

**COFFEE BREAKS 2020:**  
ESTABLISHING A BASELINE: EVIDENCE-  
SUPPORTED STATE LAWS TO ADVANCE  
STROKE CARE

CENTERS FOR DISEASE CONTROL AND PREVENTION

A collage of four images: brain scans, a paramedic, a group of people, and a doctor with a stethoscope.

Siobhan Gilchrist, JD, MPH & Adebola Popoola, JD, MPH, MBS | Applied Research and Translation Team  
August 11, 2019

NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION

DIVISION FOR HEART DISEASE AND STROKE PREVENTION

The logo of the Centers for Disease Control and Prevention (CDC), featuring a stylized eagle and the letters "CDC".

MODERATOR:

Welcome to today's Coffee Break presented by the Applied Research and Evaluation Branch in the Division for Heart Disease and Stroke Prevention at the Centers for Disease Control and Prevention.

We are fortunate to have **Siobhan Gilchrist and Bola Popoola** as today's presenters. Siobhan is a contractor with ASRT, Inc, and Bola is an ORISE Fellow from the CDC's Division for Heart Disease and Stroke Prevention and they both sit on the **Applied Research and Translation Team**.

My name is **Mallika Mahalingam** and I am today's moderator. I am also on the Applied Research and Translation team within the **Applied Research and Evaluation Branch**.

BEFORE WE BEGIN...

- Please mute your phones
- Any issues or questions during the presentation?
  - Use Q & A box on your screen
  - Email [AREBheartinfo@cdc.gov](mailto:AREBheartinfo@cdc.gov)



MODERATOR:

Before we begin, we have a few housekeeping items.

Please mute yourselves to improve audio quality.

If you are having issues with audio or seeing the presentation, please message us using the chat box or send us an email at [AREBheartinfo@cdc.gov](mailto:AREBheartinfo@cdc.gov)

If you have questions during the presentation, please enter it on the chat box on your screen. We will address your questions at the end of the session.

Since this is a training series on applied research and evaluation, we hope you will complete the poll at the end of the presentation and provide us with your feedback.

**DISCLAIMER**

 The information presented here is for training purposes and reflects the views of the presenters. It does not necessarily represent the official position of the Centers for Disease Control and Prevention.

 This presentation provides a summary of laws in effect as of January 1, 2018 and is not intended to promote any particular legislative, regulatory, or other action.

**MODERATOR:**

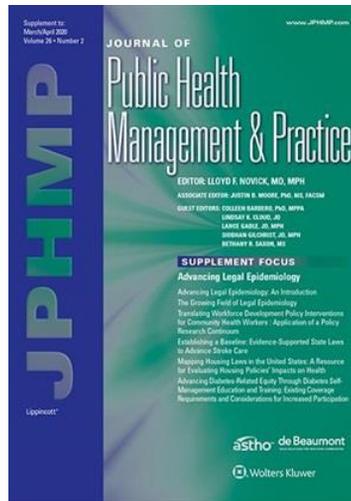
The information presented here is for training purposes and reflects the views of the presenters. It does not necessarily represent the official position of the Centers for Disease Control and Prevention.

So, without further delay. Let's get started. **Siobhan** the floor is yours.

ESTABLISHING A BASELINE:  
EVIDENCE-SUPPORTED  
STATE LAWS TO ADVANCE  
STROKE CARE

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- Erika Fulmer, MHA



Thank you, **Mallika**.

The article we are discussing today is freely available in the Journal of Public Health Management and Practice March/April 2020 Supplement: Advancing Legal Epidemiology (Volume 26 – 2) which is commissioned by DHDSP. I would like to acknowledge our co-authors listed to the left.

## ROADMAP

- What is legal epidemiology?
- What is a Stroke System of Care?
- Stroke Systems of Care and the Policy Research Continuum
- Our study:
  - What we did...
  - What we found..
- What we are doing now...

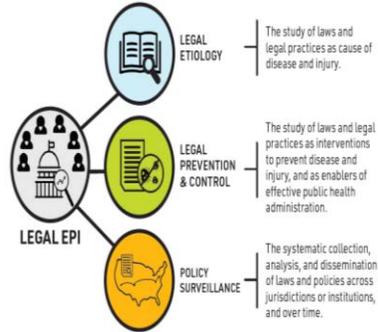
Because our article was published in our Advancing Legal Epidemiology journal supplement, we'll start with a brief description of legal epidemiology followed by an overview of what is a stroke system of care. Then we'll situate this work within our policy research continuum. Next, we'll explain our study methods, some of the key findings and takeaways, and what our team is working on now to advance this work.

# LEGAL EPIDEMIOLOGY

The scientific study and deployment of law as a factor in the cause, distribution, and prevention of disease and injury in a population.

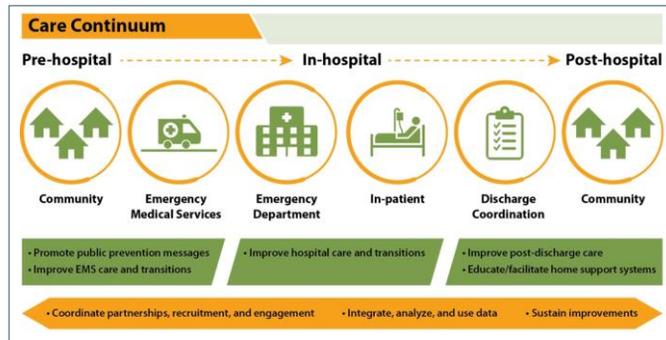
Legal epidemiology encompasses legal etiology, legal prevention and control, and policy surveillance theory and methods to

- **Measure** the nature and distribution of laws across jurisdictions and over time.
- **Evaluate** the implementation and impact of legal interventions on public health, and the health effects of non-health laws.
- **Analyze** the implementation and impact of laws defining health department powers and duties.
- **Enable and support** the rapid diffusion of healthier laws and policies.



Legal Epidemiology is defined as the scientific study and deployment of law as a factor in the cause, distribution, and prevention of disease and injury in a population. It has become a guiding principle of our policy research work within DHDSP. Because laws essentially apply to all persons within a jurisdiction, law can be seen as a tool for improving population health. However we need to systematically collect and analyze law using quantitative policy surveillance methods if we are to evaluate its impact. To date, few studies have examined the relationship between state law and prehospital and in-hospital stroke care. The study we are describing today is a policy surveillance study that we are using to guide other studies to understand how state stroke systems of care laws are affecting stroke outcomes.

## STROKE SYSTEMS OF CARE



NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION  
 CDC (2017) [The Revised National Acute Stroke Program](#)  
 Guidelines for the Early Management of Adults with Ischemic Stroke. *Circulation*, May 22, 2007.

4/16/2019

The burden of stroke continues to remain at about 800,000 strokes annually in the United States, and it is increasingly affecting working age-adults. Since the early 2000s, the American Stroke Association and the Brain Attack Coalition have promoted policies that include tiers of specialty care hospitals, called stroke centers, into a continuum of care with the goal of improving stroke outcomes by reducing the time it takes to access the most appropriate level of care. The continuum integrates prehospital, in-hospital, and post-hospital care. Prehospital care involves primary prevention and community education on the signs and symptoms of stroke. Prehospital care also involves dispatching emergency medical services (EMS) providers to assess, triage and transport or transfer a suspected stroke patient to a certified stroke center with the appropriate level of care in a timely manner.

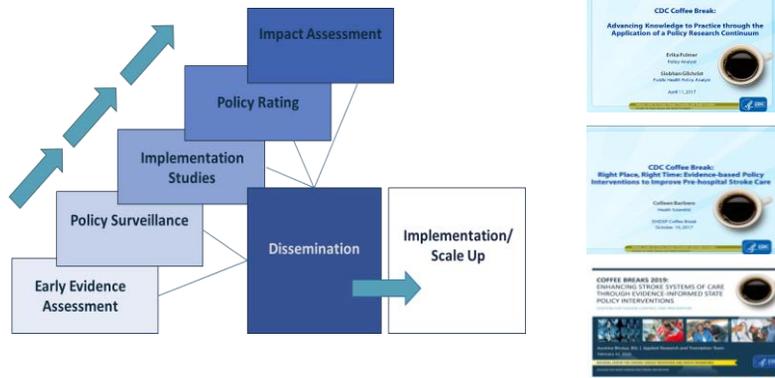
As of 2018 there are four levels at which hospitals can become certified by national accrediting organizations (such as the Joint Commission) or state agencies to provide advanced levels of stroke care. Primary Stroke Centers (PSC) are staffed and equipped to diagnose, treat, and initiate rehabilitation for most stroke patients. Comprehensive Stroke Centers (CSC)s have a greater capacity to treat more complex strokes. Acute Stroke Ready Hospitals (ASRH) are typically located in rural areas and are capable of diagnosing stroke and initiating treatment using telemedicine. Hospitals can now

attain Thrombectomy Capable Stroke Center certification to address severe strokes without having to meet the higher-level CSC certification.

Post-hospital care provides secondary prevention and rehabilitation services to improve functional impairment and lessen the chance of a stroke patient becoming disabled or readmitted.

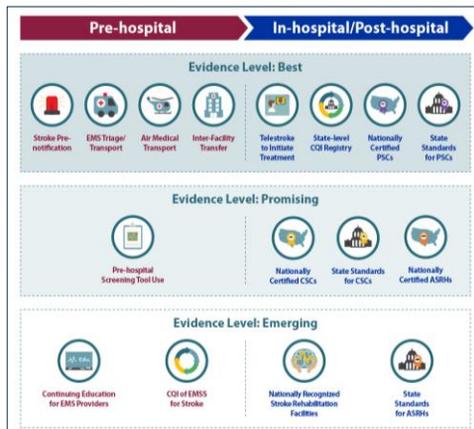
To ensure timely access to treatment, coordination between the EMS system and stroke centers is critical. Public health agencies, local and state governments can play an important role, by adopting laws that facilitate care coordination, or through less formal means, such as guidance and resource allocation. They can convene task forces; develop patient care plans such as pre-notifying a hospital when a stroke patient is enroute; and standardized protocols for ground and air ambulances to transport a stroke patient directly to a certified stroke center even if a non-stroke hospital is closer. Continuous quality improvement monitoring through EMS and stroke center data collection and sharing is integral to optimizing all aspects of the system of care.

## STROKE SYSTEMS OF CARE AND THE POLICY RESEARCH CONTINUUM



Our stroke policy surveillance builds on the foundation of work we have presented previously. Many of you will have seen our policy research continuum schematic before – shown here on the left and described in our 2017 Coffee Break. We use it to identify and guide our analysis of policy interventions likely to improve cardiovascular health. Our Coffee Breaks in February 2019 Enhancing Stroke Systems Of Care Through Evidence-informed State Policy Interventions and in the October 2017 Right Place, Right Time: Evidence-based Policy interventions to Improve Pre-hospital Stroke Care presented the stroke policy early evidence assessment results. If you are a Coverdell Grantee, you may have listened to our webinars last December and in May 2019. Today we will focus on the policy surveillance step of the continuum.

## EVIDENCE INFORMED STROKE POLICY INTERVENTIONS



The two early evidence assessments I just mentioned examined the evidence bases for 16 policy interventions that have also been adopted in law by at least one state. Seven of the policy interventions studied focused on the pre-hospital aspect of the continuum and 8 focused on the in-hospital aspect of the continuum, while one policy intervention was related to post-hospital care. The evidence bases for four prehospital and four in-hospital policy interventions met our criteria for Best – meaning state laws that address the policy interventions with best evidence are expected to have the greatest potential for a positive health and an associated economic impact. There are also 4 promising evidence and 4 emerging evidence policy interventions.

Best evidence prehospital policy interventions include: use of EMS protocols to transport a stroke patient to the most appropriate stroke facility by ground or air ambulance; pre-notification of the receiving facility that a stroke patient is enroute; and inter-facility transfer agreements to the most appropriate stroke facility. Best evidence hospital policy interventions include: National or state certification of Primary Stroke Centers, allowing the use of telemedicine to treat acute stroke, and establishing a state-level stroke continuous quality improvement registry or data system.

## STROKE POLICY SURVEILLANCE METHODS

- Stroke law coding protocol
  - 16 types of stroke policy interventions aligned with the Stroke PEARS
  - Other attributes of law related to implementation
- Data collection
  - WestLawNext and state websites
  - 50 states and District of Columbia
  - Law in effect on January 1, 2018
    - Statutes (enacted and repealed)
    - Agency Regulations (rules)
    - Legislation (Session laws)
  - 2 Coders review and code law

We applied a rigorous policy surveillance method to determine if stroke systems of care laws reflect the evidence bases and expert recommendations for policies to improve stroke outcomes. First, we reviewed and documented summaries for all 50 state and Washington DC statutes, legislation, and regulations pertaining to stroke systems of care, with close attention to the 16 evidence-informed policy interventions. Once we understood how these policy interventions were being addressed in law, we developed a stroke law coding protocol with a set of variables intended to align the content of state law with the 16 stroke PEAR policy interventions. We also wanted to contextualize the way states are addressing stroke systems of care, so we included additional variables that help explain the legal infrastructure pertaining to how states are implementing their systems of care, such as by engaging a task force, or adopting a regional versus statewide approach. We used the legal search engine, WestLawNext to retrieve statutes and regulations and uncodified legislation in effect on January 1<sup>st</sup>, 2018 for the 50 states and the District of Columbia. We also reviewed state websites as needed to ensure we had captured the most current law. Two JD/MPH staff retrieved and coded laws independently and reconciled the results. **They coded laws that clearly addressed stroke for each policy intervention. In addition, laws were coded according to the level of authorization in case we needed to distinguish between states that mandate a particular policy intervention versus authorize it.**

**FINDINGS: NUMBER OF STATES WITH RELEVANT LAW AS OF JANUARY 1, 2018**

Stroke systems of care legal authorities and organizational framework

| Policy Intervention                                    | Evidence Rating | Number of States |
|--|-----------------|------------------|
| Stroke System of Care Task Force (Task forces)         | N/A             | 20               |
| State Agency Rule-Making Authority (Regulatory bodies) | N/A             | 28               |
| Statewide System of Care (Statewide approach)          | N/A             | 30               |
| Regional System of Care (Regional approach)            | N/A             | 18               |

Thank you, Siobhan.

I am going to present some of our findings, but I hope our listeners will access the journal article on the JPHMP website for more detail. This table shows the number of states with relevant stroke laws as of January 1, 2018. We found that 39 states addressed 1 or more aspects of prehospital or in-hospital stroke care in law. Only one state addressed the post hospital policy intervention so we did not include post hospital care in our analysis. With respect to the legal authorities and organizational framework affecting the implementation of stroke systems of care policies, 20 states had a stroke task force law, 28 states delegated rule-making authority to one or more state agencies (such as the Department of Public Health), 7 of the 28 required the agency to adopt rules to implement the law. Thirty states established a state-level approach to stroke care coordination and 18 states established a regional or local decentralized approach.

## FINDINGS: NUMBER OF STATES WITH RELEVANT LAWS OF JANUARY 1, 2018

### Pre-hospital care policy interventions by evidence rating

| Policy Intervention  | Evidence Rating   | Number of States |
|--|-------------------|------------------|
| EMS Triage and Ground Transport to Most Appropriate Stroke Facility  | Best              | 20               |
| Inter-Facility Transfer to Most Appropriate Stroke Facility          | Best              | 18               |
| Standardized Stroke Screening Tool Use by EMS Providers              | Promising Quality | 13               |
| Continuing Education on Stroke for EMS Providers                     | Emerging          | 11               |
| Continuous Quality Improvement of EMSS for Stroke                    | Emerging          | 11               |
| Stroke Pre-notification of Receiving Facility by EMS Providers       | Best              | 6                |
| Air Medical Triage and Transport to Most Appropriate Stroke Facility | Best              | 3                |
| ■ Any pre-hospital evidence-supported law                            |                   | 30               |

This table shows the number of states with prehospital policy interventions. In total, 30 states' law addressed at least one of the 7 prehospital policy interventions. Twenty states' law authorized or required EMS providers to use ground triage and transport protocols to transfer patients to the most appropriate stroke facility; 14 of the 20 state law mandated it. Eighteen states' law authorized or required all or some stroke centers to enter into inter-facility transfer agreements to transfer a patient to a higher-level stroke center. Thirteen states' law authorized the use of a standardized or validated stroke screening tool to evaluate a patient, a promising quality policy intervention. Four policy interventions met the best evidence criteria: two were the most common interventions and two were the least common interventions.

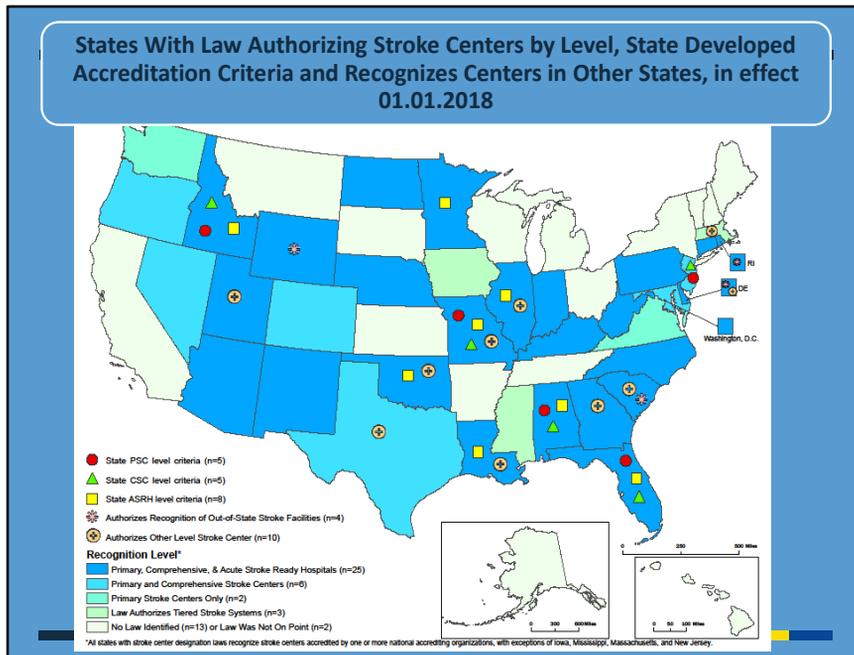
## FINDINGS: NUMBER OF STATES WITH RELEVANT LAWS OF JANUARY 1, 2018

### In-hospital care policy interventions by evidence rating

| Policy Intervention                                 | Evidence Rating   | Number of States |
|---|-------------------|------------------|
| Primary Stroke Centers (PSC)                        |                   |                  |
| Nationally Certified PSC                            | Best              | 32               |
| State Standards for PSC                             | Best              | 5                |
| Comprehensive Stroke Centers (CSC)                  |                   |                  |
| Nationally Certified CSC                            | Promising Quality | 30               |
| State Standards for CSCs                            | Promising Quality | 5                |
| Acute Stroke Ready Hospitals (ASRH)                 |                   |                  |
| Nationally Certified ASRH                           | Promising Quality | 22               |
| State Standards for ASRHs                           | Emerging          | 8                |
| Telemedicine to Initiate Treatment On-site          | Best              | 10               |
| State-level Continuous Quality Improvement Registry | Best              | 15               |
| Any in-hospital evidence-supported law              |                   | 36               |

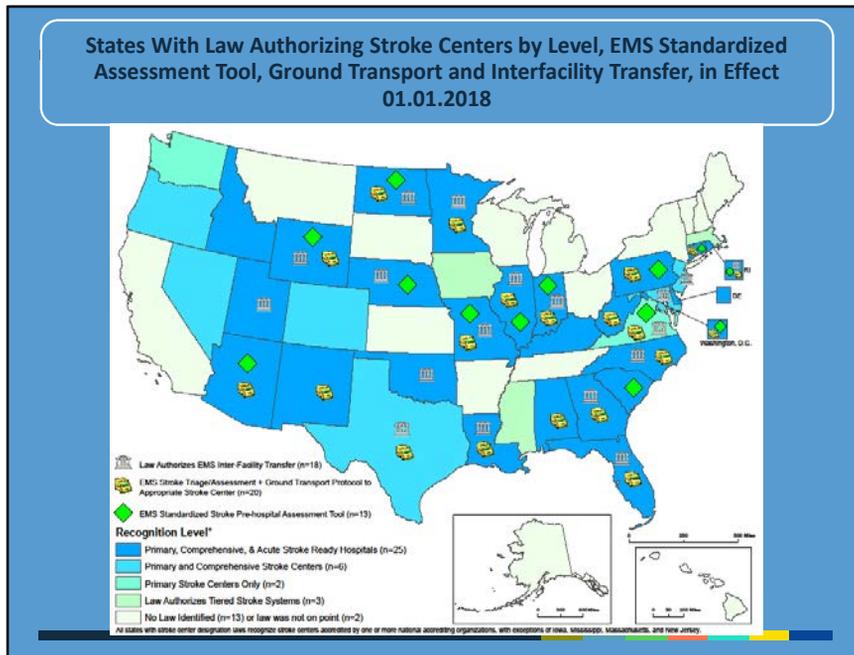
This slide shows the number of states with in-hospital policy interventions. Thirty-six states' law addressed at least one in-hospital policy intervention. A total of 33 states recognized PSCs, either through national certification (32 states) and/or state certification standard (5 states). Thirty-one states' law recognized certified CSCs; 30 recognized CSCs certified by a national certification body and 5 recognized state accreditation. Twenty-five states' law recognized certified ASRHs. The use of telemedicine for acute stroke treatment is supported by best evidence. Ten states authorized the use of telemedicine. Twenty-four states' law authorized stroke centers to participate in a continuous quality improvement (CQI) program that includes a state-level stroke data system. However, only 15 of these states requested stroke centers to report (voluntarily or as required) stroke CQI data into a statewide data system to track nationally recognized stroke performance metrics, which is supported by best evidence.

**States With Law Authorizing Stroke Centers by Level, State Developed Accreditation Criteria and Recognizes Centers in Other States, in effect 01.01.2018**

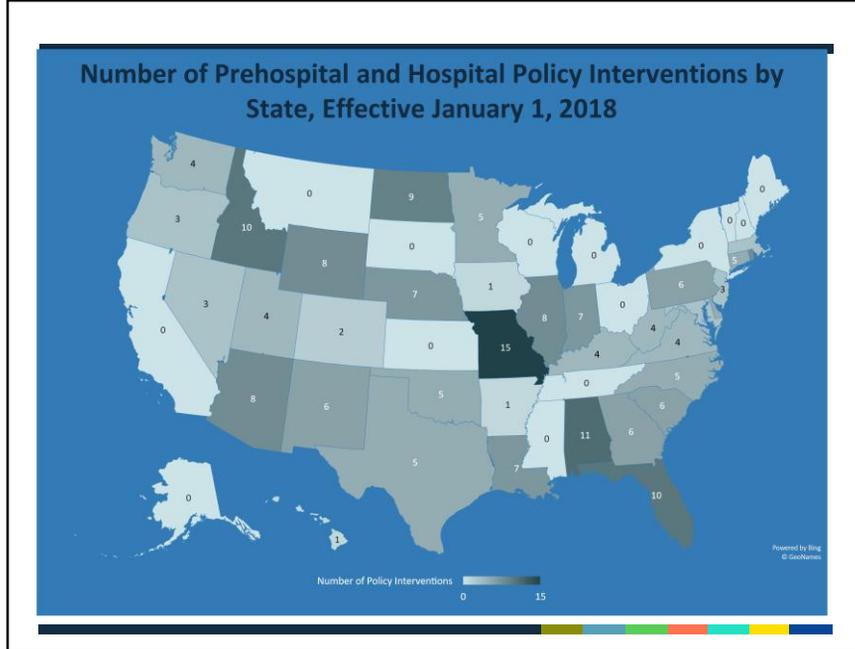


This slide shows the geographic distribution of states that established a tiered approach for acute stroke treatment in law. Thirty-six states required or authorized hospitals to be recognized or designated as a stroke center. They appear less concentrated across the east north central census division. The 25 states shaded in dark blue recognized all three levels of stroke centers. Six states recognized PSCs and CSCs, and two states were found to recognize only PSCs. The icons on the map (yellow square, green triangle and red circle) indicate states with ASRH, CSC and PSC state designation criteria that hospitals could meet instead of a national certification (a total of 9 states). In addition, 10 states recognized other stroke center designations, such as thrombectomy-capable centers and 4 states recognized out-of-state stroke centers.

States With Law Authorizing Stroke Centers by Level, EMS Standardized Assessment Tool, Ground Transport and Interfacility Transfer, in Effect  
01.01.2018



We found that certain combinations of pre-hospital and in-hospital policy interventions were more prevalent than other combinations. This slide shows an overlay of states with each type of stroke center certification law with the three most common prehospital policy interventions: EMS prenotification of the receiving hospital; ground ambulance stroke triage and transport to the most appropriate stroke center; and interfacility transfer of stroke patients to a higher-level stroke center. These three prehospital interventions have been shown to reduce the time to stroke treatment. Of the 25 states shaded in dark blue that recognized all three tiers of stroke centers, 6 states' law authorized these three prehospital policy interventions. One state (Virginia) also authorized these three prehospital interventions although it recognized only PSCs. Eleven states addressed two of these prehospital interventions – of these, 10 recognized all three stroke centers (Texas did not recognize ASRHs). Seven states' law authorized only one of these prehospital policy interventions- of these 5 states recognized all three stroke centers (New Jersey and Maryland recognized PSCs and CSCs).



This map shows the geographic variation in the adoption of the 15 policy interventions (the 7 prehospital and 8 in-hospital evidence informed laws). These data can be found in the Supplemental Digital Content excel spreadsheet that lists the number of evidence informed policy interventions for each state. States with darker shading adopted more evidence-informed policy interventions. There are 4 states with 10 or more policy interventions: 15 in Missouri, 11 in Alabama, 10 in Florida and Idaho. The median is 4 policy interventions for all states. As a reminder, we coded laws that clearly addressed stroke for each policy intervention. We recognize that many states' EMS trauma and hospital specialty care laws and policies may encompass stroke care without expressly mentioning stroke and that some states leave it up to local EMS authorities to develop and implement stroke center networks and protocols, which are limitations of our study.

## IMPLICATIONS

- Many states' law recognize the need for hospitals to be stroke certified.
- States recognizing the 3 levels of stroke centers were more likely to have multiple pre-hospital policy interventions than states with fewer levels.
- Continuous quality improvement stroke laws were more common for hospital than prehospital aspects of the continuum.
- Better understanding of local and regional EMS systems is needed to address the gaps in prehospital policy interventions.

Given that stroke systems of care policies and stroke center certification have been supported by national stroke organizations for over a decade, it is encouraging to see that a majority of US states (39 states) have enacted law that expressly addresses aspects of the stroke continuum of care. Almost 70% of states already recognize at least one level of specialty stroke care through legislation, regulation or both. Half of the states and DC recognized the 3 levels of nationally certified or state certified stroke centers supported by best and promising evidence. States that recognized 3 levels of stroke centers were also more likely to have multiple pre-hospital policy interventions than states with fewer levels. We also found that continuous quality improvement stroke laws more commonly addressed hospital reporting into a CQI registry than prehospital aspects of the continuum. This suggests policy makers are more attentive to evidence-based interventions for in-hospital stroke care than prehospital stroke care. To gain a better understanding of the gaps in the prehospital aspect of the continuum of care, more research into the ways EMS is regulated at the local and regional level is needed.

Now, I'll turn it over to Siobhan to discuss our next steps.

## WHAT WE ARE DOING NOW

- ❑ Longitudinal state stroke law analysis 2002-2018
- ❑ Update legal dataset through 2020
- ❑ Implementation Case Study: State Policy Interventions to Improve Pre-Hospital Stroke Care
- ❑ EMS Home Rule Analysis
- ❑ Stroke Policy Impact Study and Policy Rating

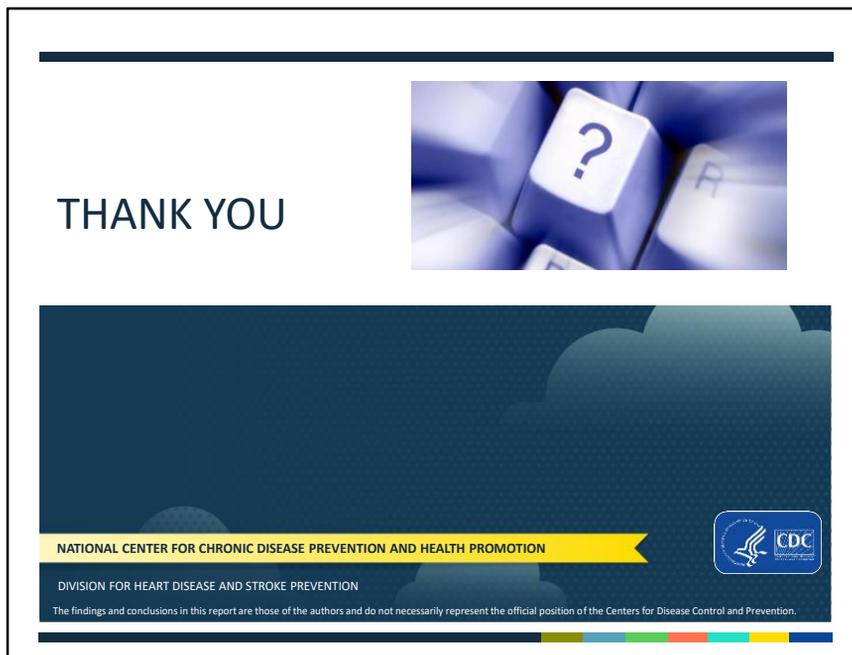
We are using the results of this study as a springboard for several other studies. We have expanded the analysis retrospectively through 2002. We are analyzing this longitudinal dataset to look at temporal and geographic trends in changes in state stroke law. We are also updating the dataset through 2020 and have added a few new variables, particularly related to thrombectomy capable stroke centers and stroke severity assessment.

We commissioned a qualitative case study examining facilitators, barriers and lessons learned from six states that recognize at least three tiers of stroke centers and had implemented prehospital stroke laws. This study is wrapping up.

It became apparent from preliminary findings from the case study and our policy surveillance work that we need to understand how prehospital care is regulated at the local level through home rule authority and how local EMS agencies and fire departments are funded. We have started to examine state laws establishing local home rule and how local jurisdictions are using home rule to regulate and fund EMS.

Lastly, we are working with ICF Macro to conduct a policy rating using our 50 state and DC longitudinal stroke policy surveillance data that will be linked to national

health outcome and economic datasets to see which attributes of stroke laws are associated with improved stroke outcomes. This study will also include a deeper dive into stroke systems of care in 9 states.



Thank you everyone for your input during the discussion phase, it sounds like there are emerging topics to explore, and continual support to improve stroke systems of care through law.

MODERATOR:

At this time, we'll take questions but first we'll check to see if any questions have come in through the Q&A box.

**\*If we have questions ask the questions posed by the attendees to the presenter\***

**\*If we do not have questions, proceed with the script below\***

Since it appears that we have no questions at this time from the audience, we have some questions that we wanted to ask that might be insightful to our participants.

Questions:

Question 1: I represent a state that passed a law establishing a stroke task force and my health department has implemented their recommendations through a

programmatic approach instead of amending the legislation or adopting regulations. How do you account for states like mine with more programmatic approaches to improving stroke outcomes?

Answer: This is an important issue for us as we try to understand the role of law in improving stroke outcomes. We are using legal epidemiology principles to test our hypotheses that state stroke laws will have positive impacts on stroke performance measures and outcomes. Our impact study should help us identify the types or combinations of policy interventions that need to be in place for state law to positively impact the stroke system of care for all populations across the state. We will need to control for the variations in programmatic activity for those states that did not pass a stroke systems of care law.

Question 2: You stated in the presentation that only one state addressed post hospital policy intervention. Which state and what policy was addressed.

Answer: **Colorado** is the state that addresses the QuIC posthospital policy intervention. A Colorado law requires that rehabilitation facilities are certified by CMS. National standards and certification for stroke rehabilitation facilities is supported by emerging evidence base. There were other states addressing posthospital intervention, but Colorado is the only state that directly regulated rehabilitation facilities.

## REMINDERS!

- All sessions are archived and the slides and script can be accessed at <https://www.cdc.gov/dhbsp/pubs/webcasts.htm>
- If you have any questions, comments, or topic ideas send an email to [AREBheartinfo@cdc.gov](mailto:AREBheartinfo@cdc.gov)

Thank you for your participation!

As a reminder, all sessions are archived, and the slides and script can be accessed at our Division website at the link shown. Today's slides will be available in about 2-3 weeks.

If you have any ideas for future topics or questions, please feel free to contact us at the listed email address on this slide.