to improve statewide consistency of care
3. Standards for patient care are available through an accreditation process
4. Agency/facility inspections are conducted for compliance to standards
5. Focused data collection or state registry of specified condition
6. Use of consensus-based measures to improve patient care quality
7. Ongoing evaluation and monitoring of benchmarks

NASEMSO recently assessed the status of state specialty systems of care that continue to evolve in spite of the lack of robust resources to support the coordination of efforts or assist EMS stakeholders. It is noted that state trauma systems evaluation was documented and reported in 2012 and was not re-evaluated for this report. The SSoC Committee determined that activities involving stroke and chest pain would be most informative and important to review. Findings reported in this document support that premise.

The following data was compiled from multiple interactions with state EMS officials, affiliated partners, and independent research to fill in several informational gaps from all 50 states and the District of Columbia. The request was specific to states that coordinate specialty systems of care that resulted in a subpopulation of all states in each section. In other words, stroke and cardiac care is obviously provided by EMS personnel in all states and territories. Healthcare facilities can voluntarily pursue accreditation as a specialty center without a state program office or system coordination at a statewide level. This report is intentionally reflective of state coordination or participation in systems of care and integration at a statewide level. Users of this document are reminded that numerical values that reflect patient care practices are likely higher in certain categories when applied to all states and territories. We appreciate the time and commitment of all of our colleagues and associates to accomplish this informational resource.

System Definitions

Multiple terms are used within states to classify information related to specialty systems of care. NASEMSO did not attempt to delve into the description variances that states use and supports common definitions by Kocher et al[6] to facilitate understanding and explain system credentialing and evaluation efforts:

Categorization is a process for inventorying, assessing, and cataloguing the emergency care resources, services, capabilities, and capacities of medical care facilities in a community or region, using a criteria-based classification system over a range of emergency care conditions. This process is used to assist physicians, hospitals, health departments, and emergency medical services (EMS) agencies in making informed decisions on how to develop, organize, and appropriately utilize health care resources for the emergency care system. Categorization may be accomplished using self-survey and self-declaration by facilities, by external agency survey and verification, or by some combination of the two.

Designation is a process for granting a charter as a preferred prehospital receiving facility and/or local or regional referral facility for a certain medical condition or group of related conditions. The fulfillment of this charter is predicated on meeting and maintaining certain capacity, capability, and performance standards and on the commitment of the facility to continually improve the care of patients with these medical conditions. This process is usually implemented by a governmental organization responsible for local or regional planning and oversight of EMS and may entail funding from a governmental body.

Accreditation is the process that leads to attestation by an outside agency that a practice, laboratory, department, organization, or institution has met certain predetermined and generally agreed-upon standards. These standards may involve considerations of the type and quality of care, safety, efficiency, cost-effectiveness, and accessibility.

Regionalization is the matching of medical resources to patient needs to maximize health benefits and outcomes while minimizing cost and use of resources over a specified geographic area. In general, this process implies a level of organization beyond the local level, but below the national level.

Verification is the act of reviewing, assessing, inspecting, or testing to establish that a service or system meets predetermined standards.

Licensure is the legal permission granted by governmental bodies to provide specified goods and services.

[6] Kocher, Keith E., et al. "Categorization, Designation, and Regionalization of Emergency Care: Definitions, a Conceptual Framework, and Future Challenges." Academic Emergency Medicine, vol. 17, no. 12, 2010, pp. 1306–1311., doi:10.1111/j.1553-2712.2010.00932.x.

Summary

NASEMSO commonly focuses on the state's regulatory authority to implement change. This consideration reflects the level to which a state has a legal authority to mandate or voluntarily coordinate certain procedures as part of its responsibility to protect the public.

Overall, we found that systems of care coordination among the states is complex and multifaceted. State EMS authorities share responsibilities with other state agencies, regional coordinating bodies, and community partnerships. It should go without saying that efforts to improve cardiovascular care is occurring in all 50 states and DC at varying levels. Formal systems of care coordination at a statewide level involves 82% of all states, however, not all systems of care coordination is directed by the state lead agency for EMS. It should be noted that system data from the U.S. territories was more difficult to access and were not able to be reliably catalogued for this report.

Recognition of an event and the time to treatment is of utmost importance and a high priority to the EMS and emergency care community. However, limited federal support and funding from charitable foundations that has become available to compliment this effort are focused more on prevention, disease management, and hospital care than the EMS response and systems coordination.

SPECIALTY SYSTEMS OF CARE

Excluding trauma, does your state designate/certify/recognize/ coordinate specialty systems of care such as stroke, STEMI, or others at the state level? *(n=51)*

Figure 1

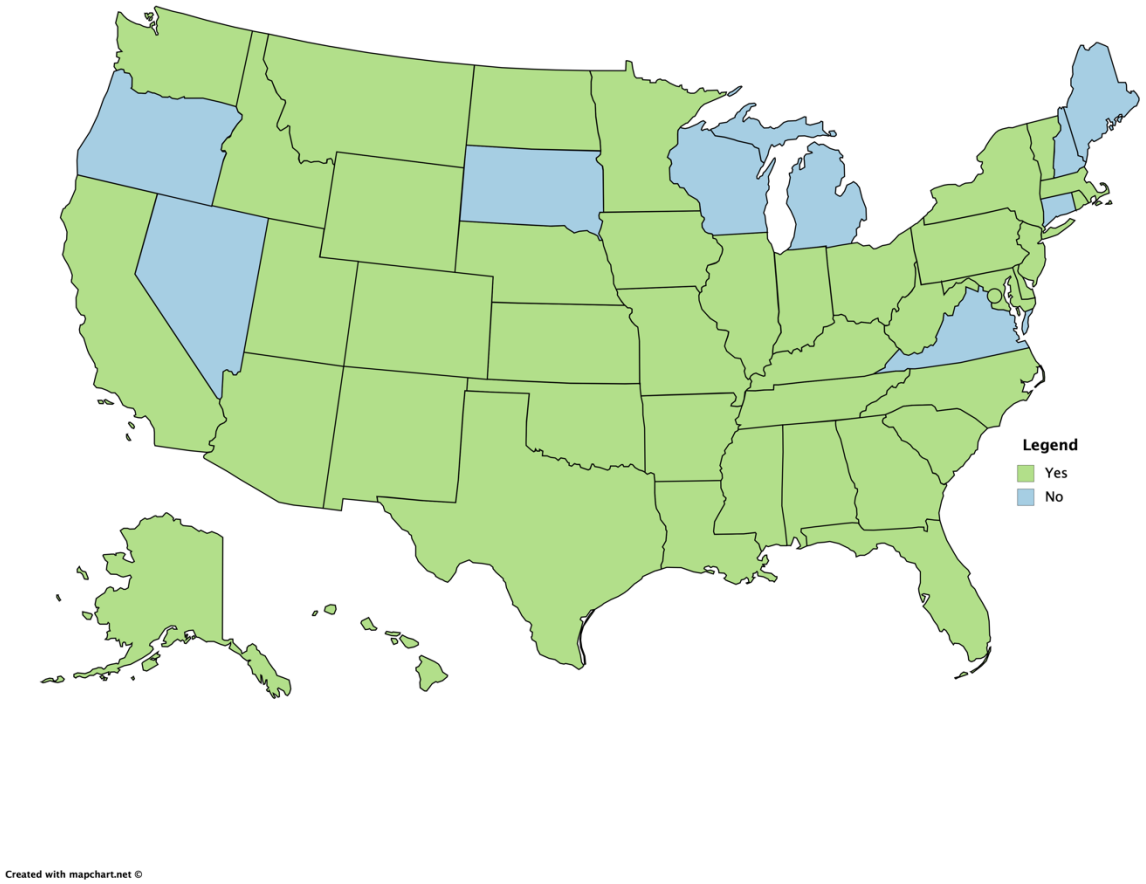
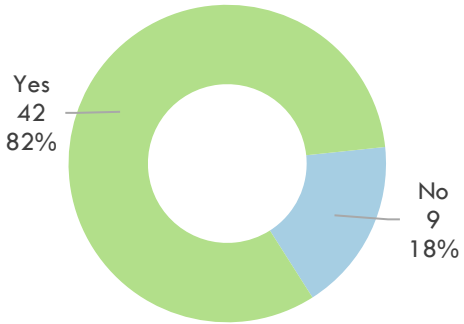


Chart 1



SPECIALIZED STROKE CENTERS

Definition

Designate/Certify/Recognize/Coordinate Stroke Centers

For the purposes of this assessment, the references to "designate, certify, recognize, and coordinate" is intended to reflect whatever process or terminology a state uses that results in a statewide identification of facilities that provides focused specialty care. In general, states are provided the legal authority to designate specialty centers through an authorization provided to them by the state legislature. "Designation" is a process outlined by and reserved for a state agency. "Accreditation" engages criteria (i.e., standards) developed by an outside professional organization which involves facility, staffing, equipment, and other requirements used to describe resources and capabilities. "Verification" services can be offered by the state and/or an accrediting agency that attests to compliance with predefined standards that is usually comprised of a comprehensive review of documentation with an on-site inspection.

> *DISCLAIMER: It is very important to note that while we intended to collect data on all statewide system coordination activities, some states responded from the state EMS office perspective as if the program office was located in and managed by the state EMS office. Other states attempted to respond even if systems coordination is managed by a different authority. A few states deferred to program offices beyond EMS. Other states skipped specific questions entirely. Actual results may vary based on the position of the respondent. Therefore, we present these results based on the number of respondents to a specific question and not as a percentage or representation of all state practices.*

Does your state designate/certify/recognize/coordinate stroke centers? (choose the answer that best reflects stroke activities in your state) *(n=42)*

In this question, respondents were able to choose from three options: the availability of authorizing legislation, the state provision of oversight to voluntary accreditation activities among facilities, and a reflection on the inability to provide state oversight/support to this activity at all. Authorizing legislation is available to 69% (n=29) of states to recognize stroke centers and another 26% (n=11) provides voluntary accreditation services. One state indicated it has the ability to expand designation authority but system coordination for stroke care is adequately being addressed at the regional level. Two states do not currently have the ability to authorize or recognize stroke centers but acknowledge that national accreditation is pursued by individual facilities.

Legislative Authority for State to Recognize Stroke Centers

Figure 2

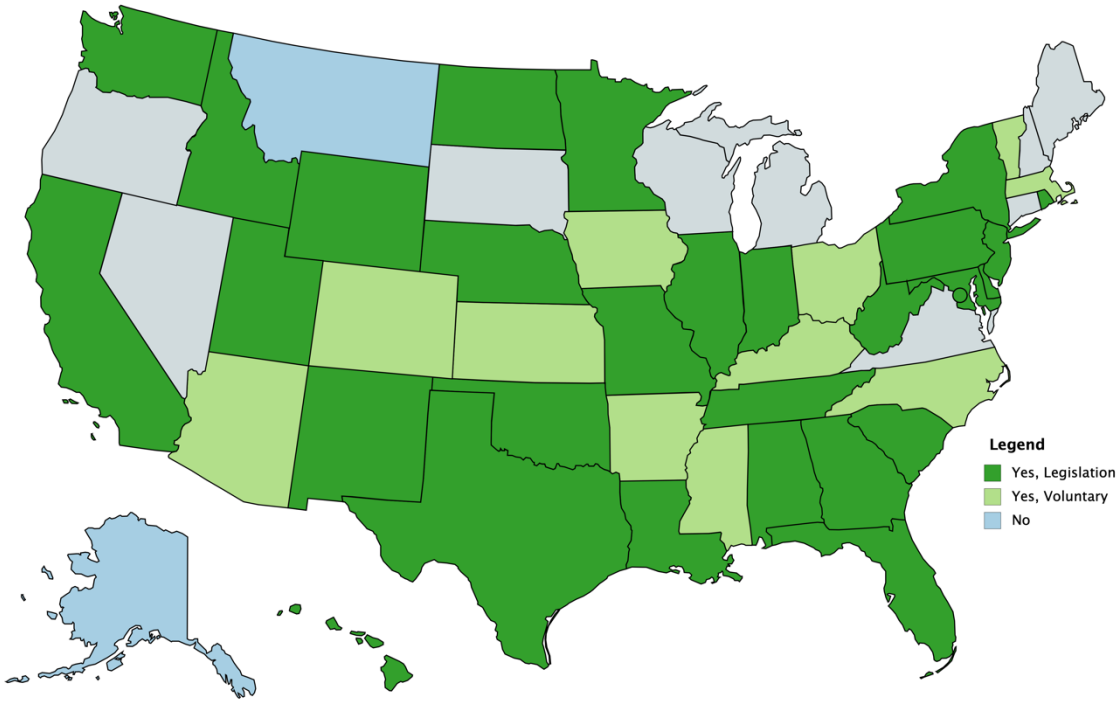
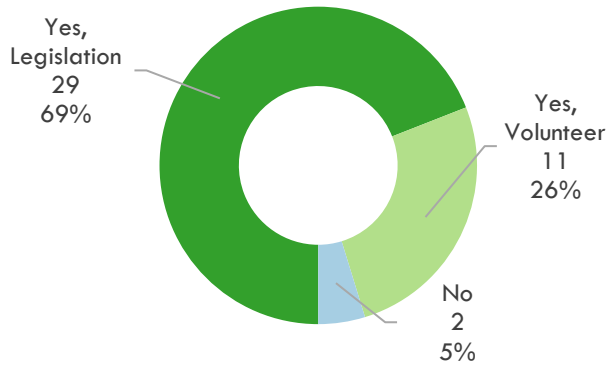


Chart 2

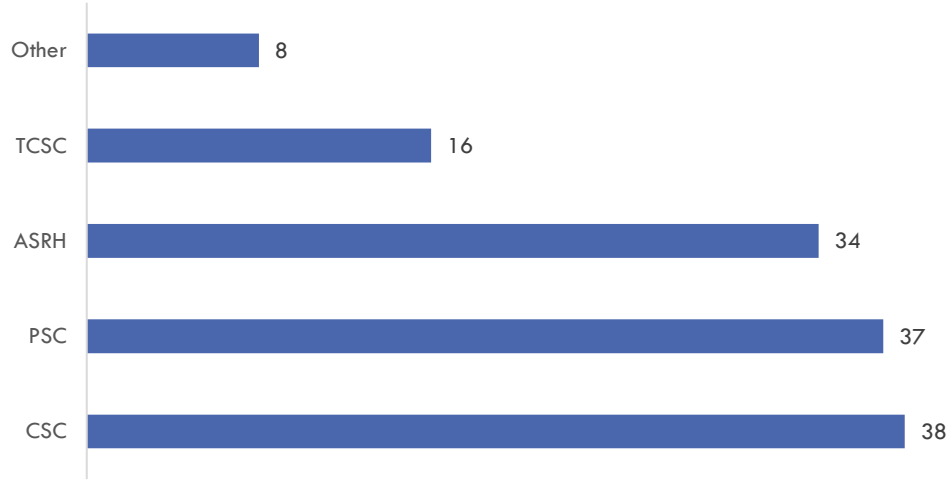


Levels of Stroke Centers

What levels of stroke care are recognized in your state? (select all that apply) *(n=40)*

Recognition levels for facilities have been defined by national accrediting organizations. Ninety five percent (n=38) of state respondents recognize Comprehensive Stroke Centers (CSC), 93% (n=37) of respondents recognize Primary Stroke Centers (PSC), 85% (n=34) of respondents recognize Acute Stroke Ready Hospitals (ASRH), and 40% (n=16) of respondents identify Thrombectomy Capable Stroke Centers (TCSC). While these categories have been adopted nationwide, 9 states have also identified a need for additional intermediate levels, such as Emergent Stroke Ready Hospital (ESRH) and Non-emergent Stroke Ready Hospital (NSRH), PSC-E (Primary Stroke Center with Endovascular capability, but not certified by an external body), Stroke Bypass Hospitals, Primary Stroke Services (Between ASRH and PSC), Stroke Referral Center, Stroke Support Hospital, and Certification of Stroke Rehabilitation. One of the respondents also acknowledges numerical levels of I-IV.

Chart 3



Comprehensive Stroke Center (CSC)

Figure 3

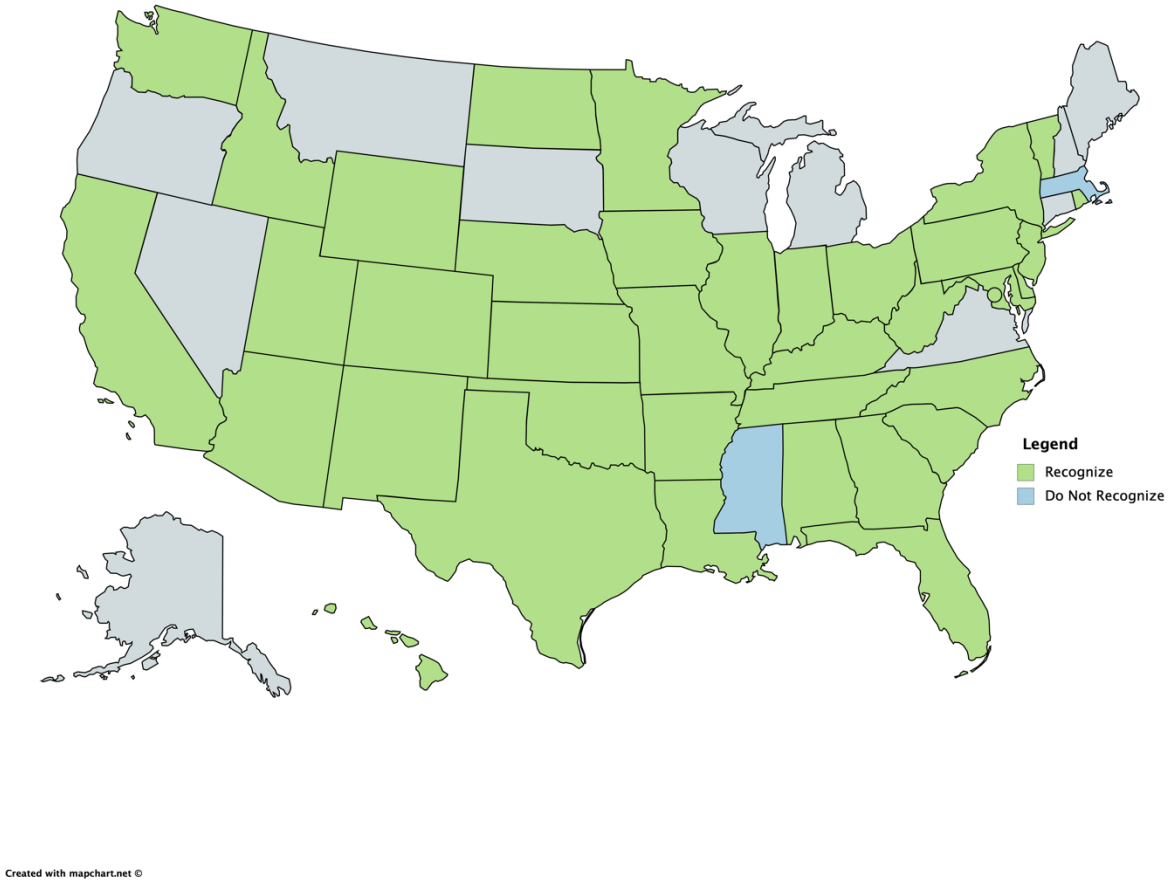


Chart 4

of states with a stroke system recognize CSC (n=38)

Thrombectomy Capable Stroke Center (TCSC)

Figure 4

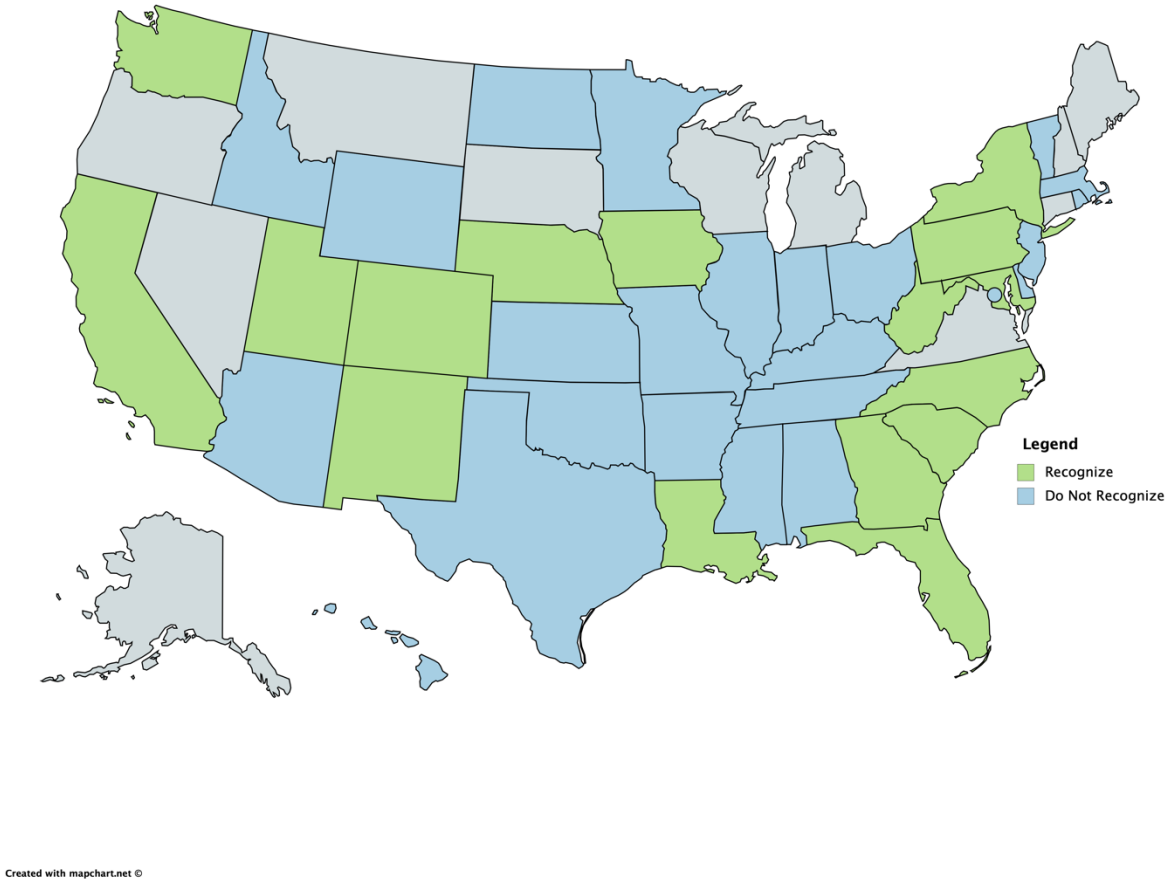


Chart 5

of states with a stroke system recognize TCSC
(n=16)

Primary Stroke Center (PSC)

Figure 5

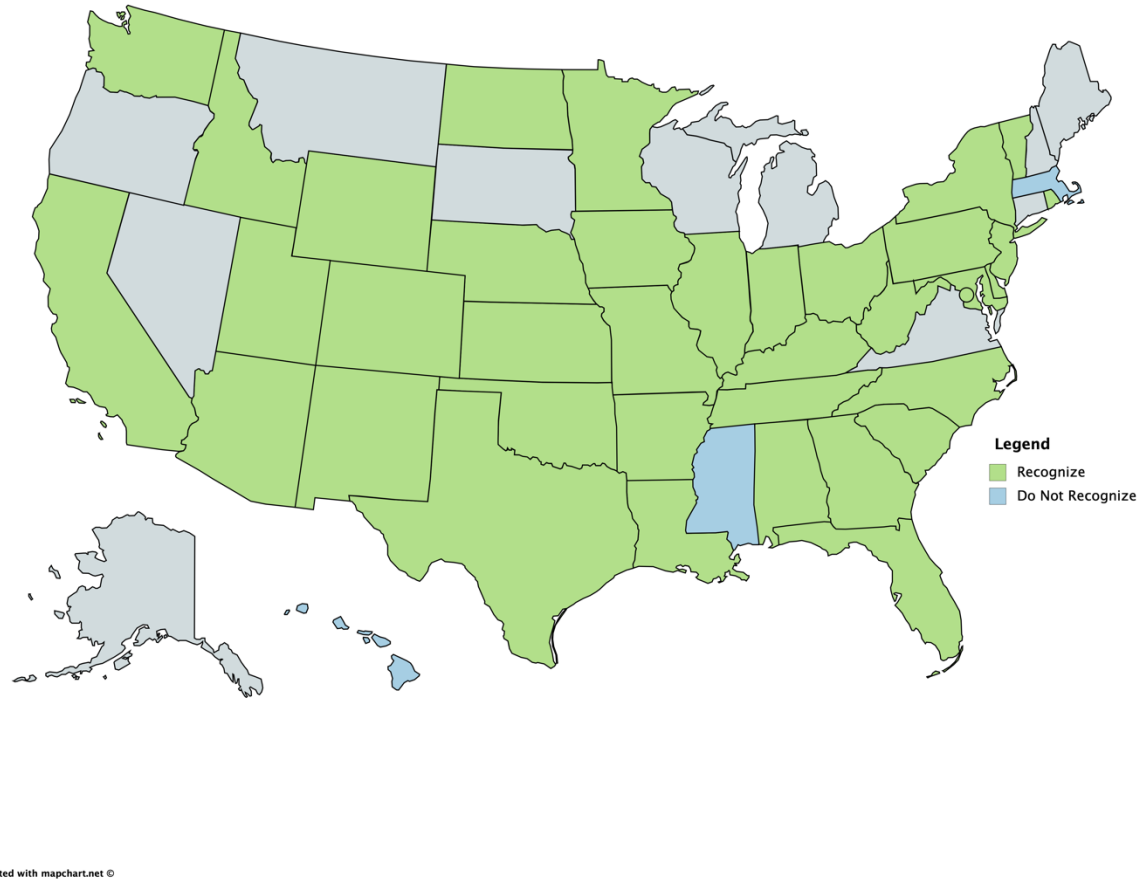


Chart 6

of states with a stroke system recognize PSC
(n=37)

Acute Stroke Ready Hospital (ASRH)

Figure 6

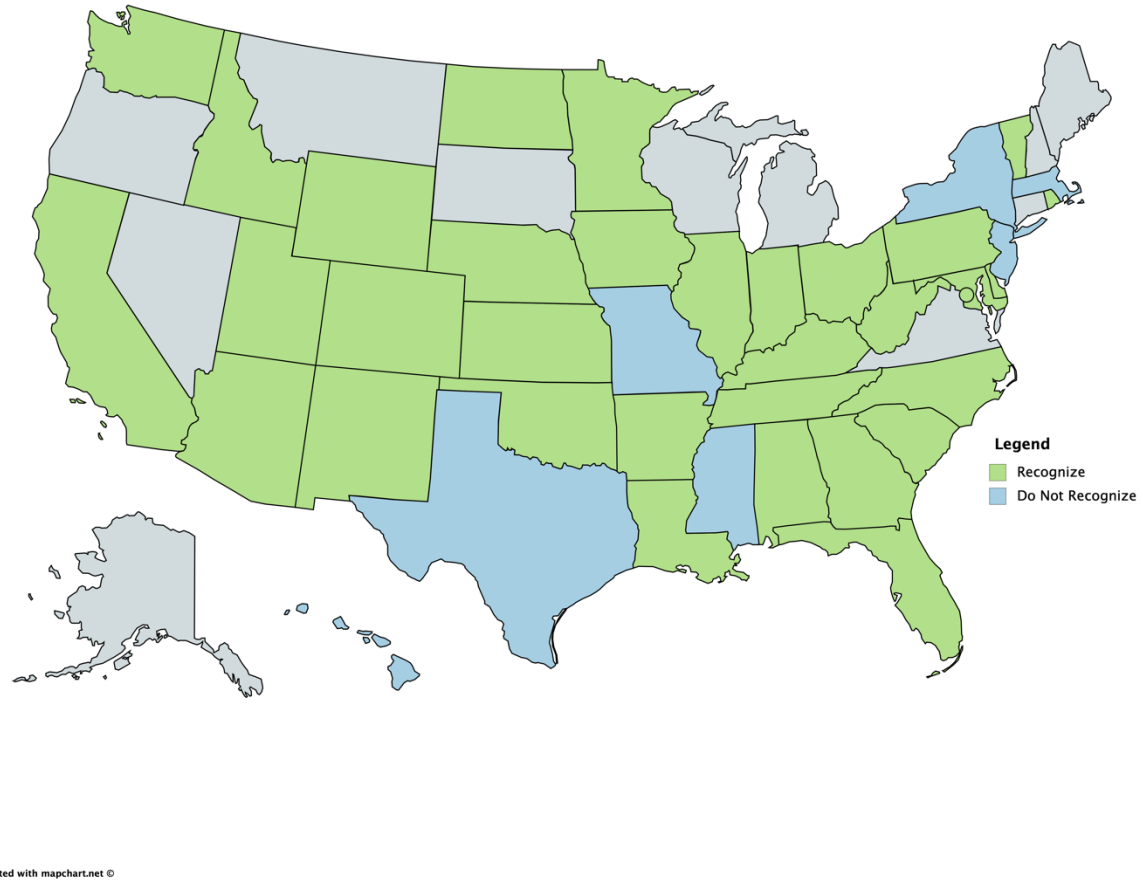


Chart 7

of states with a stroke system recognize ASRH
(n=34)

Other Levels

Figure 7

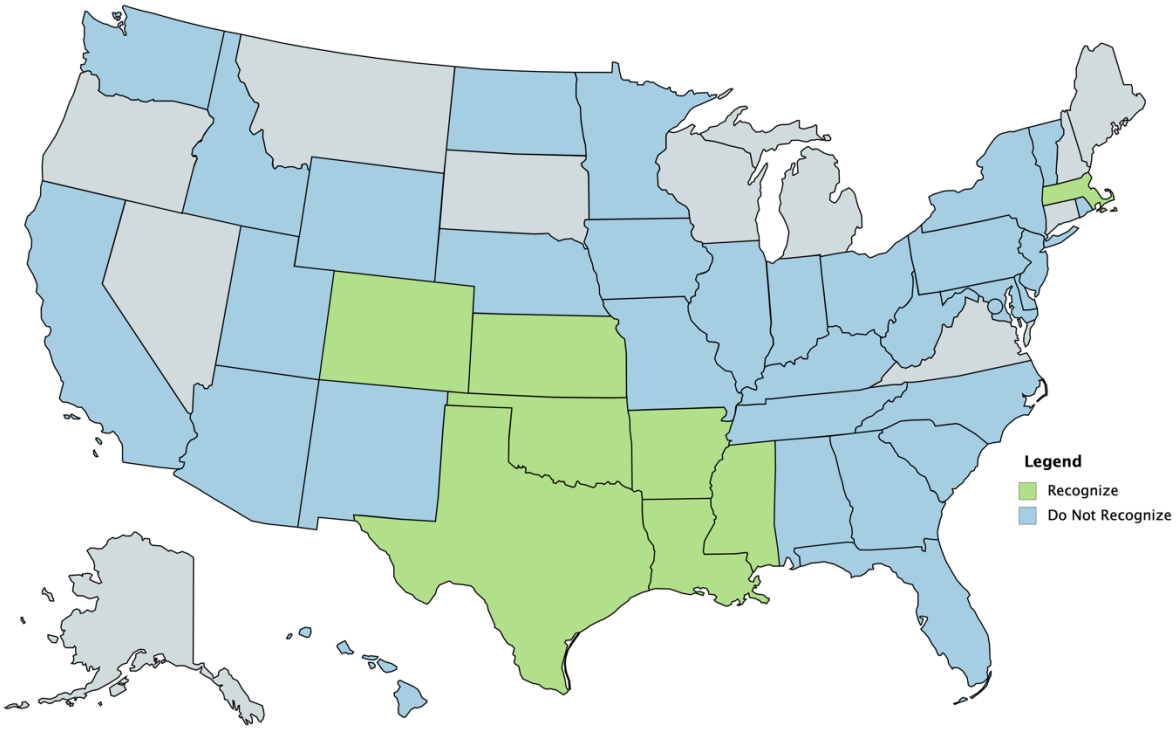


Chart 8

of states with a stroke system recognize another level of care not identified by national standards
(n=8)

Please enter the total # of recognized stroke centers in your state by category CSC, PSC, ASRH, and other? (n=33)

Among 33 respondents, we identified that while the possibility of Comprehensive Stroke Center recognition existed, the majority of system participants lean towards credentialing as a Primary Stroke Center, Acute Stroke Ready Hospital, or one of the alternate levels recognized by the states. A total of 1,904 stroke centers were reported although this estimate is most likely underestimated as several respondents skipped this question.

Statewide Designation and National Accreditation

> ***How does the state designate/certify/recognize/coordinate stroke centers?*** *(n=40)*

For stroke care, the majority of states (53% of respondents or n=21) recognize a national certification/ accreditation process and do not conduct their own site visit. Thirty three percent (n=13) of respondent states utilize a hybrid process, in other words, a combination of national and state elements. Six states (15% of respondents) establish state specific criteria and perform their own site visits.

Figure 8

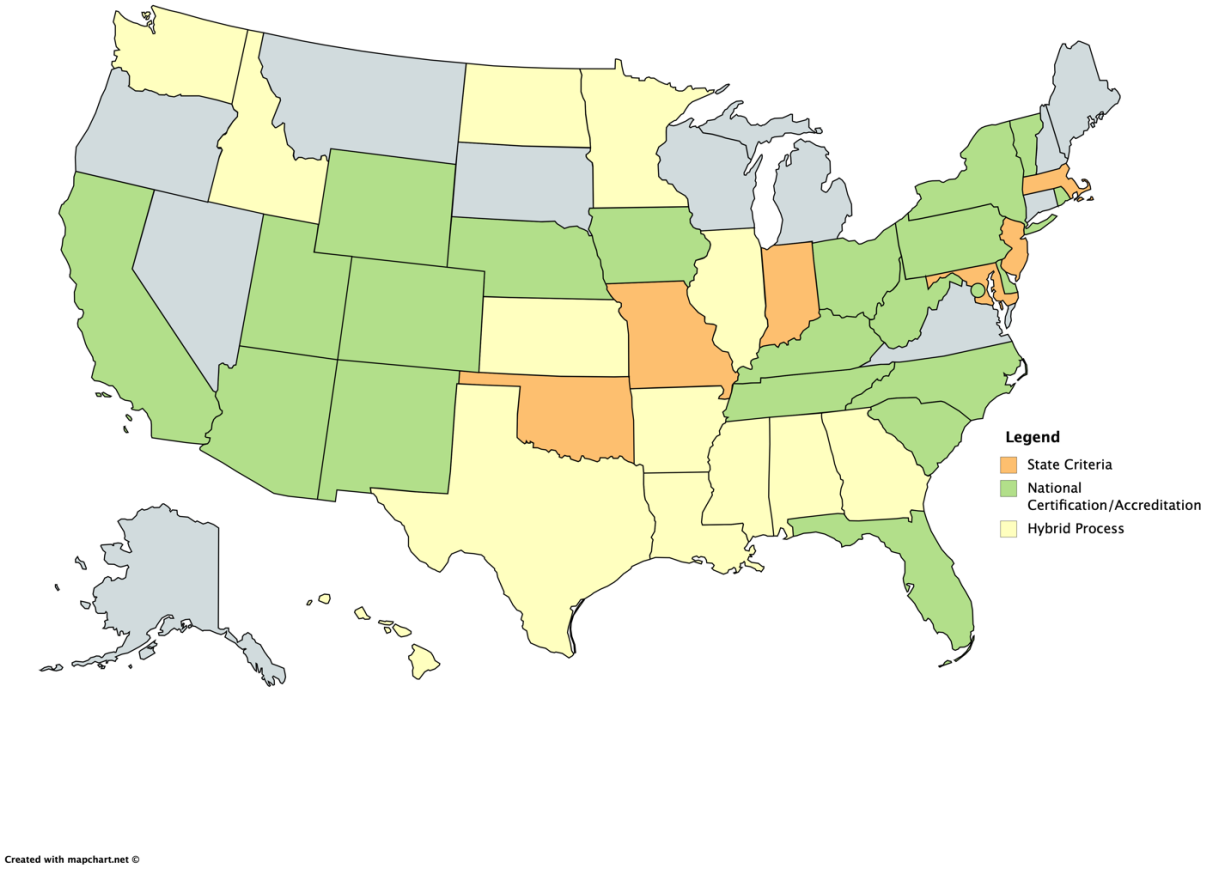
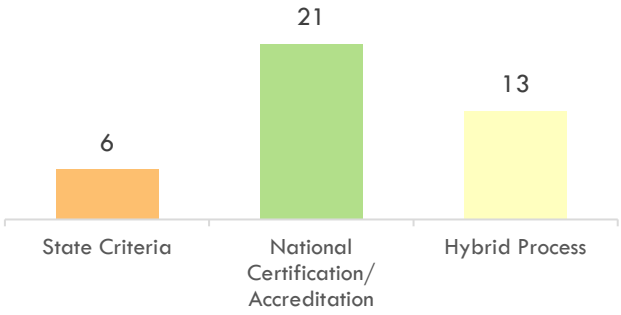


Chart 9

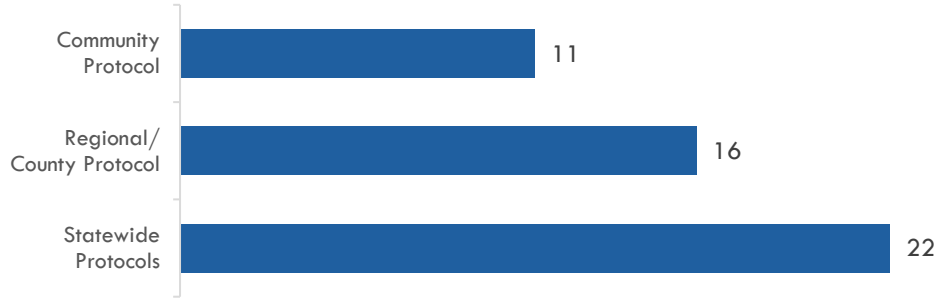


EMS Transport and Destination Decisions

> ***How are stroke transport and destination decisions determined in your state? In other words, if ambulances can bypass facilities to go to a specialty center, what authority determines the proper guidance?*** *(n=40)*

In this question, states were able to select multiple responses to reflect the collaboration among states, EMS agencies, and medical directors to achieve the best care for patients. Fifty five percent (n=22) of respondents have established statewide protocols or administrative rules that enable EMS personnel to transport patients directly to a specialty stroke center. Forty percent (n=16) of respondents noted regional or county level protocols while 26% (n=9) acknowledged that community or EMS agency protocols prevail. Seven states (35%) use two of the listed protocol types while two states (15%) use three of the listed protocol types. Zero states indicated that ambulances bypass was not permitted, and the majority indicated heavy influence from EMS medical directors. Best evidence to support *EMS Triage and Transport to Most Appropriate Stroke Facility* was included in the CDC evidence report on state laws[4].

Chart 10



Statewide Protocols

Figure 9

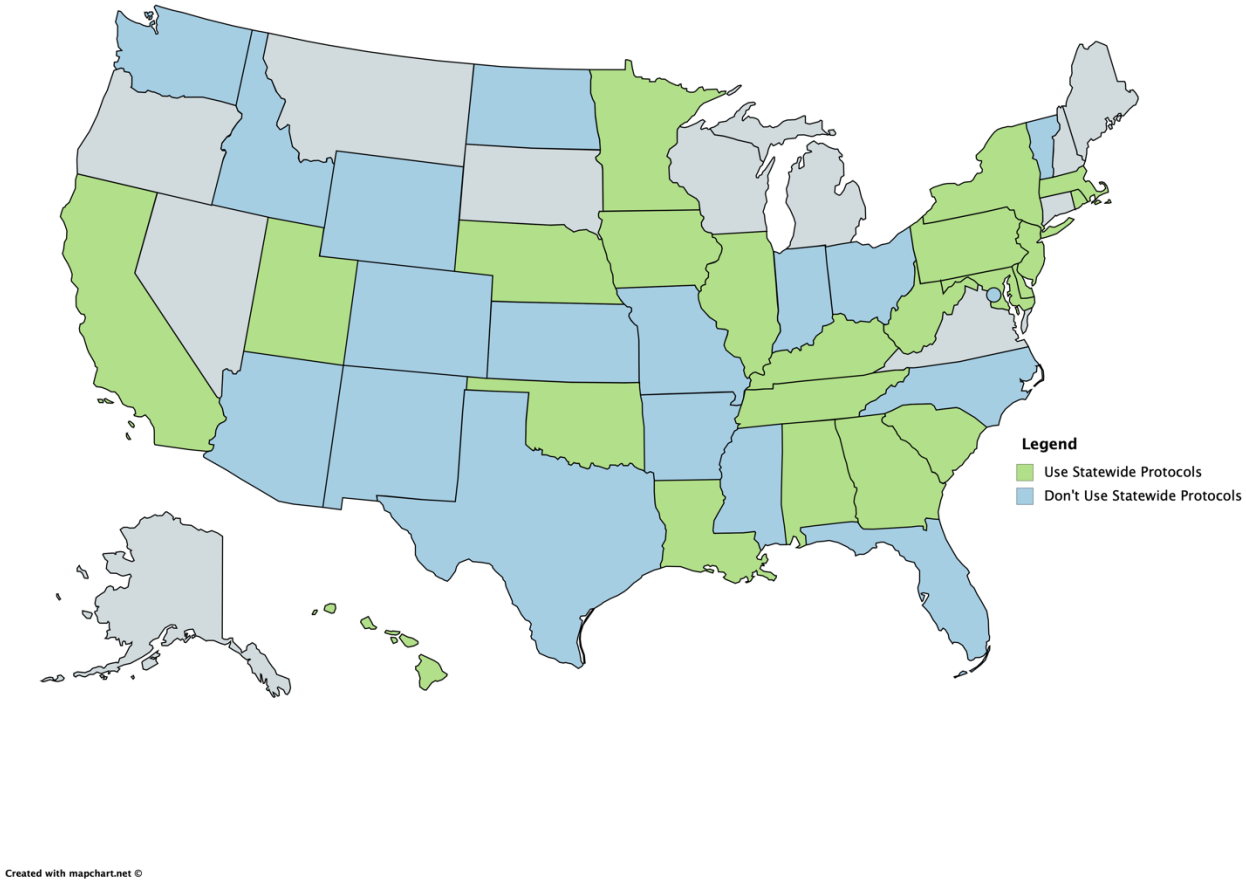


Chart 11

of states recognize statewide destination protocols (n=22)

Regional/County Level Protocols

Figure 10

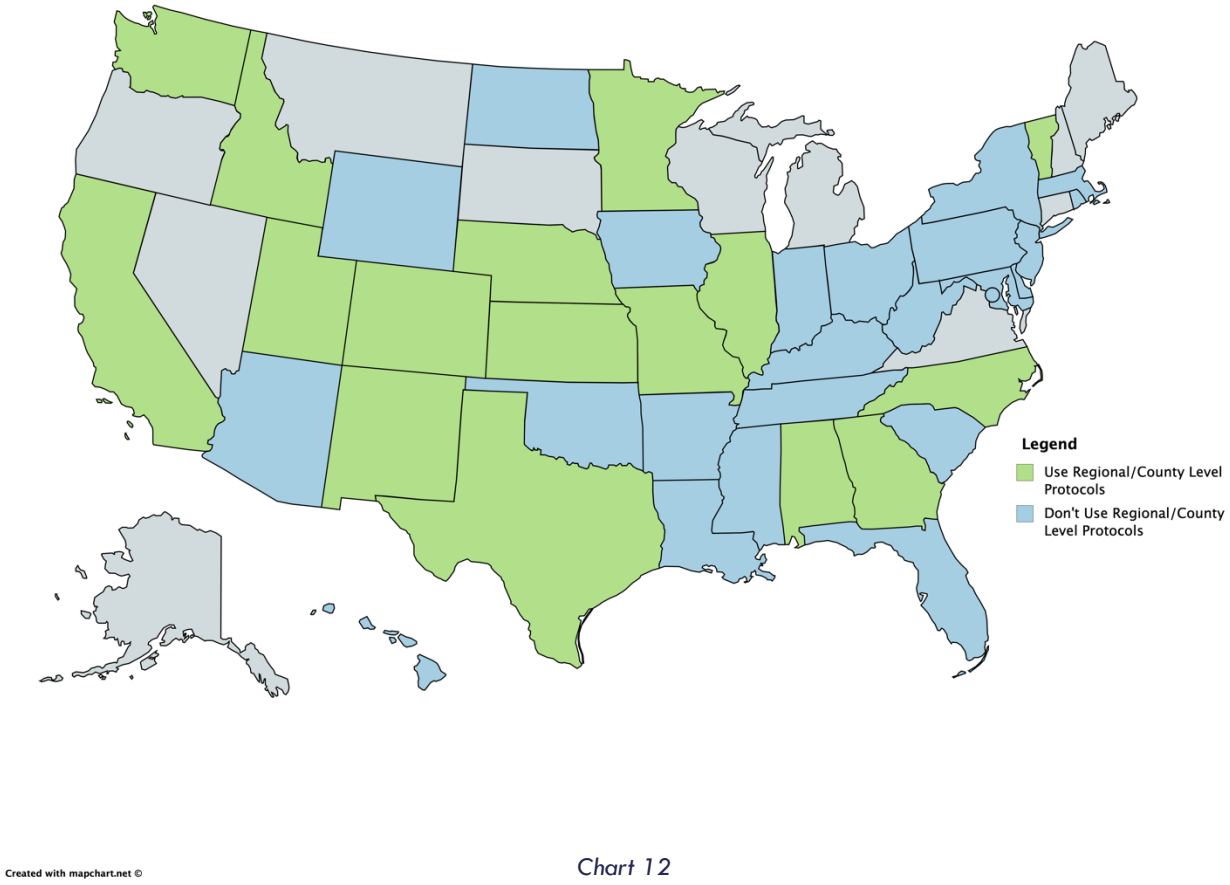


Chart 12

of states recognize
regional/county level destination
protocols
(n=16)

Community Level Protocol

Several states that indicated "medical director prerogative" are included here.

Figure 11

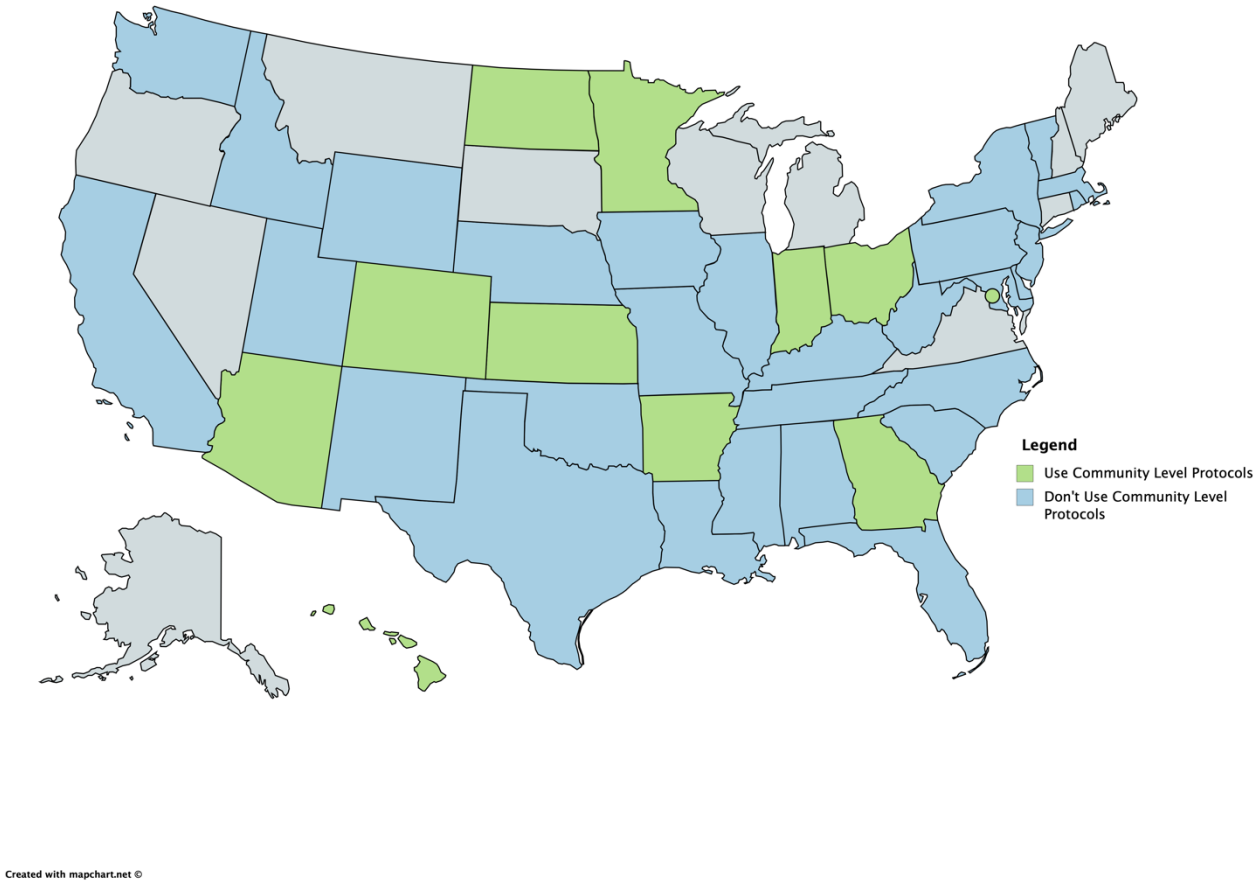


Chart 13

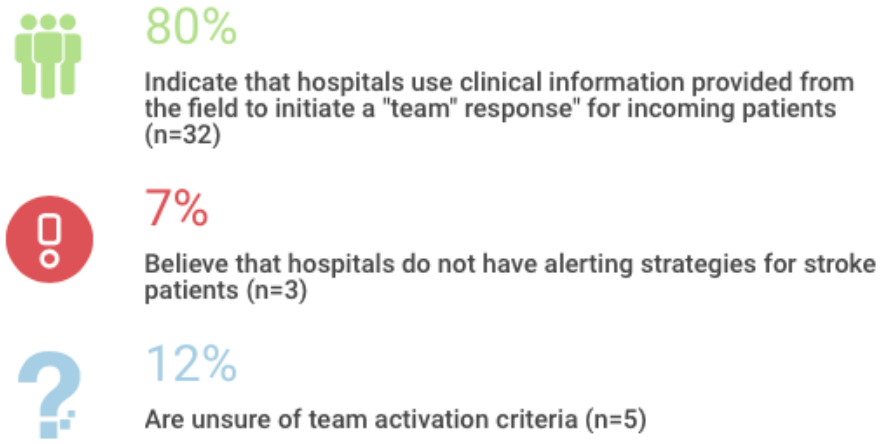
of states recognize community level destination protocols (n=11)

Team Activation Criteria for Stroke

> ***Do hospitals in your state recognize EMS-based "team activation criteria" for stroke? (i.e., hospital initiates pre-arrival team response based on clinical info provided from the field)*** *(n=40)*

Best evidence to support stroke prenotification of receiving facilities has been published by the CDC[4,7,8] Eighty percent (n=32) of respondents indicate that hospitals use clinical information provided from the field to initiate a "team response" for incoming patients. 7% (n=3) of respondents believe that hospitals do not have alerting strategies for stroke patients and another 12% (n=5) are not sure.

Figure 12



[7] Patel, Mehul D., et al. "Prehospital Notification by Emergency Medical Services Reduces Delays in Stroke Evaluation." Stroke, vol. 42, no. 8, 2011, pp. 2263–2268., doi:10.1161/strokeaha.110.605857.

[8] English, Stephen W., et al. "Rethinking Prehospital Stroke Notification: Assessing Utility of Emergency Medical Services Impression and Cincinnati Prehospital Stroke Scale." Journal of Stroke and Cerebrovascular Diseases, vol. 27, no. 4, 2018, pp. 919–925., doi:10.1016/j.jstrokecerebrovasdis.2017.10.036.

National Accreditation Criteria Recognized by State

What national accreditation standards/entity does your state utilize? (select all that apply) *(n=40)*

The Joint Commission (TJC) is the single most influential accreditation body for stroke centers with 83% (n=33) of respondents that recognize TJC facility based standards. Forty eight percent (n=19) of respondents use Stroke Recognition Criteria established by the American Heart Association. Forty three percent (n=17) of respondents use standards created by Det Norske Veritas (DNV) Healthcare, a US based organization with Norwegian origins that is accredited as an ISO 9001 standards setting organization. Thirty three percent (n=13) of respondents acknowledge the Healthcare Facilities Accreditation Program (HFAP), an accreditation approach that grew out of the former hospital approval process of the American Osteopathic Association. Thirteen percent of state respondents (n=5) have created their own standards/criteria for stroke care recognition. One state commented they allow specialty centers to use criteria from the membership based organization Center for Improvement in Healthcare Quality, an option that was not included as a selection for all respondents.

Table 1

ACCREDITATION STANDARDS/ENTITY	%	n
AMERICAN HEART ASSOCIATION/AMERICAN STROKE ASSOCIATION	*48%*	*19*
HEALTHCARE FACILITIES ACCREDITATION PROGRAM (HFAP)	*33%*	*13*
THE JOINT COMMISSION	*83%*	*33*
DET NORSKE VERITAS (DNV)	*43%*	*17*
STATE-DEVELOPED CRITERIA	*13%*	*5*

It is important to note that most states do not mandate a specific accreditation body, rather, they permit recognition by multiple organizations using consensus based standards.

Figure 13

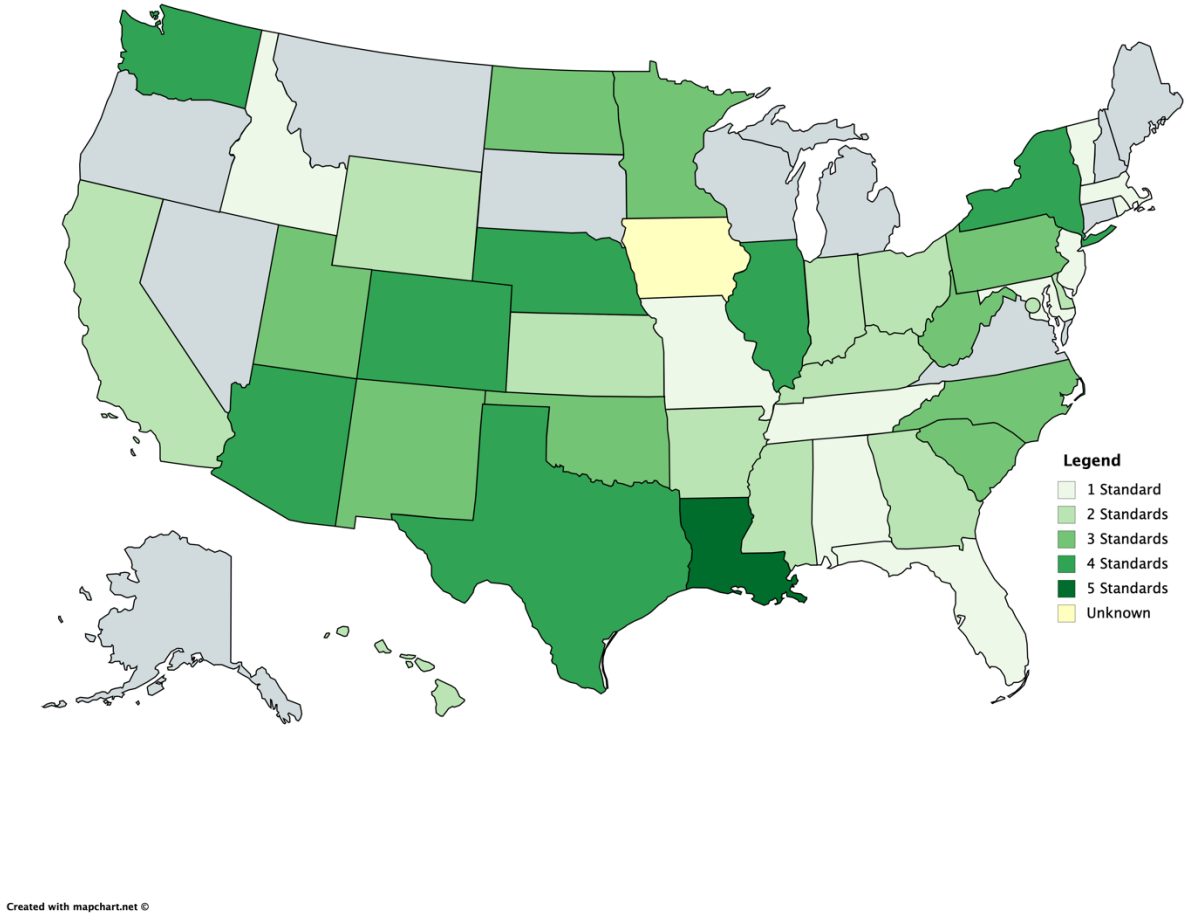
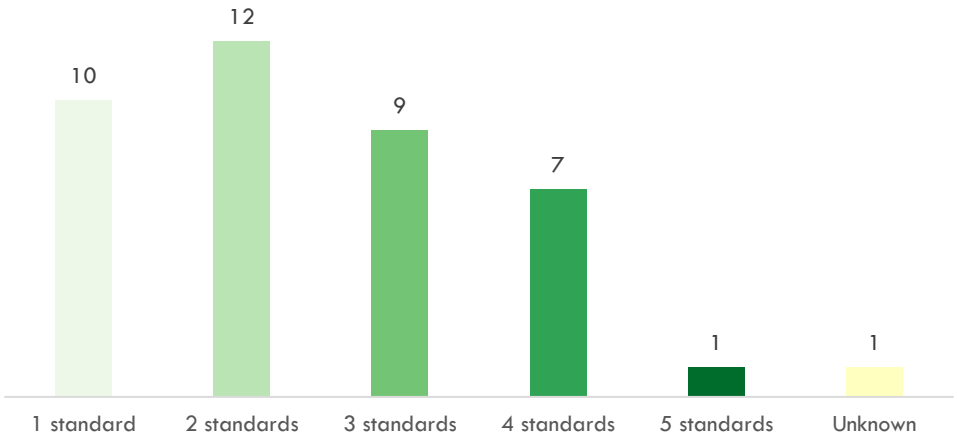


Chart 14



Frequency of Reverification

How often does your state review/reverify stroke centers? *(n=40)*

Fifty eight percent of respondents (n=23) accept the time frame for review/reverification established by the accreditation/issuing entity. Twenty eight percent of respondents (n=11) reverify stroke centers every 3-4 years while 5% of respondents (n=2) reverify every 5 years. Five percent of respondents (n=2) do not reverify stroke centers once they have been recognized.

State Stroke Registry

Does your state participate in a stroke registry? (n=40)

Figure 14

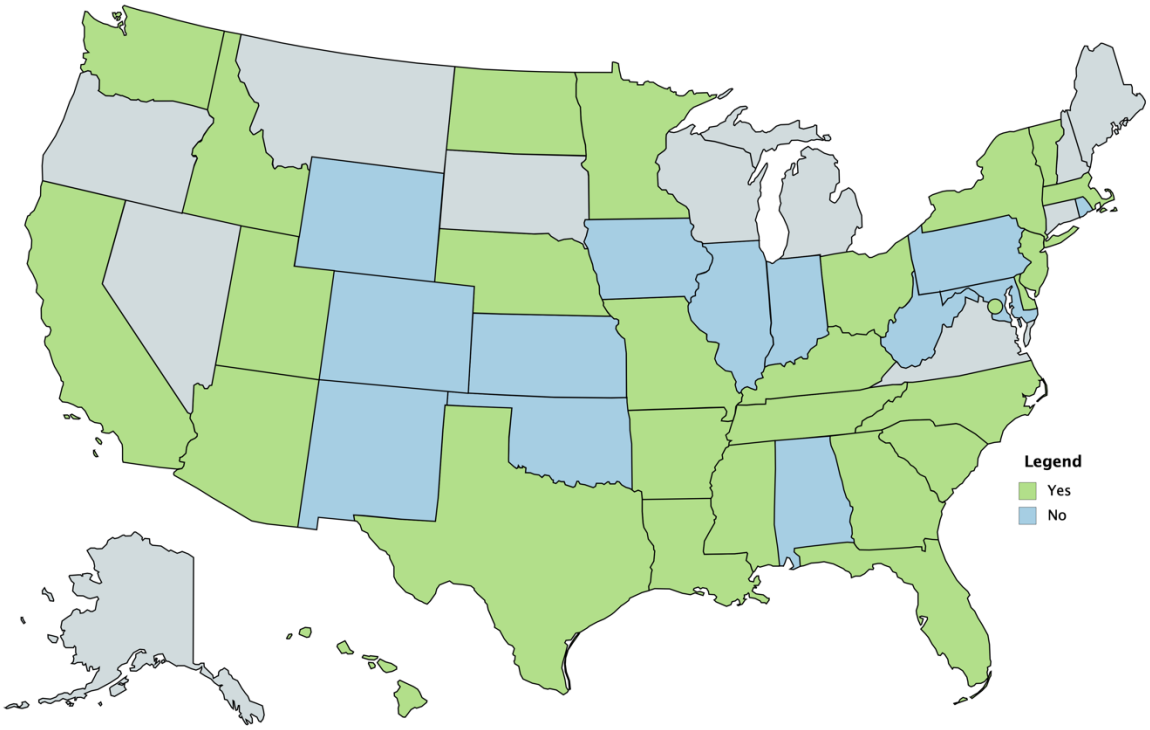
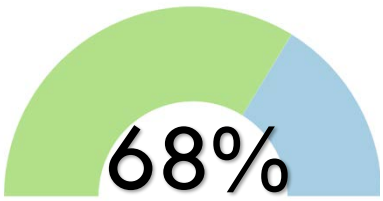


Chart 15



of states with a stroke program participate in a stroke registry (n=27)

What stroke registry does your state participate in? (select all that apply) *(n=27)*

Fifty two percent of respondents (n=14) are involved in submitting data to Get With The Guidelines – Stroke. 44% of respondents (n=12) have established state based stroke registries. Eleven percent of respondents (n=3) are involved in health information exchanges that are not specific to stroke. The Paul Coverdell National Acute Stroke Registry was acknowledged by 30% of respondents (n=8.) One respondent indicated that stroke care and data submission requirements are specific to hospitals, not EMS.

Table 2

STROKE REGISTRY	**%**	**n**
GET WITH THE GUIDELINES – STROKE	*56%*	*15*
PAUL COVERDELL NATIONAL ACUTE STROKE REGISTRY	*30%*	*8*
STATE-DEVELOPED	*44%*	*12*

Number of Stroke Registries in which States Participate

Figure 15

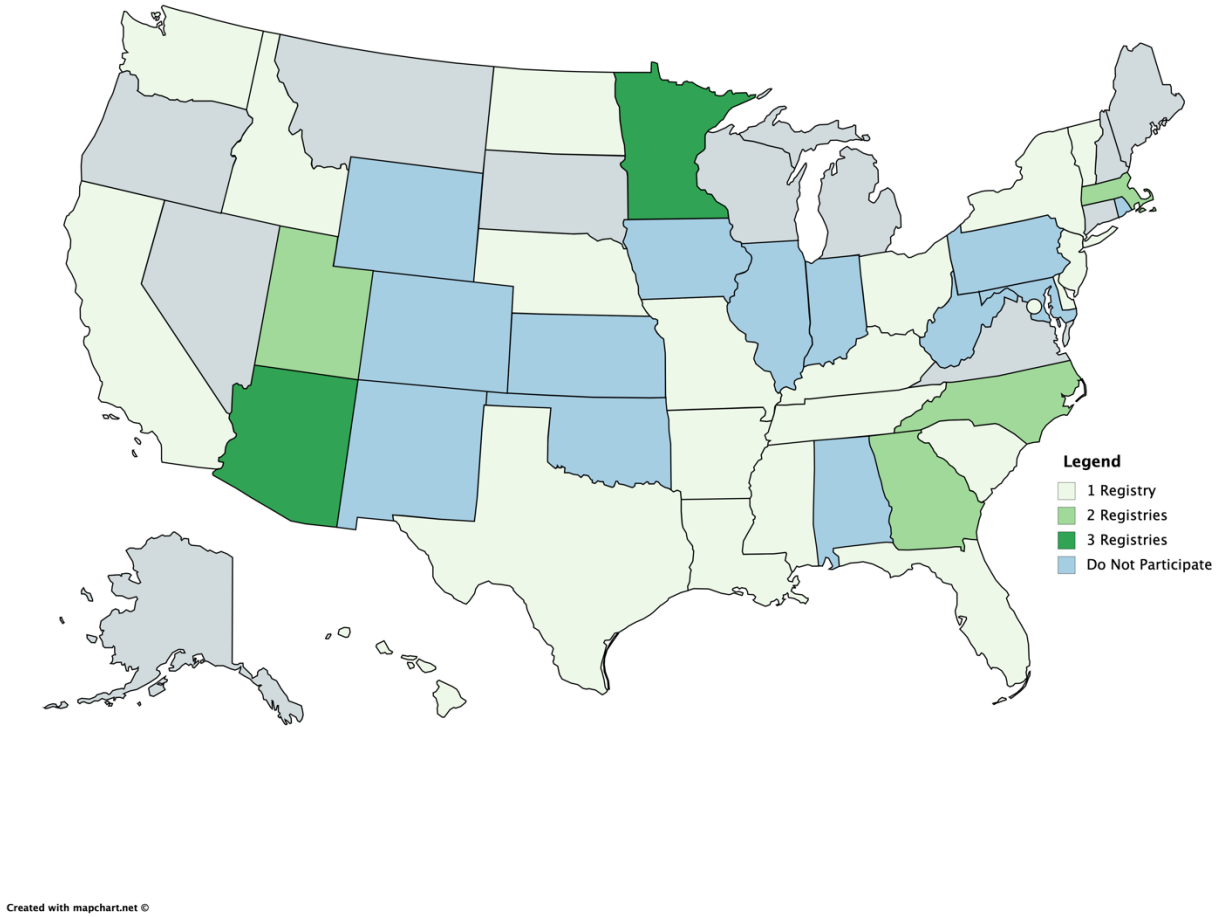
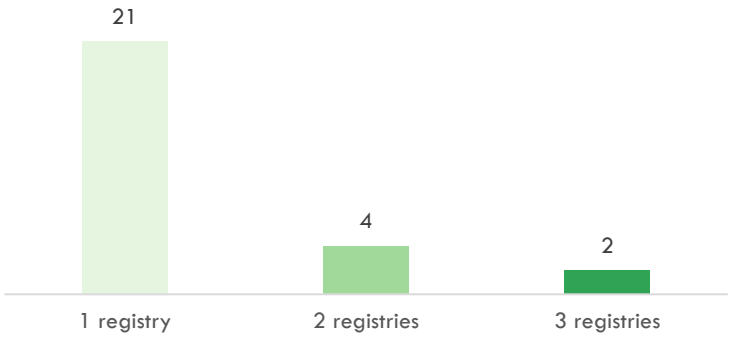


Chart 16



Use of EMS Stroke Assessment Tools

How are preferred prehospital stroke assessment tools determined in your state? (n=40)

In this question, respondents had the ability to select more than one option. Fifty one percent of respondents (n=20) recognize regional/local decisions for assessment tools. Thirty one percent of respondents (n=12) have a statewide mandate although two states specifically added comments that local medical directors could supersede the state recommendation and one respondent indicated that the documentation of a stroke assessment tool was voluntary and not required by the state.

What stroke assessment tool(s) are in use in your state? (n=40)

We identified multiple stroke assessment tools available to EMS personnel through mobile applications and the National EMS Information System (NEMSIS.) Stroke scales identified with an asterisk (*) are elements currently listed as data elements in the NEMSIS. In this question, respondents had the ability to select more than one option and two stroke assessment tools dominated the replies. Seventy three percent of respondents (n=29) use **both** the *Cincinnati Stroke Triage Assessment Tool (C-STAT) and *Face Arm Speech Time (F.A.S.T.) The use of the *Los Angeles Motor Score (LAMS) is used by 28% of respondents (n=11). The *Miami Emergency Neurologic Deficit Checklist and Rapid Arterial Occlusion Evaluation (RACE) are acknowledged by 20% of respondents (n= 8.) Ten percent of respondents (n=4) selected the Prehospital Acute Stroke Severity (PASS) and Vision-Aphasia-Neglect (VAN) tools as options. Zero respondents are currently using the *Boston Stroke Scale as part of an EMS assessment. Five percent of respondents (n=2) currently utilize the *NIH Stroke Scale, an 11 point scale arguably not practical for use in EMS settings.

Table 3

STROKE ASSESSMENT TOOLS	**%**	**N**
*BOSTON STROKE SCALE (also known as the Massachusetts stroke scale)	*0%*	*0*
*CINCINNATI STROKE TRIAGE ASSESSMENT TOOL (C-STAT)	*73%*	*29*
*LOS ANGELES MOTOR SCORE (LAMS)	*28%*	*11*
*MIAMI EMERGENCY NEUROLOGIC DEFICIT (MEND) CHECKLIST	*20%*	*8*

STROKE ASSESSMENT TOOLS	%	N
*FACE ARM SPEECH TIME (F.A.S.T.)	*73%*	*29*
*NIH STROKE SCALE	*5%*	*2*
PREHOSPITAL ACUTE STROKE SEVERITY (PASS)	*10%*	*4*
RAPID ARTERIAL OCCLUSION EVALUATION (RACE)	*20%*	*8*
VISION-APHASIA-NEGLECT (VAN)	*10%*	*4*
OTHER	*25%*	*10*

Figure 16

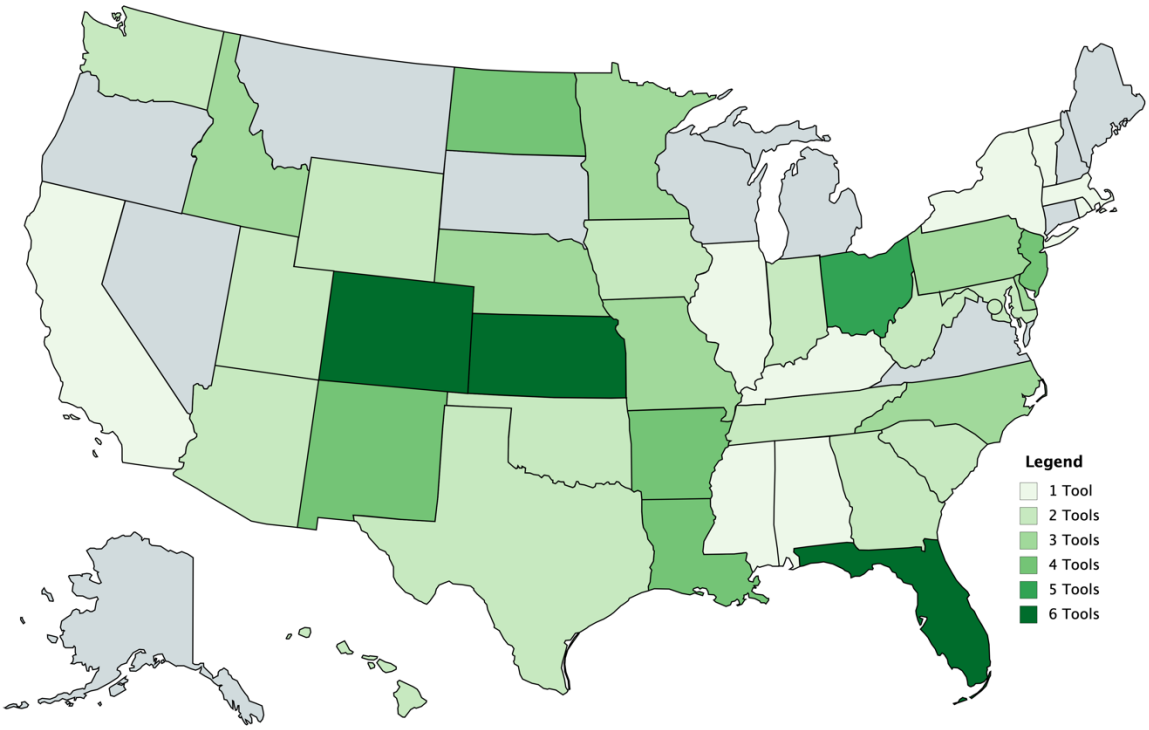
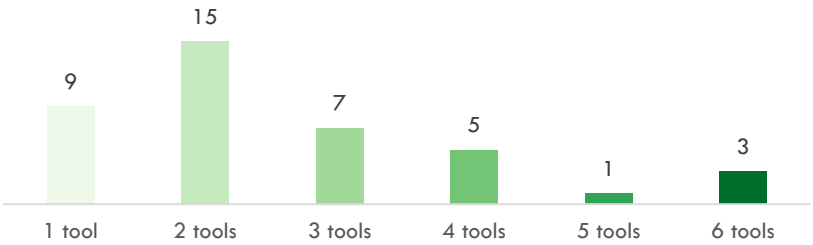


Chart 17



Mobile Stroke Ambulances

Does your state license/recognize Mobile Stroke Ambulances? (n=40)

Fifty percent of respondents (n=20) do not specifically license mobile stroke ambulances to operate in the state. Five percent of respondents (n=2) mentioned specific licensing criteria for mobile stroke ambulances and 30% of respondents (n=12) offer an exception or waiver process to current ambulance licensing requirements.

Point of Care Testing for Stroke

What EMS point-of-care testing is allowed/encouraged in your state for suspected stroke patients? (not including blood drawn for testing in hospital) (n=40)

Ninety eight percent of respondents (n=39) encourage EMS personnel to assess a blood glucose for a suspected stroke patient. Ten percent of respondents (n=4) support coagulation calculation using an International Normalized Ratio (INR). Nine percent of respondents (n= 3) permit a platelet count or defer to local medical direction for advice on point of care testing for stroke assessment.

Table 4

POINT OF CARE TESTING	%	n
BLOOD GLUCOSE	*98%*	*39*
INR	*10%*	*4*
PLATELET COUNT	*3%*	*1*
OTHER	*8%*	*3*

Paramedic Use of Thrombolytics

Is the paramedic use of prehospital thrombolytic/fibrinolytic therapy (such as tPA) for stroke permitted in your state? *(n=40)*

Thirty three percent of respondents (n=13) permit administration of tPA by paramedics. Just over two-thirds of respondents, 68% (n=27), do not permit the administration of tissue plasminogen activators (tPA) by paramedics. These results may be higher in states where the local medical director has the authority to supersede statewide protocols.

Figure 17

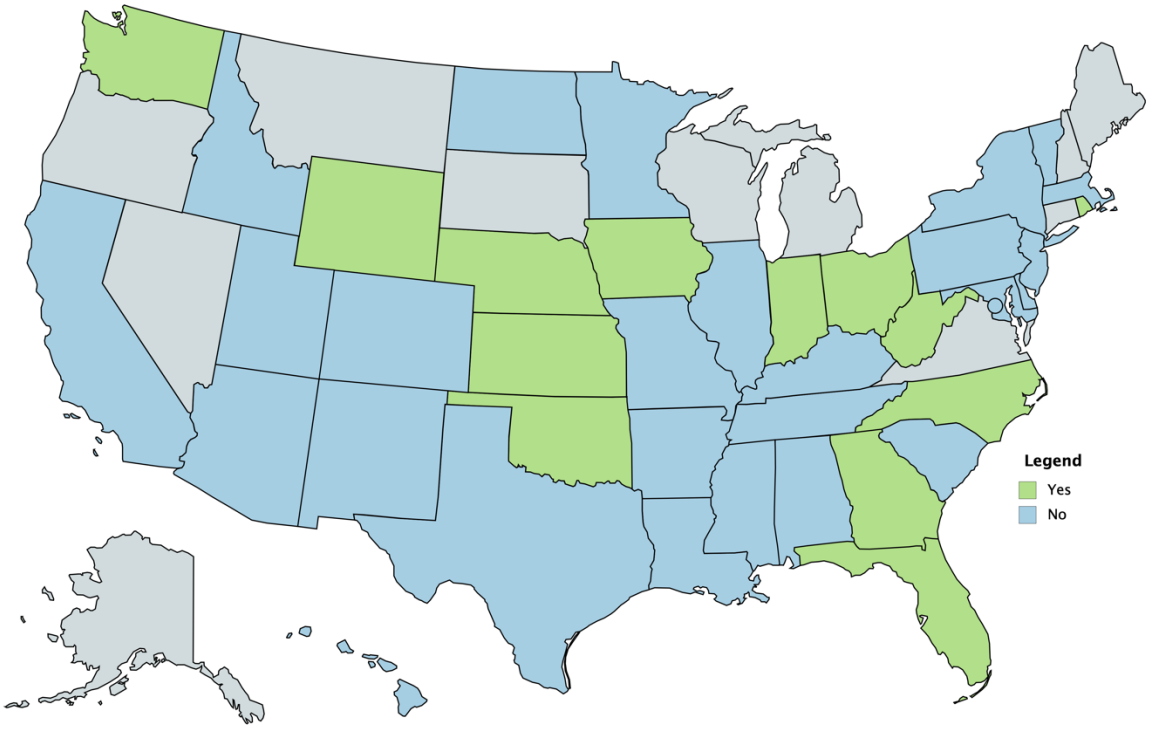
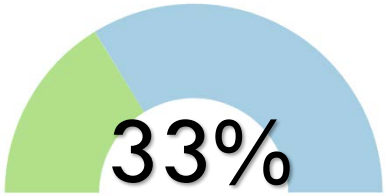


Chart 18



of states allow for the use of prehospital thrombolytic/ fibrinolytic therapy (n=13)

What criteria for the paramedic use of prehospital thrombolytic/ fibrinolytic therapy (such as tPA) for stroke is required in your state? (select all that apply) *(n=13)*

In situations where there were multiple criteria in use, respondents had the ability to select more than one option. In the states that permit paramedic use of tPA, 77% of respondents (n=10) offer written protocols to guide administration. Thirty eight percent of respondents (n=5) require specialized training such as critical care transport, and 31% of respondents (n=4) require on-line medical direction before paramedics initiate thrombolytic/fibrinolytic therapy for stroke.

Table 5

CRITERIA FOR USE	%	n
WRITTEN PROTOCOLS	*25%*	*10*
SPECIALIZE TRAINING (E.G., CRITICAL CARE TRANSPORT)	*13%*	*5*
ON-LINE MEDICAL COMMAND	*10%*	*4*

Number of Required Criteria for Thrombolytic/Fibrinolytic Therapy in Stroke

Figure 18

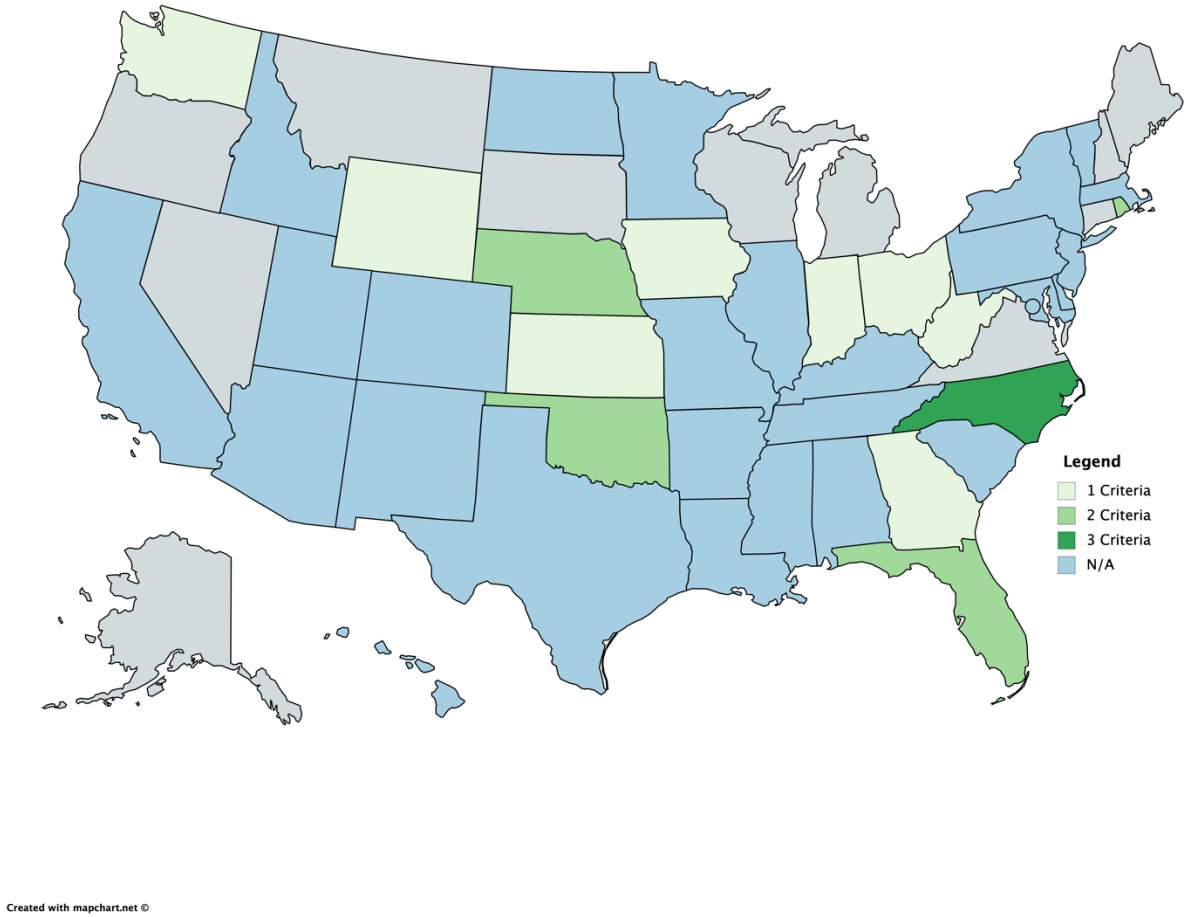
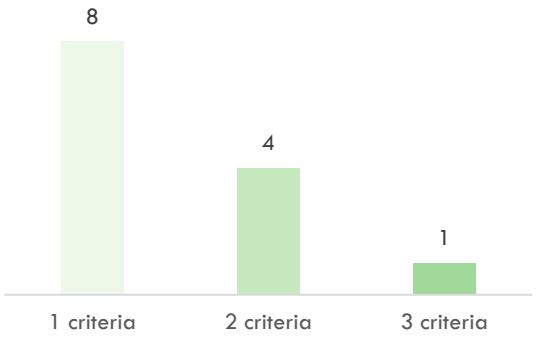


Chart 19



Stroke Quality Metrics

What stroke quality metrics (performance measures) from the National EMS Clinical Guidelines do you evaluate? (select all that apply) (n=40)

States may choose to evaluate several quality indicators to assess the quality of patient care. For the purposes of this discussion, NASEMSO specifically inquired about suggested metrics published in the National Model EMS Clinical Guidelines[9] It is important to note that state EMS offices share responsibilities with multiple other agencies and actual results are likely higher than projected here. Eighty percent of respondents (n=32) evaluated two specific metrics: documentation of last seen normal and blood glucose analysis. Sixty eight percent of respondents (n=27) assessed the use of a validated stroke score. Sixty five percent of respondents (n=26) analyze EMS scene time with a goal of less than 20 minutes. Sixty percent of respondents (n=24) look for documentation that hospital stroke team pre-arrival alert or activation occurred as early as possible after stroke assessment findings in the prehospital setting.

Table 6

QUALITY METRIC	%	N
DOCUMENTATION OF TIME "LAST SEEN NORMAL"	80%	32
USE OF VALIDATED STROKE SCORE	66%	27
BLOOD GLUCOSE LEVEL OBTAINED	80%	32
EMS SCENE TIME MINIMIZED	65%	26
HOSPITAL STROKE TEAM PRE-ARRIVAL ALERT OR ACTIVATION OCCURRED AS EARLY AS POSSIBLE	60%	24

[9] National Model EMS Clinical Guidelines. National Association of State EMS Officials, 2019, National Model EMS Clinical Guidelines. Accessed March 10, 2020 at https://nasemso.org/projects/model-ems-clinical-guidelines/.

Number of Stroke Quality Metrics Used by States

Figure 19

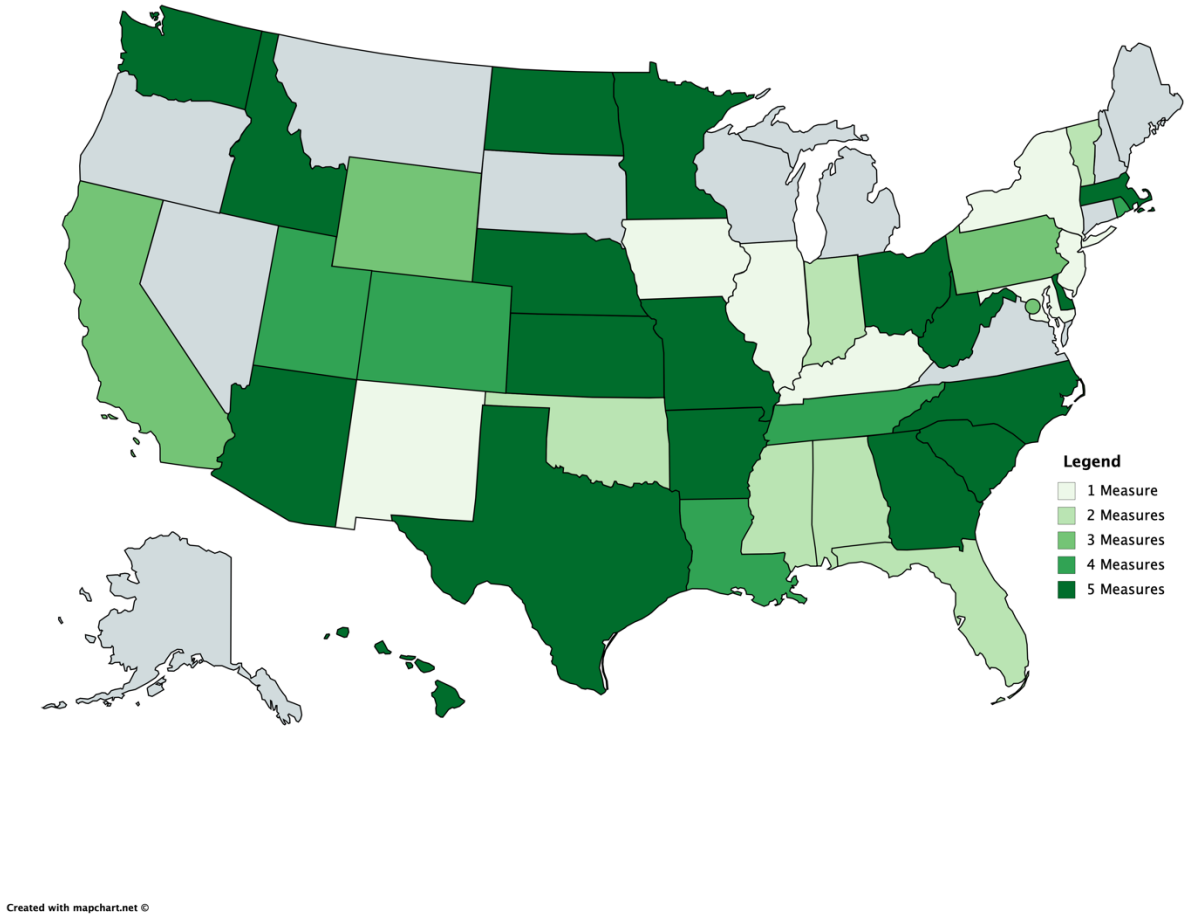
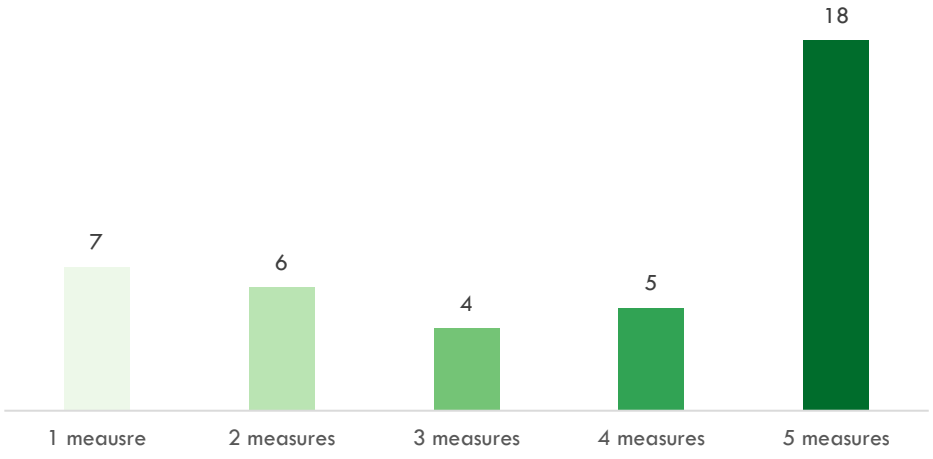


Chart 20



CHEST PAIN CENTERS

Designate/Certify/Recognize/Coordinate Chest Pain Centers

The references to "designate, certify, recognize, and coordinate" is intended to reflect whatever process or terminology a state uses that results in a statewide identification of facilities that provides focused specialty care. In general, states are provided the legal authority to designate specialty centers through an authorization provided to them by the state legislature. "Designation" is a process outlined by and reserved for a state agency. "Accreditation" engages criteria (i.e. standards) developed by an outside professional organization which involves facility, staffing, equipment, and other requirements used to describe resources and capabilities. "Verification" services can be offered by the state and/or an accrediting agency that attests to compliance with predefined standards that is usually comprised of a comprehensive review of documentation with an on-site inspection.

> *DISCLAIMER: It is very important to note that while we intended to collect data on all statewide system coordination activities, some states responded from the state EMS office perspective as if the program office was located in and managed by the state EMS office. Other states attempted to respond even if systems coordination is managed by a different authority. A few states deferred to program offices beyond EMS. Other states skipped specific questions entirely. Actual results may vary based on the position of the respondent. Therefore, we present these results based on the number of respondents to a specific question and not as a percentage or representation of all state practices.*

Legislative Authority for State to Recognize Specialty Chest Pain Centers

> ***Does your state designate/certify/recognize/coordinate chest pain centers? (designations are usually based on a facility's STEMI treatment capabilities and strategies)*** *(n=42)*

In this question, respondents were able to choose from three options: the availability of authorizing legislation, the state provision of oversight to voluntary accreditation activities among facilities, and a reflection on the inability to provide state oversight/support to this activity at all. Authorizing legislation is available to 31% (n=13) of states to recognize chest pain centers and another 21% (n=9) provides voluntary accreditation services. Forty eight percent of respondents (n=20) do not currently have the ability to authorize or recognize chest pain/STEMI centers.

Figure 20

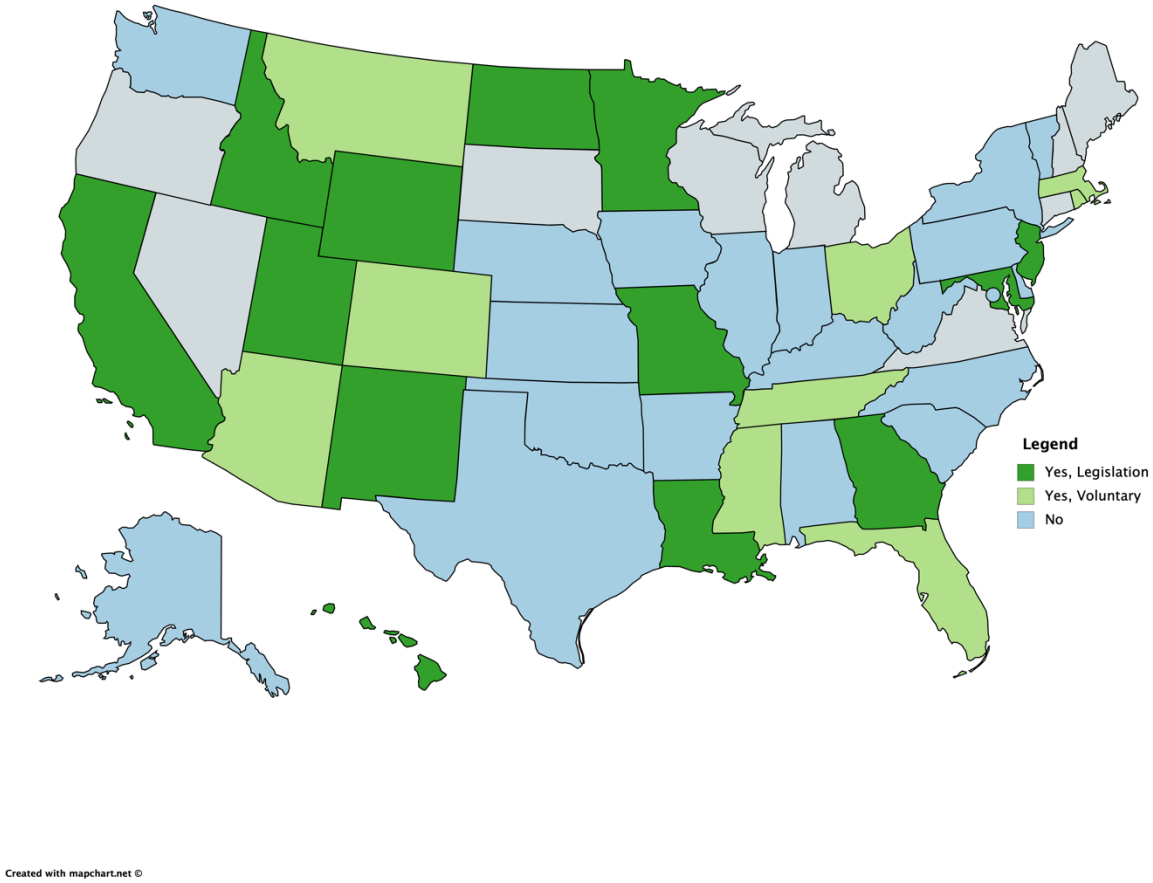
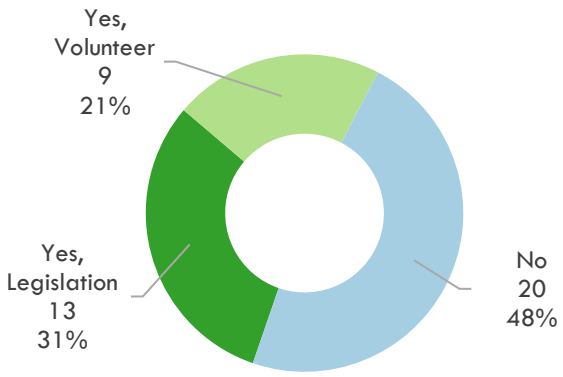


Chart 21



Statewide Designation and National Accreditation

How does the state designate/certify/recognize/coordinate chest pain centers? *(n=22)*

For STEMI care, the majority of states (55% of respondents or n=12) recognize a national certification/accreditation process and do not conduct their own site visit. 14% (n=3) of respondent states utilize a hybrid process, in other words, a combination of national and state elements. Seven states (32% of respondents) establish state specific criteria and perform their own site visits.

Figure 21

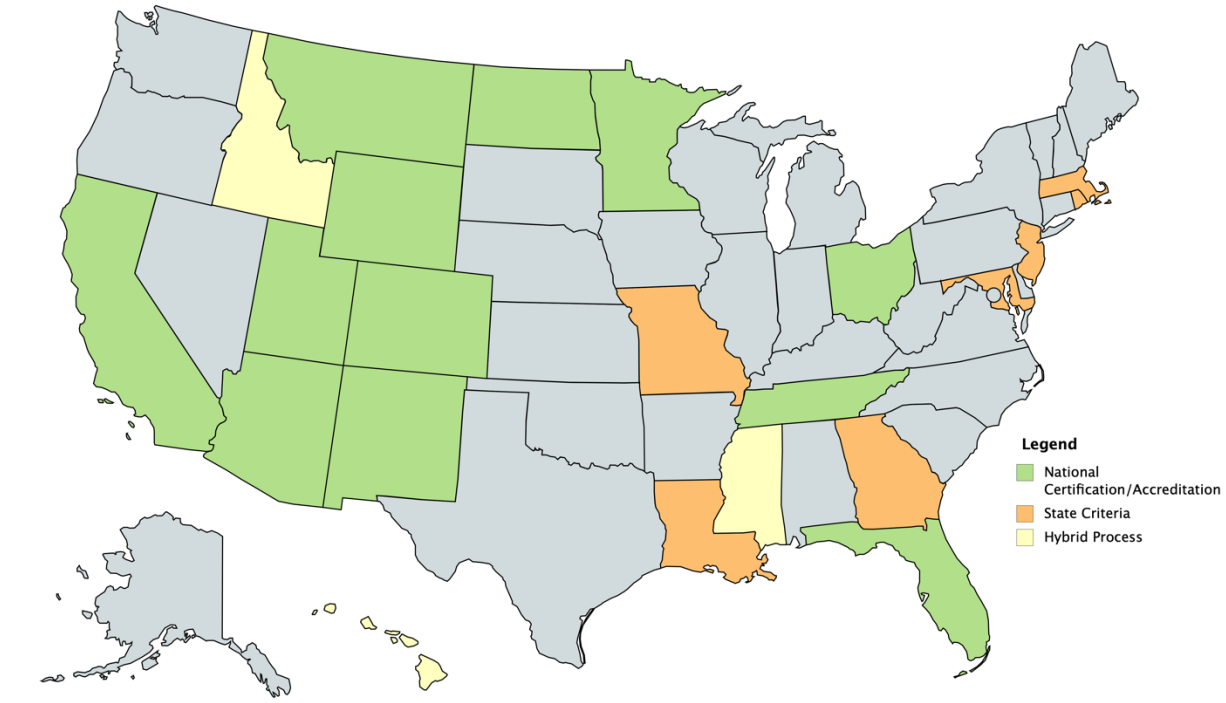
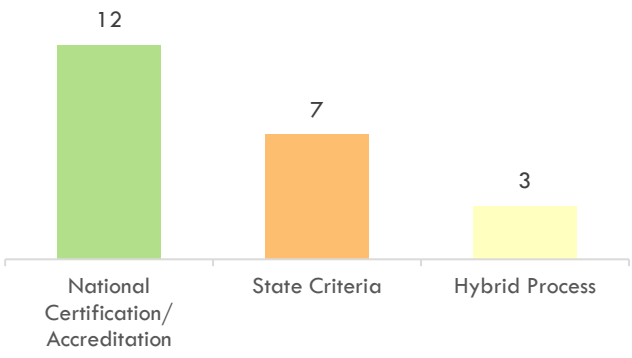


Chart 22

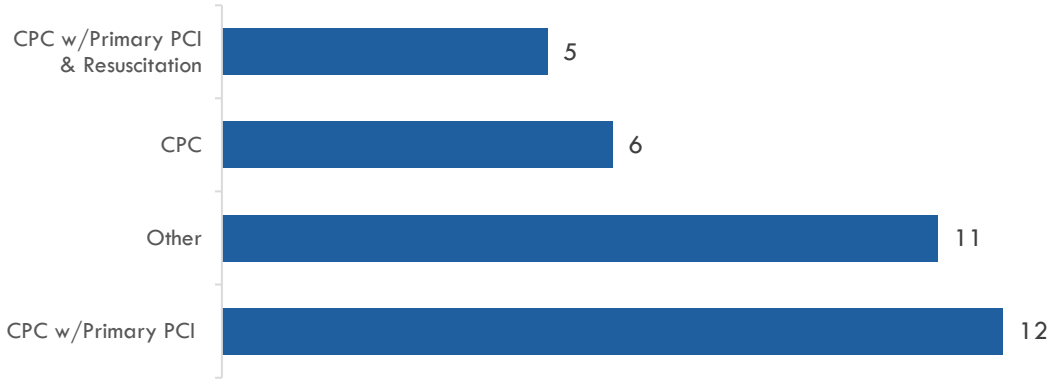


Levels of Chest Pain Centers

What levels of chest pain centers are recognized in your state? (select all that apply) *(n=22)*

While the majority of states with chest pain centers are using national accreditation definitions, several alternate definitions/descriptions have emerged as described below.

Chart 23



Other – 50% (n=11)

- Cardiac Ready Communities
- Cardiac Receiving and Cardiac Referral Centers
- EKG Transmission Capable
- Level I Emergency Cardiac Care Center (24/7 PCI and on-site surgical backup, ability to implant AICD and percutaneous LVAD, protocols for therapeutic hypothermia for OHCA), Level II Emergency Cardiac Care Center (24/7 PCI, protocols for therapeutic hypothermia for OHCA), Level III Emergency Cardiac Care Center (protocols for therapeutic hypothermia for OHCA)
- STEMI Levels I and II
- STEMI Receiving Center
- STEMI Referring Center
- STEMI Receiving Center, and STEMI Referring Hospital
- Heart Attack Receiving Center; Heart Attack Referring Center

Chest Pain Center

Figure 22

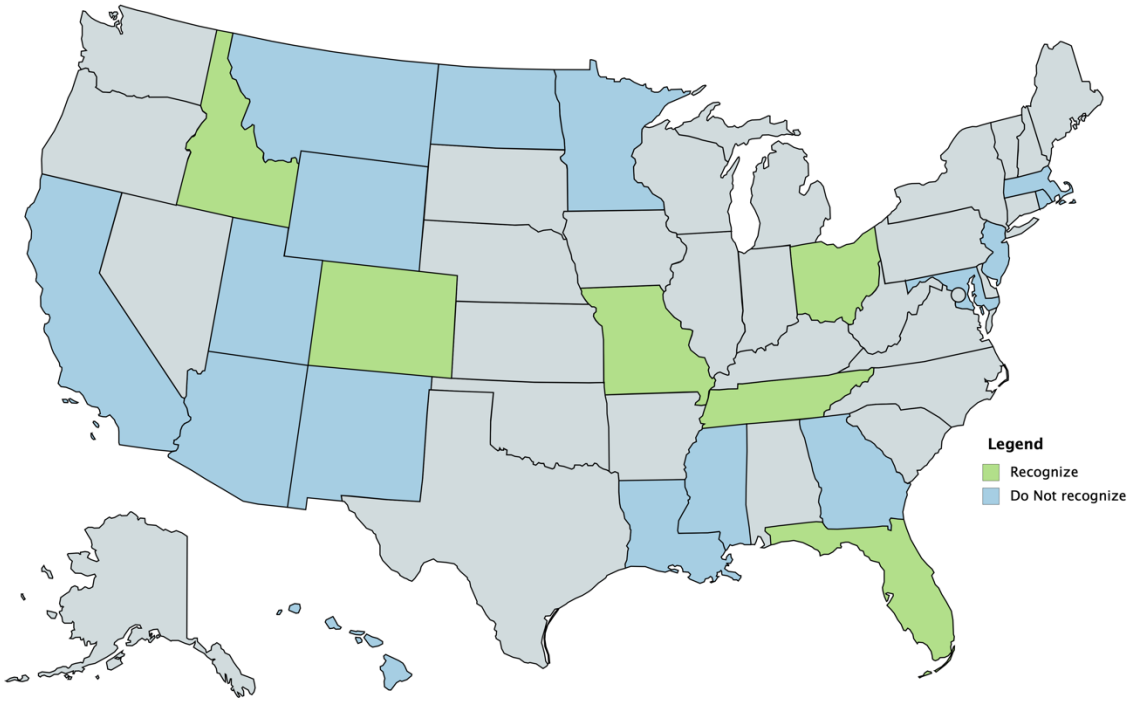


Chart 24

of states recognize Chest Pain Centers
(n=6)

Chest Pain Center with Primary Percutaneous Coronary Intervention (PCI)

Figure 23

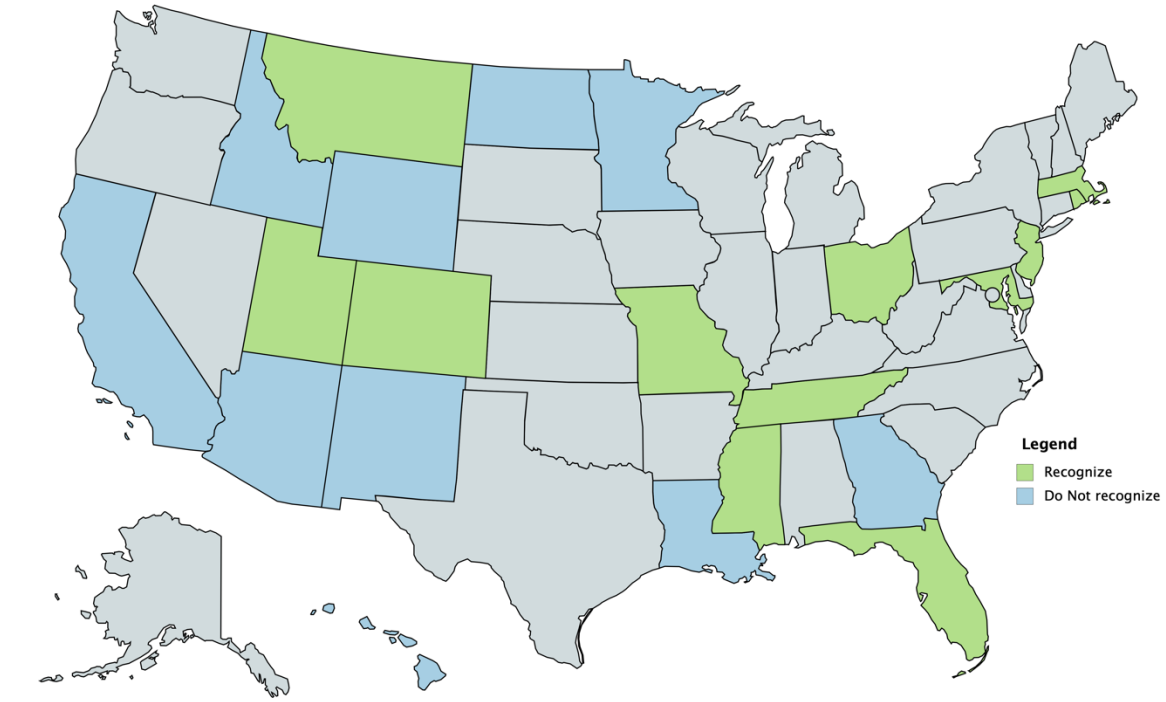


Chart 25

of states recognize CPC with PCI capabilities

Chest Pain Center with Primary PCI and Resuscitation

Figure 24

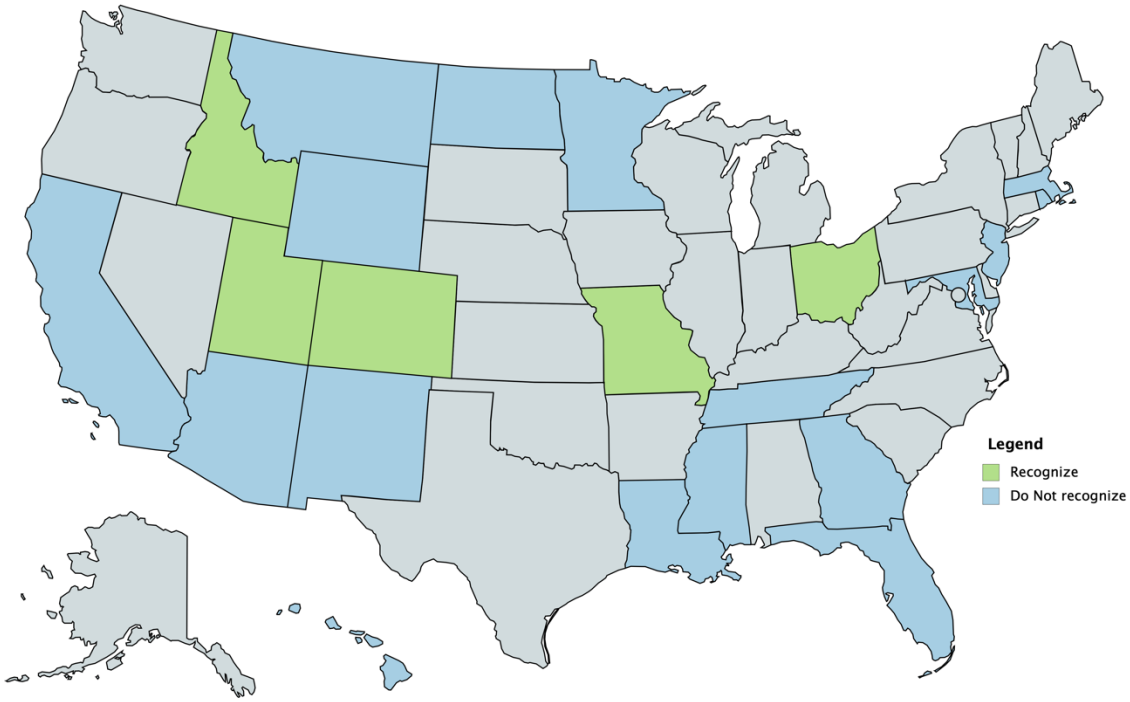


Chart 26

of states recognize CPC with
primary PCI & resuscitation capabilities
(n=5)

Please enter the total # of recognized chest pain centers in your state by category CPC, PCI, PCI and Resuscitation, and Other. *(n=17)*

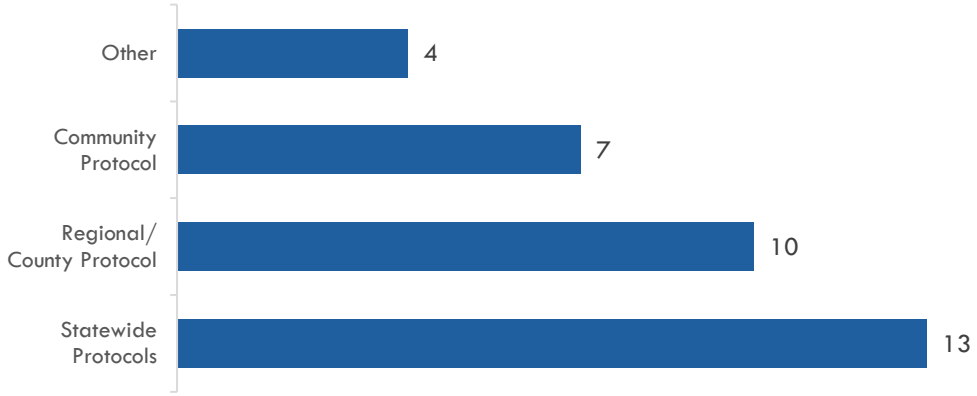
Among 17 respondents, we identified that while the possibility of national recognition levels existed, the majority of system participants lean equally towards credentialing in one of the alternate levels recognized by the states. A total of 245 cardiac centers were reported although this estimate is most likely underestimated as several respondents skipped this question.

EMS Transport and Destination Decisions

> ***How are chest pain transport and destination decisions determined in your state? In other words, if ambulances can bypass facilities to go to a specialty center, what authority determines the proper guidance?*** *(n=22)*

In this question, states were able to select multiple responses and reflect the collaboration among states, EMS agencies, and medical directors to achieve the best care for patients. Fifty nine percent (n=13) of respondents have established statewide protocols or administrative rules that enables EMS personnel to transport patients directly to a specialty cardiac center. Forty five percent (n=10) or respondents noted regional or county level protocols while 32% (n=7) acknowledge that community or EMS agency protocols prevail. Zero states indicated that ambulances bypass was not permitted and the majority indicated heavy influence from EMS medical directors. The use of multiple practices to determine destination decisions is not uncommon. Twelve states (55%) use only one of the listed protocol types, eight states (36%) use two of the listed protocol types, and two states (9%) use three of the listed protocol types.

Chart 27



Statewide Protocols

Figure 25

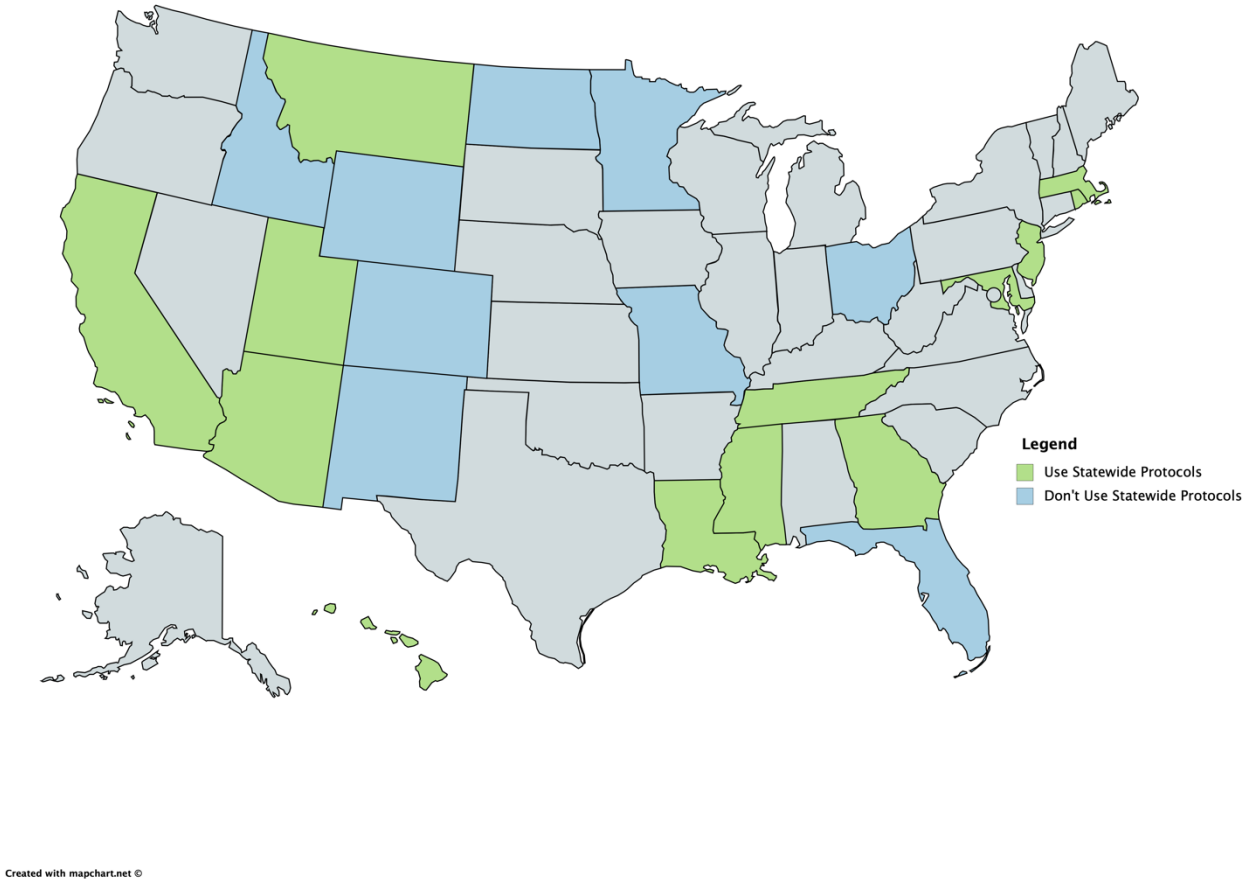


Chart 28

of states recognize statewide destination protocols (n=13)

Regional/County Level Protocols

Figure 26

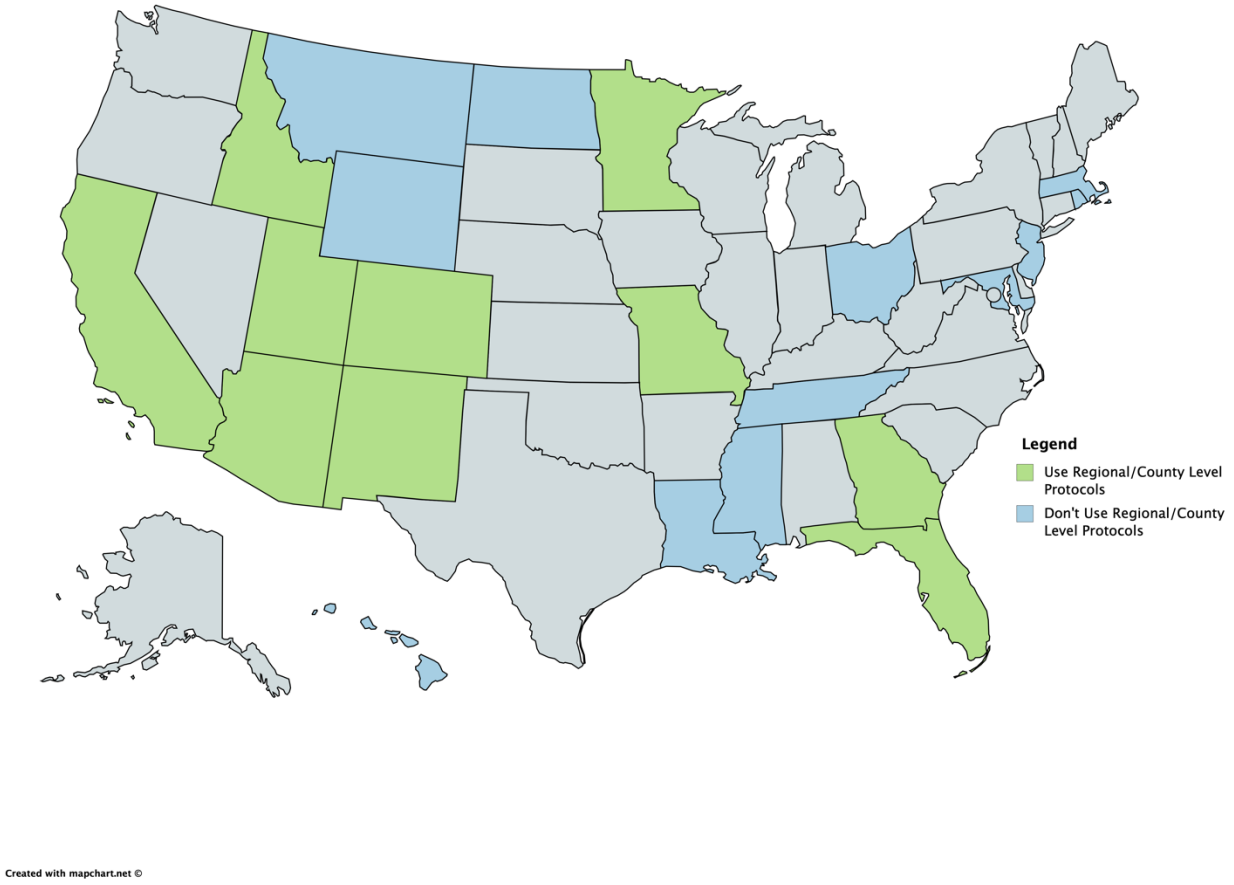


Chart 29

of states recognize regional/county level destination protocols

Community Level Protocols

Figure 27

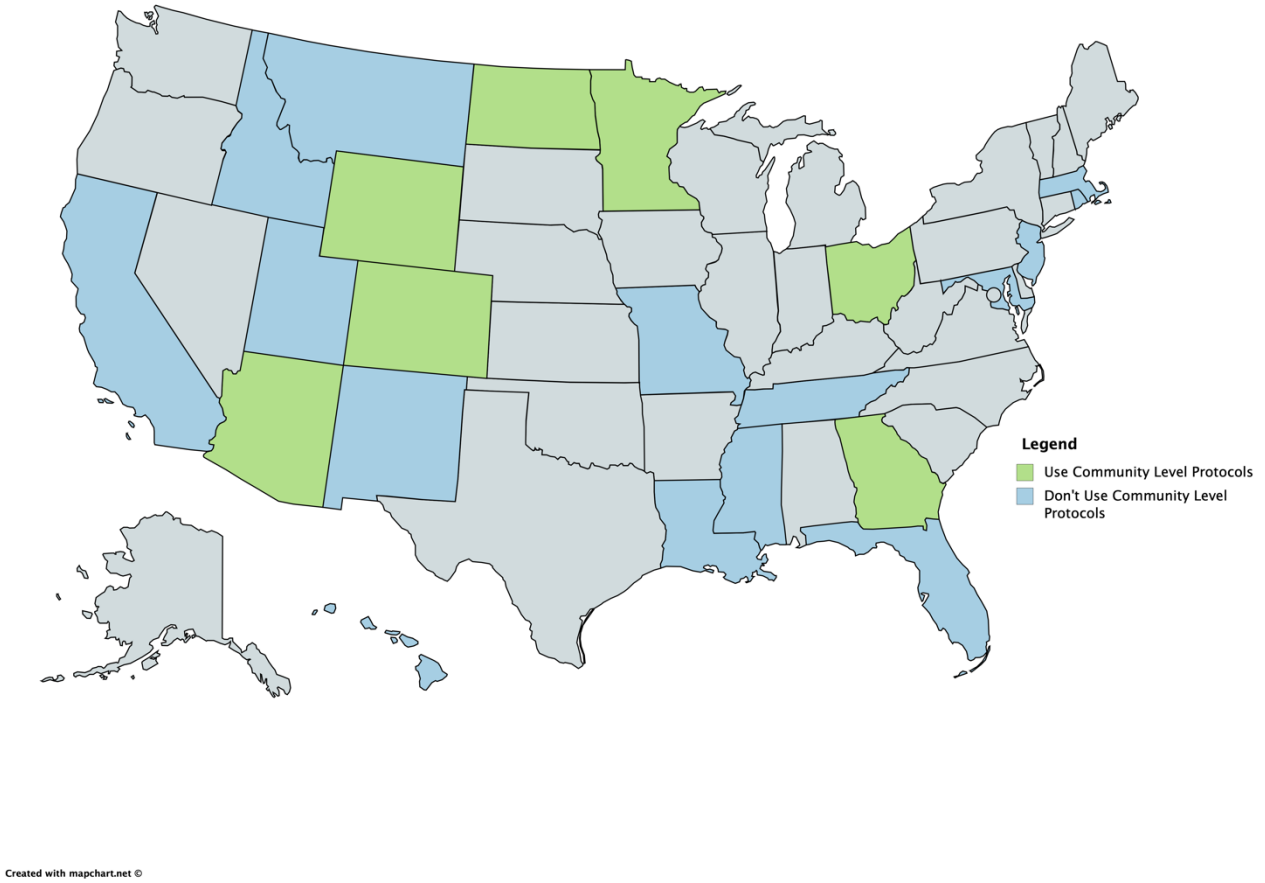


Chart 30

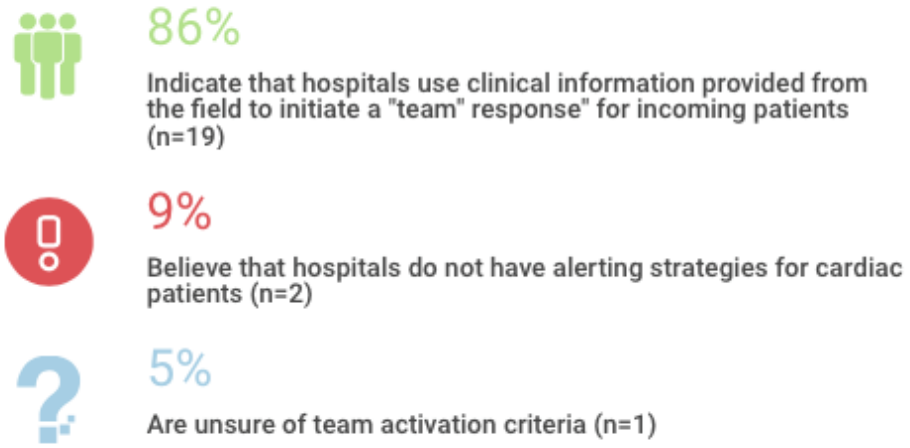
of states recognize community level destination protocols (n=7)

Team Activation Criteria for Chest Pain/STEMI

Do hospitals in your state recognize EMS-based "team activation criteria" for STEMI? (i.e, hospital initiates pre-arrival team response based on clinical info provided from the field) (*n*=22)

In contrast to stroke care, best evidence to support prenotification of cardiac receiving facilities has been published by peer reviewed journals and the American Heart Association[10]. Eighty six percent (n=19) of respondents indicate that hospitals use clinical information provided from the field to initiate a "team response" for incoming patients. Nine percent (n=2) of respondents believe that hospitals do not have alerting strategies for cardiac patients and another 5% (n=1) of respondents are not sure.

Figure 28



[10] Kontos, Michael C., et al. "Prehospital Activation of Hospital Resources (PreAct) ST-Segment–Elevation Myocardial Infarction (STEMI): A Standardized Approach to Prehospital Activation and Direct to the Catheterization Laboratory for STEMI Recommendations from the American Heart Association's Mission: Lifeline Program." Journal of the American Heart Association, 20 Jan. 2020, www.ahajournals.org/doi/10.1161/JAHA.119.011963.

National Accreditation Criteria Recognized by State

What national accreditation standards/quality entity does your state utilize?(select all that apply) (*n=22*)

The American Heart Association Mission: Lifeline is the single most influential accreditation body for cardiac centers with 55% of respondents (n=12) that recognize AHA's facility based standards. Forty five percent (n=10) of respondents use The Joint Commission (TJC). Thirty six percent of respondents (n=8) have implemented American College of Cardiology accreditation, Twenty seven percent of respondents (n=6) acknowledge The Society for Cardiovascular Patient Care (formerly known as The Society of Chest Pain Centers) Fourteen percent of respondents (n=3) use standards created by Det Norske Veritas (DNV) Healthcare. Thirty six percent of state respondents (n=8) have created their own standards/criteria for cardiac care recognition. One state offered information about the Accreditation for Cardiovascular Excellence, a department-approved, nationally recognized organization that provides Mission: Lifeline STEMI receiving or referring center accreditation or substantive equivalent. It is important to note that most states do not mandate a specific accreditation body, rather, they permit recognition by multiple organizations using consensus based standards.

Table 7

ACCREDITATION STANDARDS/ENTITY	%	n
AMERICAN COLLEGE OF CARDIOLOGY	36%	8
AMERICAN HEART ASSOCIATION	55%	12
DET NORSKE VERITAS (DNV)	14%	3
THE JOINT COMMISSION	45%	10
THE SOCIETY FOR CARDIOVASCULAR PATIENT CARE *(formerly known as the Society of Chest Pain Centers)*	27%	6
STATE-CREATED STANDARDS/CRITERIA FOR CARDIAC CARE RECOGNITION	36%	8
OTHER	5%	1

Number of Accreditation Standards States Recognize for Stroke

Figure 29

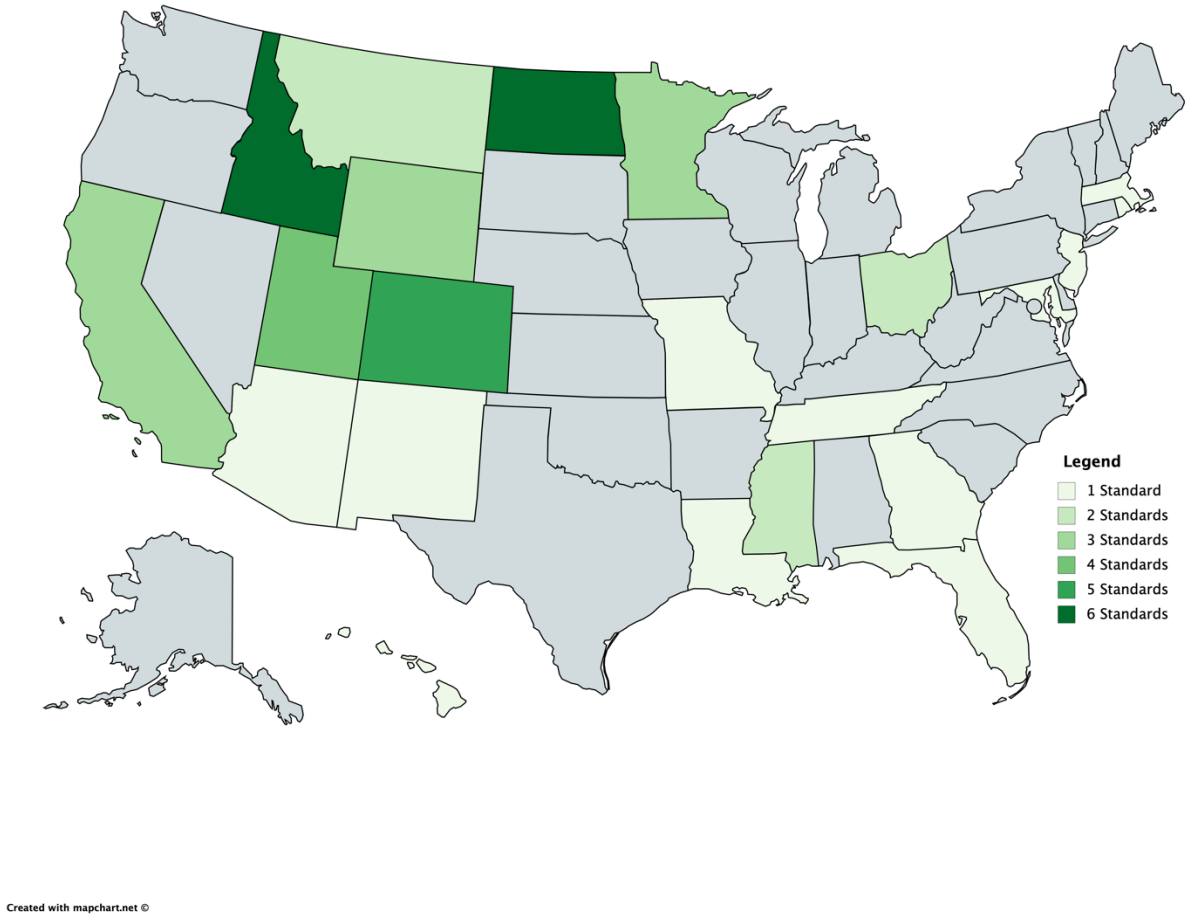
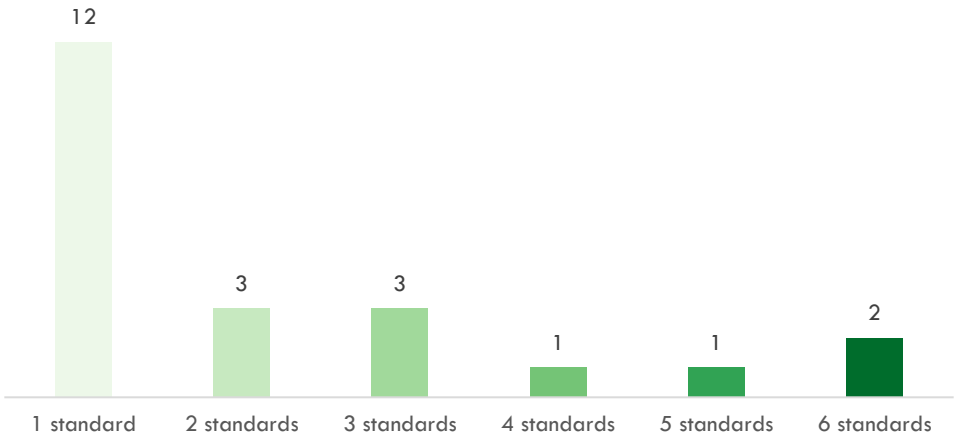


Chart 31



Frequency of Reverification

How often does your state review/reverify chest pain centers? *(n=22)*

Forty five percent of respondents (n=10) accept the time frame for review/reverification established by the accreditation/issuing entity. Thirty two percent of respondents (n=7) reverify stroke centers every three to four years while 9% of respondents (n=2) reverify every two years and 9% of respondents (n=2) reverify every five years. Five percent of respondents (n=1) do not reverify stroke centers once they have been recognized.

State Cardiac Care Registries

Does your state participate in a cardiac registry? (n=22)

Although states have become increasingly sophisticated in using data, 55% of respondents (n=12) indicated they report data to one or more cardiac care registries. Forty five percent of respondents (n=10) do not maintain or participate in registries specific to cardiac care.

Figure 30

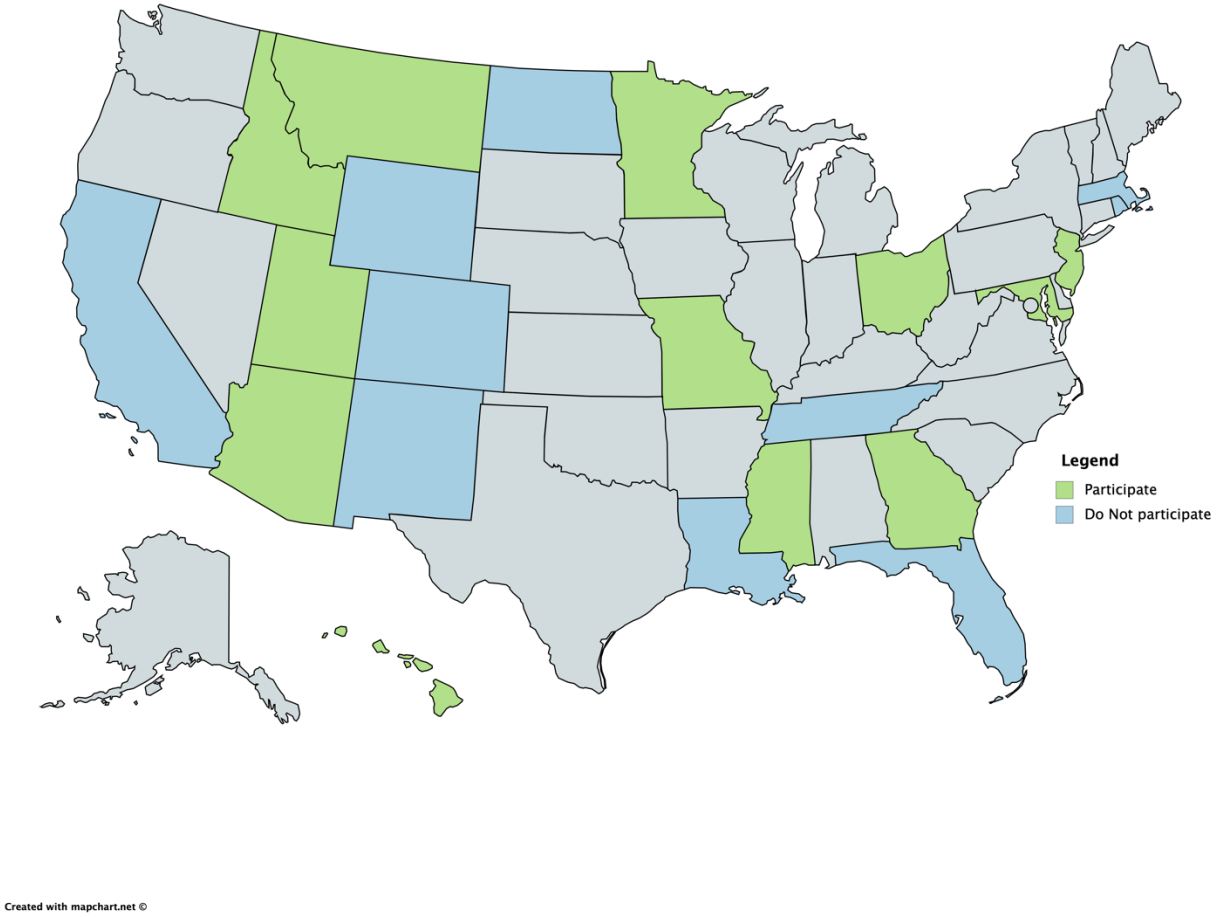
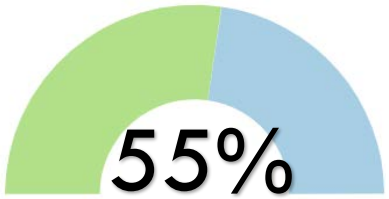


Chart 32



of states participate in a cardiac care registry (n=12)

What cardiac care registries does your state participate in? (n=12)

Of the 12 states that actively participate in cardiac care registries 50% of respondents (n=6) submit data to the Cardiac Arrest Registry to Enhance Survival (CARES). Forty two percent of respondents (n=%) have developed their own cardiac care registries. Twenty five percent of respondents (n=3) submit data to Get With the Guidelines (resuscitation, A-fib, CAD, or heart failure). Eight percent of respondents (n=1) provide data to the National Cardiovascular Data Registry.

Table 8

CARDIAC REGISTRY	%	n
CARDIAC ARREST REGISTRY TO ENHANCE SURVIVAL (CARES)	50%	*6*
GET WITH THE GUIDELINES (RESUSCITATION, A-FIB, CAD, OR HEART FAILURE)	8%	*3*
NATIONAL CARDIOVASCULAR DATA REGISTRY (NCDR)	25%	*1*
SOCIETY OF THORACIC SURGERY (STS)	0%	*0*
STATE-DEVELOPED	42%	*5*
OTHER	0%	*0*

Number of Cardiac Care Registries in which States Participate

Figure 31

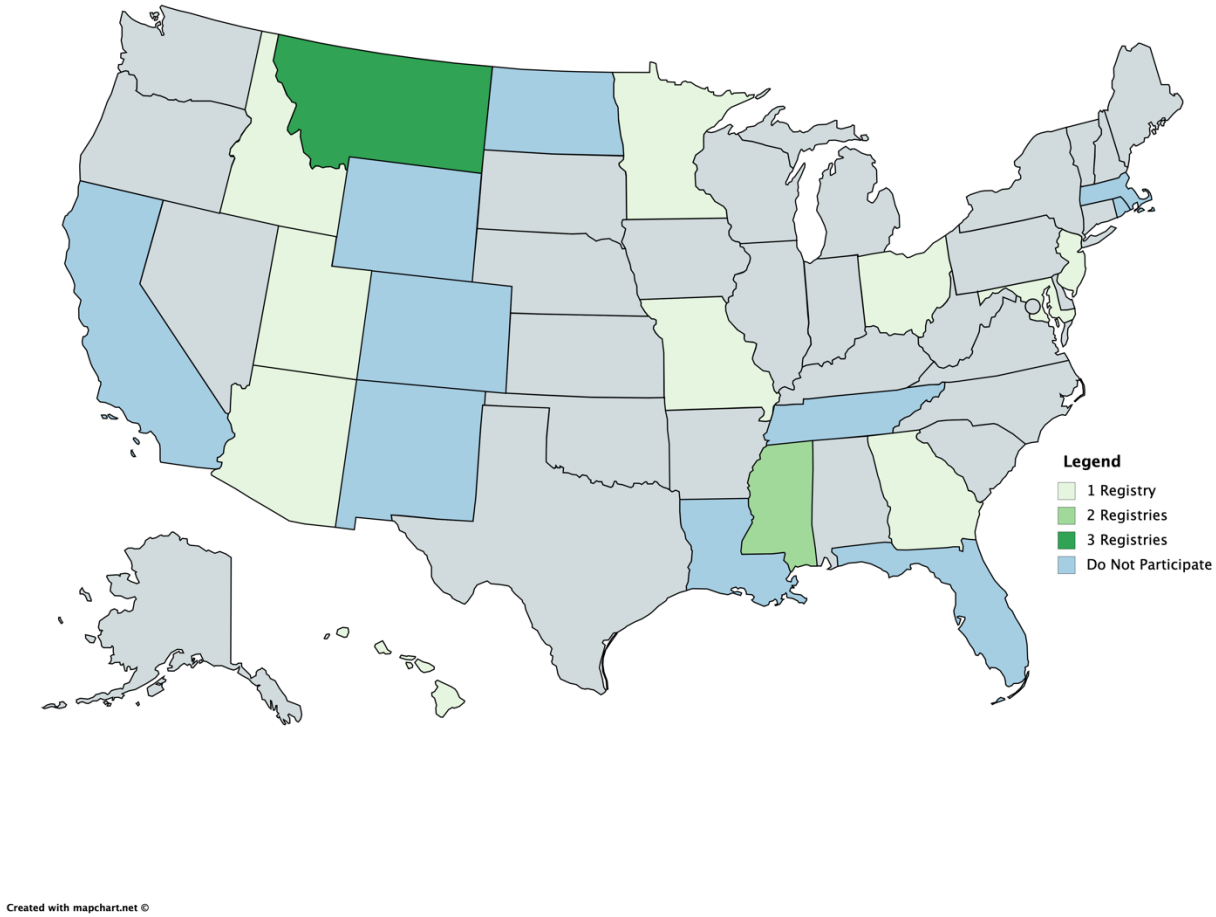
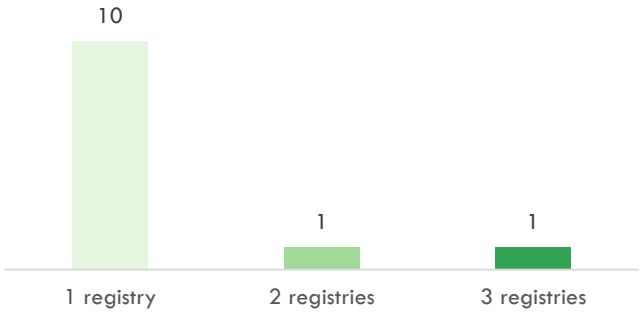


Chart 33



EMS Requirements for 12 Lead ECG Capabilities

ALS Transport Requirements to Carry

Are all ALS vehicles that transport patients required to carry 12 lead ECG capable monitors in your state? (n=12)

Twenty-two responses were submitted to this question and the responses were evenly divided: 50% of respondents (11) require ALS vehicles that transport patients and 50% of respondents (n=11) left the decision to carry 12 lead ECG monitors to local authorities. It is important to note that responses to this section are proportional to the number of states in the subpopulation that recognize specialty systems of care. It is not reflective of all state requirements on equipment.

ALS Non-Transport Requirements to Carry

Are all ALS non-transport vehicles required to carry 12 lead ECG capable monitors in your state? (i.e. interface unit, supervisor unit, "fly car")? (n=12)

Twenty-two responses were submitted to this question. Seventy seven percent of respondents (n=17) left the decision to carry 12 lead ECG monitors to local authorities and 23% of respondents (n=5) indicate the decision for ALS non-transport vehicles to carry 12 lead ECG monitors is actually a state mandate. It is important to note that responses to this section are proportional to the number of states in the subpopulation that recognize specialty systems of care. It is not reflective of all state requirements.

Interpret 12 Lead ECGs

Are paramedics taught to interpret 12 lead ECGs in your state?
(n=22)

Ninety five percent of respondents (n=21) in this subpopulation indicate that paramedics are taught to interpret 12 lead ECGs while 5% of respondents (n=1) indicates the practice varies by EMS agency. 12 lead ECG interpretation is included in the National EMS Scope of Practice Model.

Figure 32

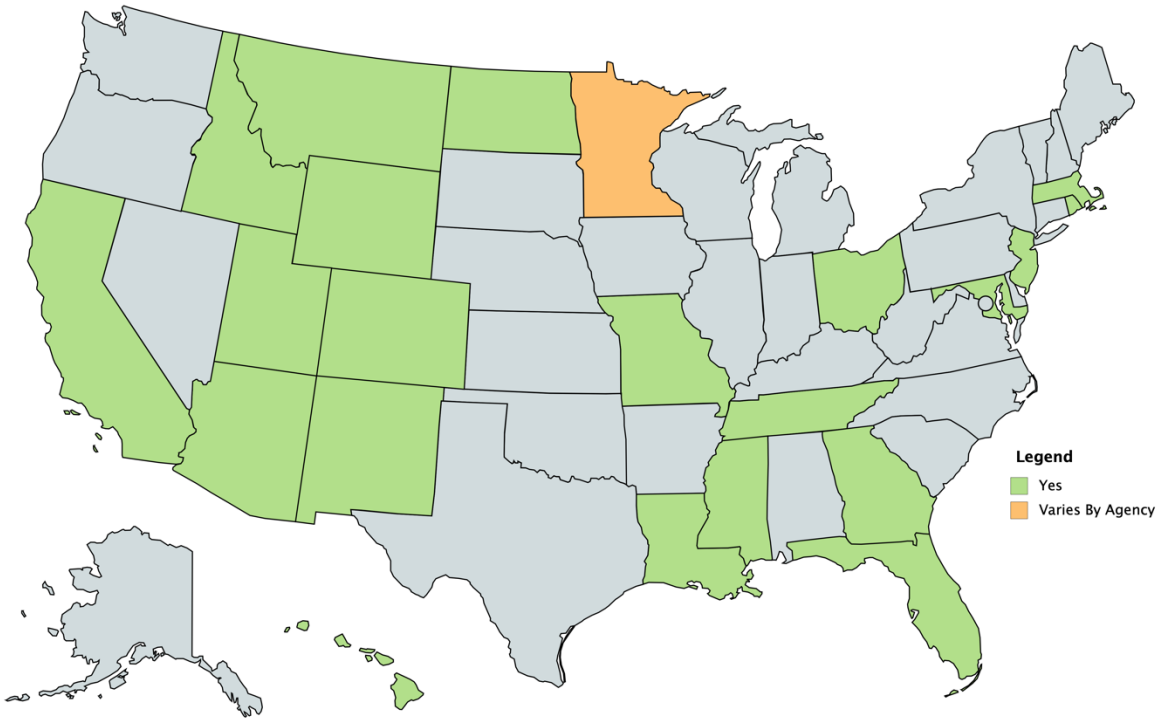
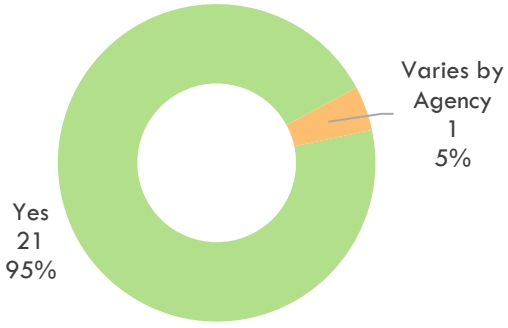


Chart 34



Paramedic Use of Thrombolytics

Is the paramedic use of prehospital thrombolytic/fibrinolytic therapy (such as tPA) for STEMI permitted in your state? (n=22)

Sixty eight percent of respondents (n=15) indicate that thrombolytic/fibrinolytic therapy is not permitted for cardiac care at the paramedic level. Thirty two percent or respondents (n=7) authorize the practice by paramedics. These results may be higher in states where the local medical director has the authority to supersede statewide protocols.

Figure 33

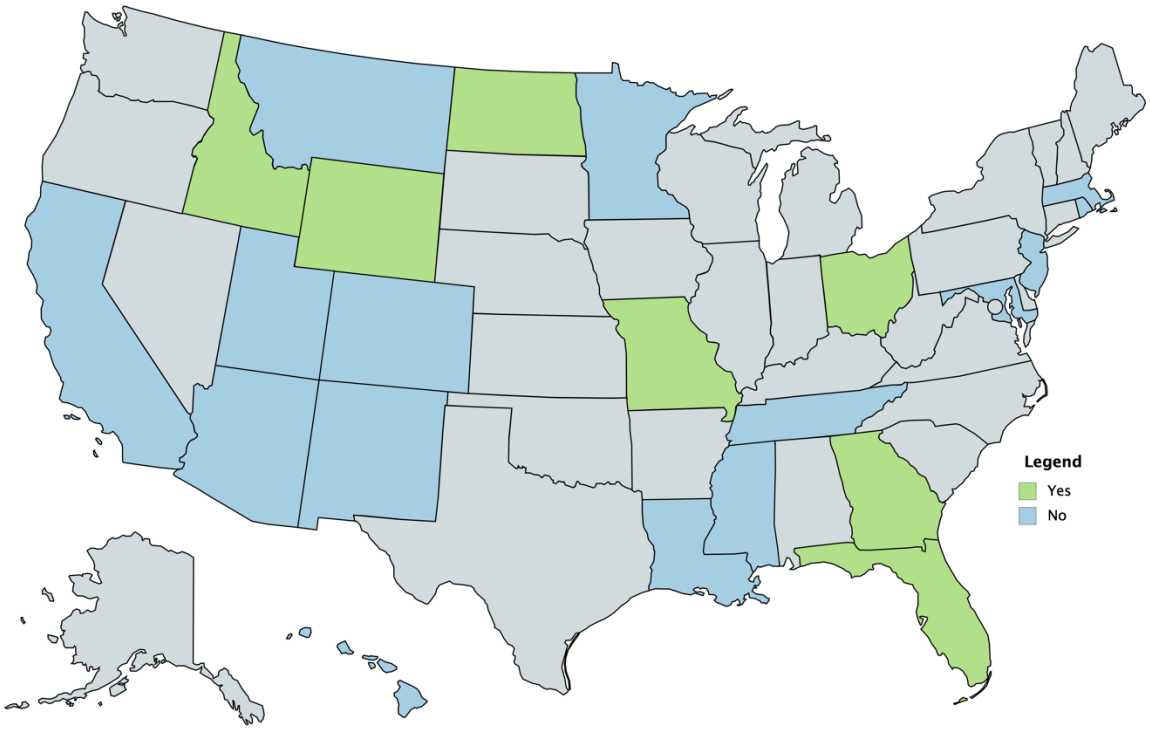
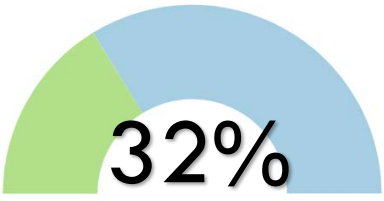


Chart 35



of states allow for the use of prehospital thrombolytic/ fibrinolytic therapy (n=7)

What criteria for the paramedic use of prehospital thrombolytic/ fibrinolytic therapy (such as tPA) for chest pain/STEMI is required in your state? (select all that apply) *(n=7)*

One hundred percent of respondents (n=7) indicate that written protocols drive the use of administration of tPA in out of hospital settings. Forty three percent of respondents (n=3) require the documentation of a 12 lead ECG prior to administration. Twenty nine percent (n=2) require specialized training (such as critical care transport). Fourteen percent of respondents (n=1) require on line medical direction before the use of thrombolytic/fibrinolytic therapy for chest pain.

Table 9

CRITERIA FOR USE	%	n
WRITTEN PROTOCOLS	*100%*	*7*
12 LEAD EKG DOCUMENTATION (pre-administration)	*43%*	*3*
SPECIALIZE TRAINING (e.g., critical care transport)	*29%*	*2*
ON-LINE MEDICAL COMMAND	*14%*	*1*

Number of Required Criteria for Thrombolytic/Fibrinolytic Therapy in STEMI

Figure 34

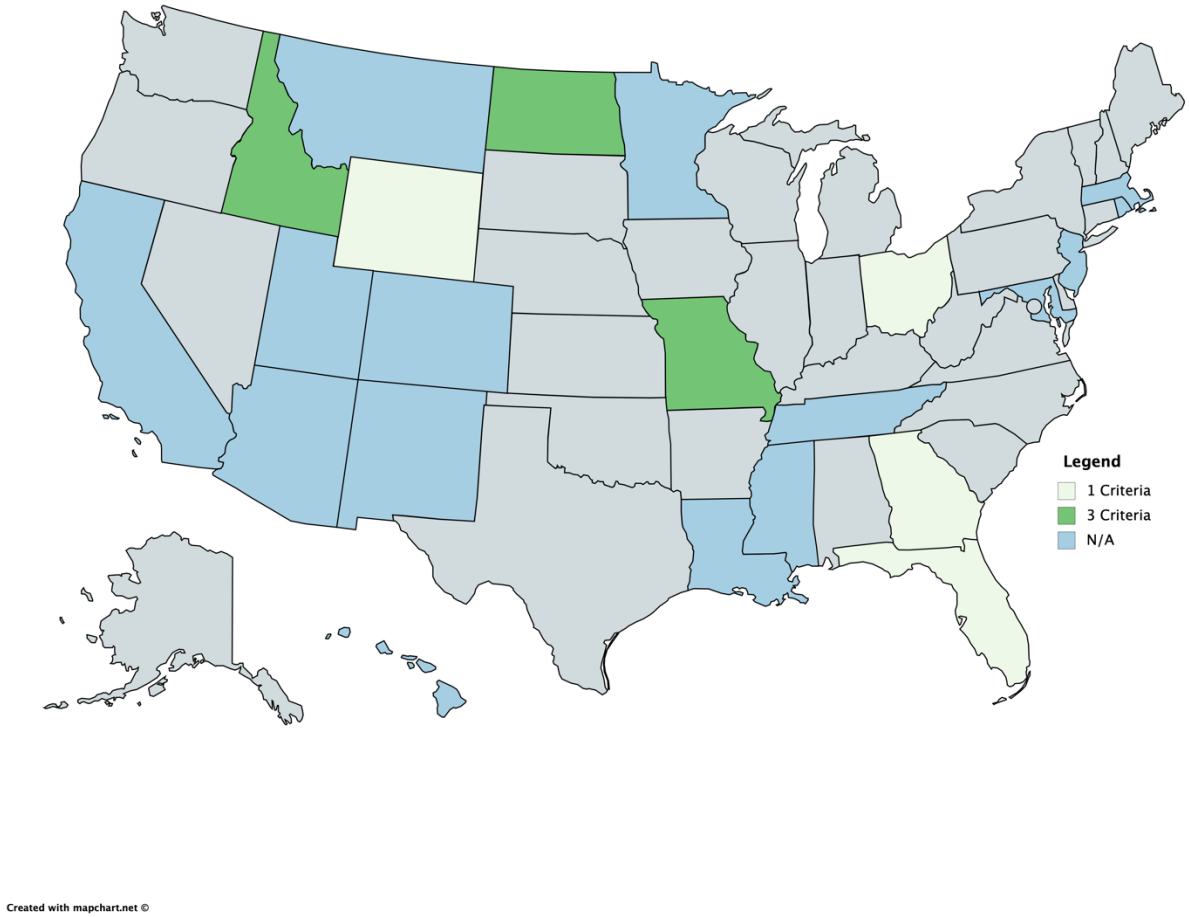
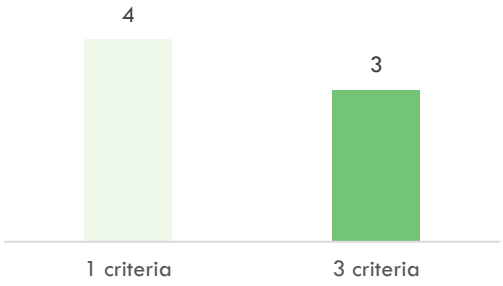


Chart 36



EMS Point of Care Testing for Chest Pain

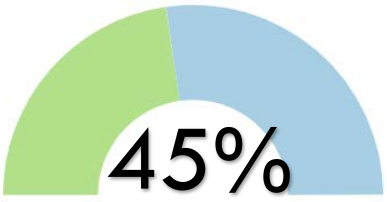
What EMS point-of-care testing is allowed on ambulances in your state for suspected STEMI patients? (not including blood drawn for testing in hospital) *(n=22)*

In this question, states were able to select multiple responses. Troponin levels were tested according to 23% of respondents (n=5). B-type natriuretic peptide (BNP) was permitted by 18% of respondent (n=4.) 83% of respondents (n=18) indicated that other point of care testing was permitted as determined by the agency, EMS medical directors, and the availability of equipment. One respondent specified that many ambulances in their state has CLIA waivers (see https://www.cms.gov/Regulations-and-Guidance/Legislation/CLIA/Downloads/HowObtainCertificateofWaiver.pdf) but the state does not track this information.

Table 10

POINT OF CARE TESTING	%	n
TROPONIN	*23%*	5
BNP	*18%*	*4*
DETERMINED LOCALLY	*82%*	*18*

Chart 37



of respondents allow for some type of point-of-care testing on ambulances for chest pain (n=10)

STEMI Quality Metrics

What STEMI quality metrics (performance measures) from the National EMS Clinical Guidelines do you evaluate? (select all that apply) *(n=22)*

States may choose to evaluate several quality indicators to assess the quality of patient care. For the purposes of this discussion, NASEMSO specifically inquired about suggested metrics from the National EMS Clinical Guidelines.[9] It is important to note that state EMS offices share responsibilities with multiple other agencies and actual results are likely higher than projected here.

Table 11

QUALITY METRIC	%	n
THE TIME OF PATIENT CONTACT BY TO THE TIME OF 12-LEAD ECG ACQUISITION WITHIN 10 MINUTES	*73%*	*16*
THE TIME FROM FIRST DIAGNOSTIC 12-LEAD ECG TO STEMI NOTIFICATION.	*50%*	*11*
CONFIRMATION PATIENT RECEIVED ASPIRIN (TAKEN PRIOR TO EMS ARRIVAL, GIVEN BY EMS, OR SUBSTANTIATED BY OTHER PERTINENT NEGATIVES)	*73%*	*16*
THE TIME OF A STEMI PATIENT'S ULTIMATE ARRIVAL TO A RECEIVING HOSPITAL	*55%*	*12*
THE TIME OF EMS NOTIFICATION TO THE TIME OF ACTIVATION OF A CARDIAC CATHETERIZATION LABORATORY	*36%*	*8*
THE TIME OF ARRIVAL AT THE PCI CENTER TO THE TIME OF CARDIAC CATHETERIZATION (DOOR-TO-BALLOON TIME) OR IF PATIENT NOT TRANSPORTED DIRECTLY TO PCI CENTER, THE TIME OF ARRIVAL AT RECEIVING HOSPITAL TO THROMBOLYTICS	*45%*	*10*
THE TIME OF PREHOSPITAL 12-LEAD ECG ACQUISITION TO THE TIME OF CARDIAC CATHETERIZATION (ECG-TO-BALLOON TIME)	*45%*	*10*

Number of STEMI Quality Metrics Used by States

Figure 35

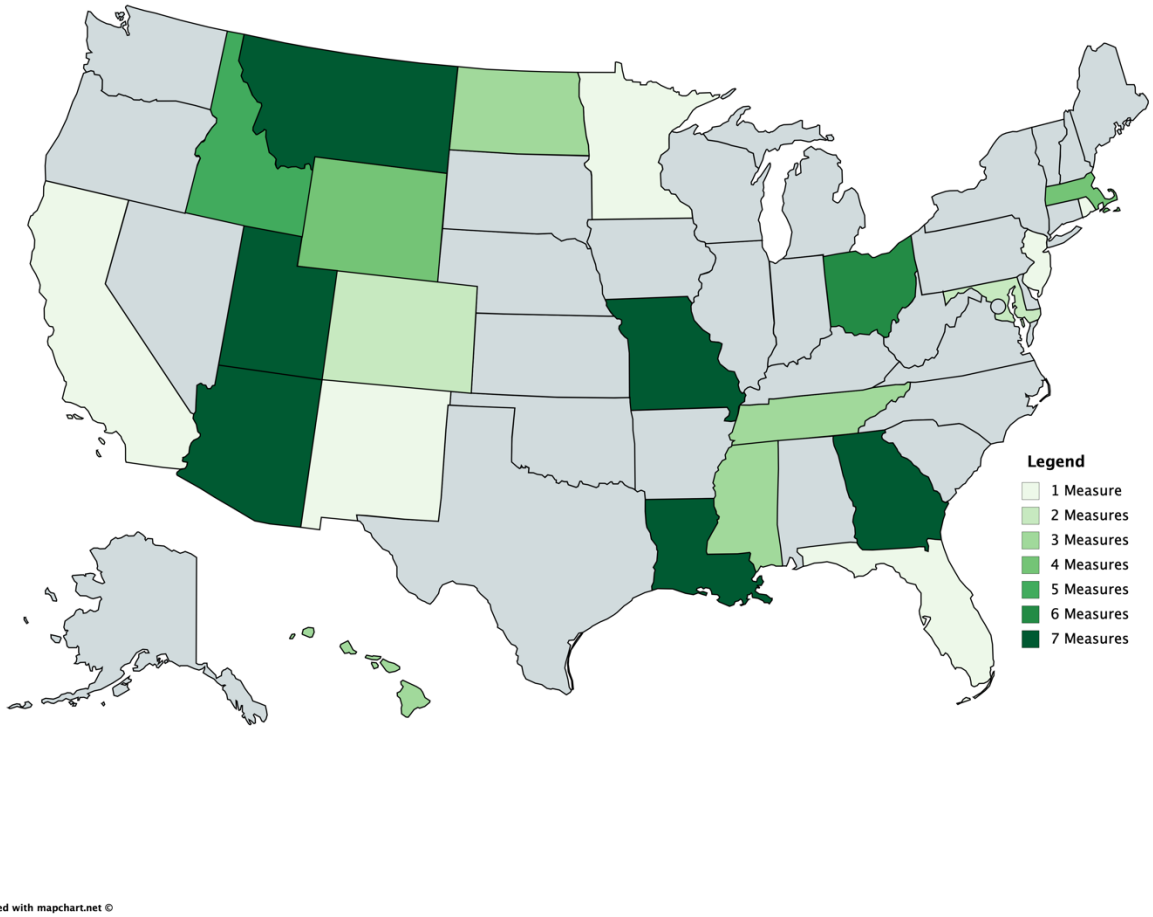
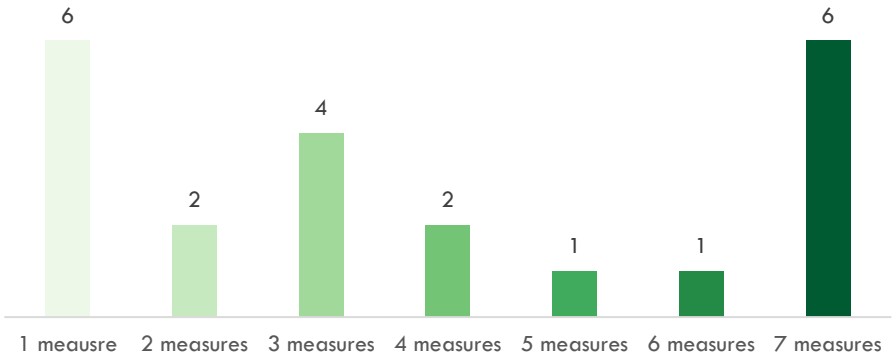


Chart 38



Cardiac Arrest Metrics

What cardiac arrest quality metrics (performance measures) from the National EMS Clinical Guidelines do you evaluate? (n=22)

States may choose to evaluate several quality indicators to assess the quality of patient care. For the purposes of this discussion, NASEMSO specifically inquired about suggested metrics from the National Model EMS Clinical Guidelines.[9] It is important to note that state EMS offices share responsibilities with multiple other agencies and actual results are likely higher than projected here.

Table 12

METRIC	%	n
TIME TO SCENE	*77%*	*17*
TIME TO PATIENT	*45%*	*10*
TIME TO FIRST CPR	*50%*	*11*
TIME TO FIRST SHOCK	*55%*	*12*
TIME OF ROSC	*59%*	*13*
COMPRESSION FRACTION	*18%*	*4*
AVERAGE AND LONGEST PERI-SHOCK PAUSE	*18%*	*4*
RATE AND DEPTH OF COMPRESSIONS	*10%*	*4*

Number of Cardiac Arrest Quality Metrics Used by States

Figure 36

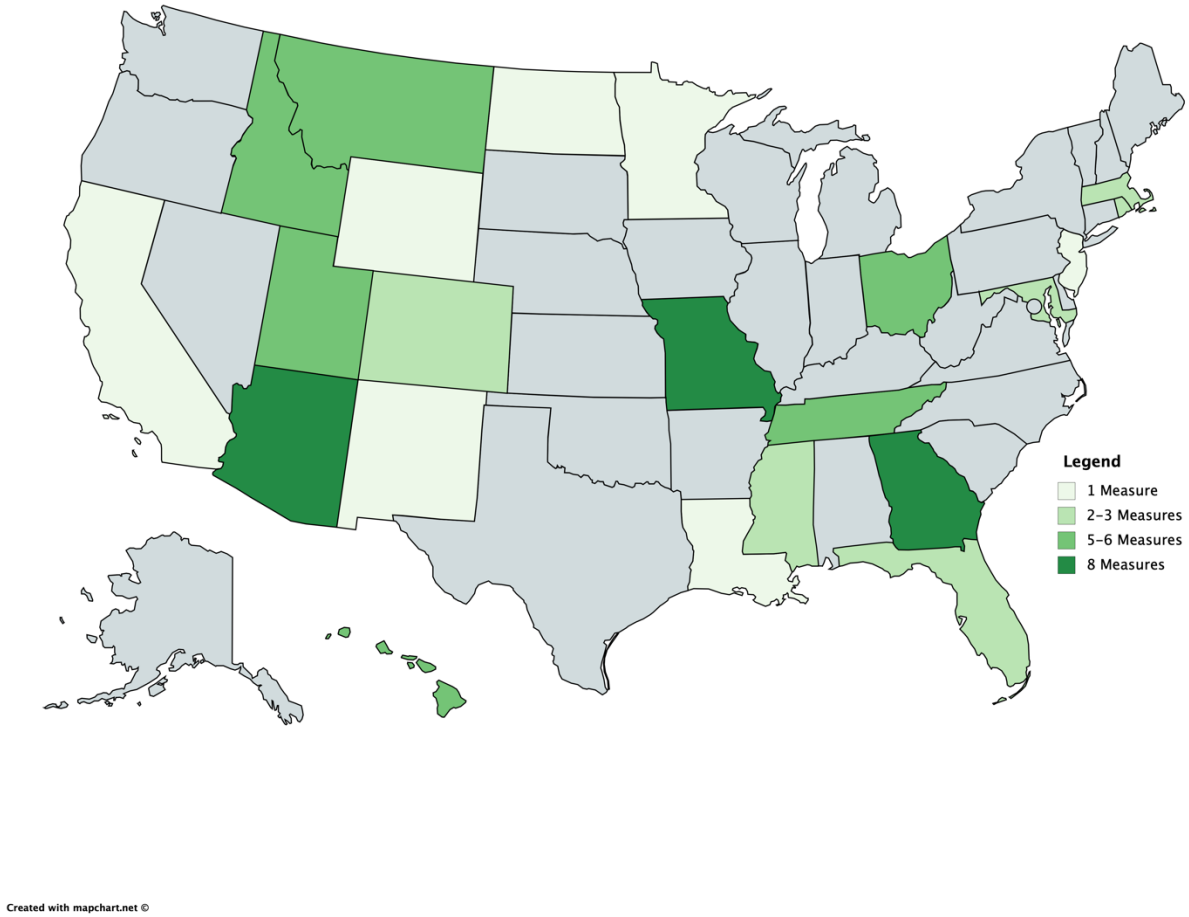
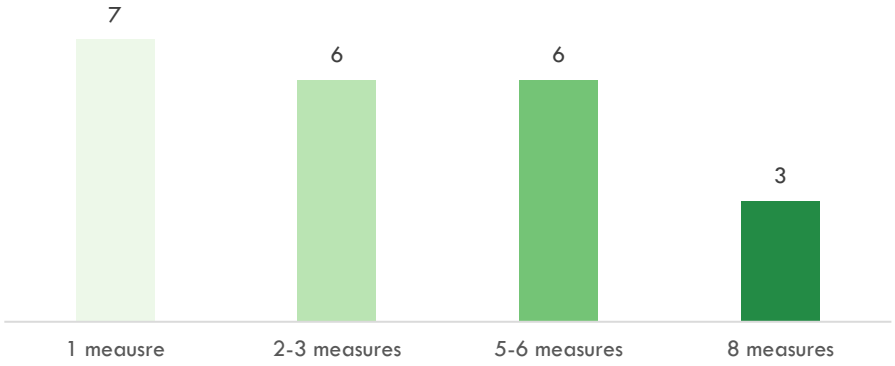


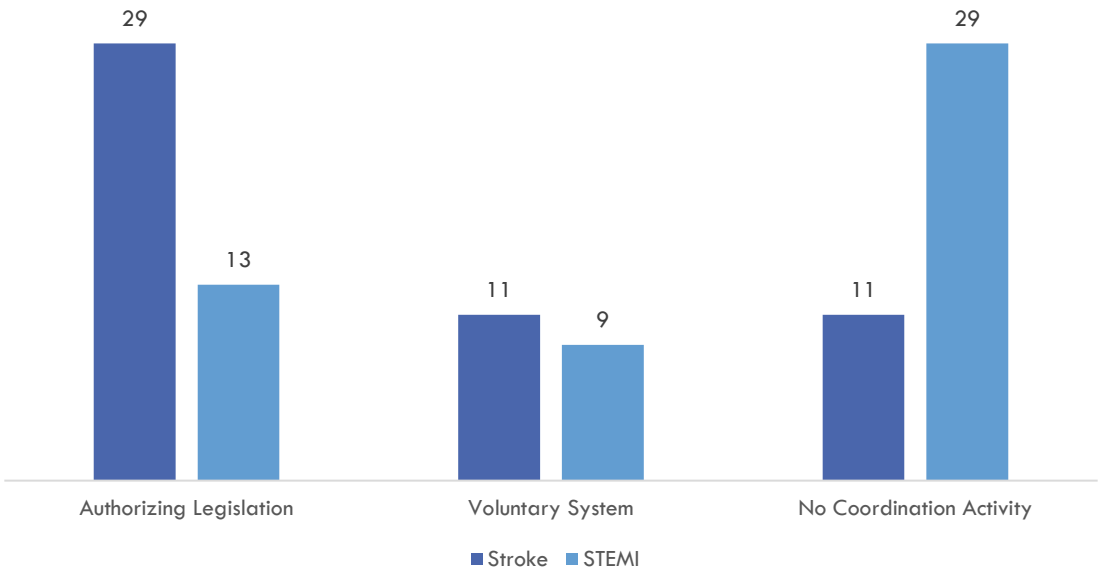
Chart 39



STROKE & STEMI COMPARISON

Our analysis demonstrates a disparity in authorizing legislation available to support stroke over STEMI. It also appears that when authorizing legislation is enacted to provide a state the authority to designate specialty centers, it enhances overall efforts to coordinate and improve systems of care.

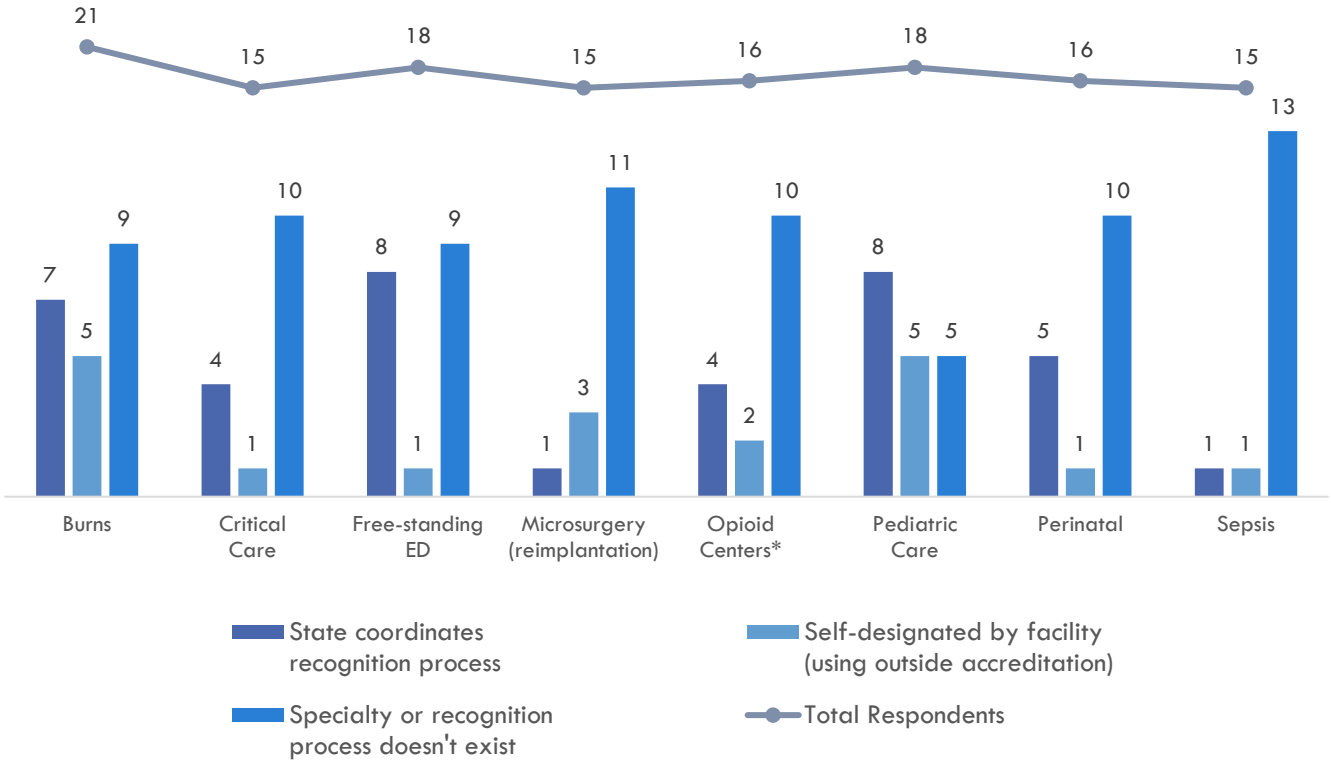
Chart 40



OTHER TIME-SENSITIVE OR SPECIALTY AREAS

DISCLAIMER: It is very important to note that while we intended to collect data on all statewide system coordination activities, some states responded from the state EMS office perspective as if the program office was located in and managed by the state EMS office. Other states attempted to respond even if systems coordination is managed by a different authority. A few states deferred to program offices beyond EMS. Other states skipped specific questions entirely. Actual results may vary based on the position of the respondent. Therefore, we present these results based on the number of respondents to a specific question and not as a percentage or representation of all state practices.

Chart 41



* *Opioid Centers: alternate destination for treatment, observation, and/or referral not located in an emergency department*

CONCLUSION

Rapid response, assessment and treatment by EMS personnel with expedited delivery of patients to a specialty center equipped with experts and equipment to treat time sensitive conditions such as stroke and STEMI are directly proportional to patient outcomes. Further, the relationship of "time to intervention" are well documented in the medical literature. Specialty centers are incentivized to participate in statewide or regional systems of care through approaches such as the Centers for Medicare and Medicaid Services "Outcome-Based Certification" and patient reported outcomes while the applicability of these terms is foreign to most EMS providers. State EMS officials are committed to improving the effectiveness of EMS care through education, medical oversight, evaluation, and coordination with EMS licensees. Data quality, patient triage and transport, and evaluation of clinical protocols are routine discussions among state EMS officials, yet our assessment identified that the resources available to support EMS system coordination are variable.

The majority of our current respondents indicated that legislative authority, staffing, and funding to support systems integration initiatives are needed to better coordinate specialty care in their state. In prior assessments, NASEMSO identified that 80% of state EMS offices are located in state health departments, the remaining 20% are evenly split between public safety agencies and freestanding commissions or boards[11]. While several respondents report collaborative relationships with other state agencies, our assessment identified that funding for system coordination related to stroke and STEMI is controlled largely by cardiovascular programs and chronic disease departments that are not based within the authority of the state EMS office nor do EMS authorities have much input into how specialty care coordination funds are spent.

In 2016, the Office of the Assistant Secretary for Planning and Evaluation at the U.S. Department of Health and Human Serves wrote, "Data sharing across programs is common in most states but often only within an agency. For example, more than three-quarters of responding agencies (36 of 46) reported that client history data is available to appropriate staff of other programs within the agency without explicit client consent, but fewer than one-third (13 of 46) reported that this data is similarly available to staff in other agencies[12]." This finding suggests that challenges may exist with establishing and maintaining accurate data registries that include EMS encounters.

We attempted to query (non-EMS) state agencies for systems of care information with some difficulty. If time and data are as critical to specialized care as the current literature suggests, our findings support the need for greater alignment and integration of the "front line" personnel responsible for

[11] Organization, Staffing, and Functions of State EMS Offices, National Association of State EMS Officials, 2017, nasemso.org/wp-content/uploads/EMS_OfficeStructureFunction_2017-0428.pdf.

[12] "Status of State Efforts to Integrate Health and Human Services Systems and Data: 2016." ASPE Research Brief December 2016, US Department of Health and Human Services, Dec. 2016, aspe.hhs.gov/system/files/pdf/255411/StateHHSSystems.pdf.

accomplishing these goals and advise that a greater equity of resources to improve patient outcomes is essential.