May 19, 2023

MEMORANDUM

TO: The Honorable Glenn A. Youngkin
Governor of Virginia

The Honorable Janet D. Howell
Co-Chair, Senate Finance and Appropriations Committee

The Honorable George L. Barker
Co-Chair, Senate Finance and Appropriations Committee

The Honorable Barry D. Knight
Chair, House Appropriations Committee

The Honorable Terry L. Austin
Vice Chair, House Appropriations Committee

FROM: Karen Shelton, MD
State Health Commissioner, Virginia Department of Health

SUBJECT: 2022 Stroke Care Improvement Report

This report is submitted in compliance with the Virginia Acts of the Assembly – § 32.1-111.15:1, which states:

The Department shall report to the Governor and the General Assembly annually on July 1 on stroke care improvement initiatives undertaken in accordance with this section. Such report shall include a summary report of the data collected pursuant to this section.

Should you have any questions or need additional information, please feel free to contact me at (804) 864-7002.

KS/AJ
Enclosure

Pc: The Honorable John Littel, Secretary of Health and Human Resources

2022 Report to the Virginia General Assembly

Data-Driven Action Steps and Statewide Capacity Building
Pursuant to Stroke Care Quality Improvement in Virginia

Table of Contents
Acronym Glossary **Table of Contents**

Acronym Glossary

AHA/ASA	American Heart Association/American Stroke Association
ASTS	acute stroke treatment strategies
CDC	Centers for Disease Control and Prevention
CHW	community health worker
CSC	Comprehensive Stroke Center
CT	computed tomography
DNV	Det Norske Veritas
ED	emergency department
EMR	electronic medical record
EMS	Emergency Medical Services
ePCR	electronic patient care report
ESO	Emergency Services Organization
FIPS	Federal Information Processing Standards
FQHC	federally qualified health center
GWTG	Get With The Guidelines
HFAP	Healthcare Facilities Accreditation Program
JCHC	Joint Commission on Health Care
LKW	last known well
LVO	large vessel occlusion
MSV	Medical Society of Virginia
NIH	National Institutes of Health
OEMS	Office of Emergency Medical Services
PSC	Primary Stroke Center
PSC+	Primary Stroke Center Plus
PSNASP	Paul Coverdell National Acute Stroke Program
SAI	Sheltering Arms Institute
SAMS	Secure Access Management Services

SWSTF	Southwest Stroke Task Force
TJC	The Joint Commission
tPA	tissue plasminogen activator
VDH	Virginia Department of Health
VHHA	Virginia Hospital and Healthcare Association
VPhA	Virginia Pharmacists Association
VSCC	Virginia Stroke Coordinator Consortium
VSCQI	Virginia Stroke Care Quality Improvement
VSSTF	Virginia Stroke Systems Task Force

Executive Summary
Effective January 1, 2019, the Code of Virginia § 32.1-111.15:1 was amended to require the Virginia Department of Health (VDH) to implement systems for stroke data collection and information sharing, apply evidence-based guidelines for community-based follow-up care, and implement a continuous process for stroke care quality improvement initiatives in collaboration with hospitals and emergency medical services (EMS) agencies. VDH convened the Virginia Stroke Care Quality Improvement (VSCQI) Advisory Group to fulfill these requirements.

The purpose of this report to the Virginia General Assembly is to provide updates on progress towards the implementation of data-driven action steps and building statewide capacity pursuant to § 32.1-111.15:1. In June 2021, VDH began implementing the Centers for Disease Control and Prevention (CDC) Paul Coverdell National Acute Stroke Program (PCNASP). The strategies and activities contained in the approved work plan for the CDC PCNASP align with requirements of § 32.1-111.15:1 and support staffing for these efforts. Virginia's CDC PCNASP work plan has been adopted as the updated work plan as described in the 2021 Report to the Virginia General Assembly – Data-Driven Action Steps and Statewide Capacity Building Pursuant to Stroke Care Quality Improvement in Virginia. Prior published reports to the General Assembly can be accessed on the Legislative Information System. Recent progress on strategies and activities contained in the work plan of the Virginia proposal are described under the following requirements of this legislation:
- Implement systems to collect data and information about stroke care;
- Facilitate data sharing and collaboration;
- Apply guidelines for transitioning patients to community-based follow-up care; and
- Establish a process for continuous quality improvement.

History and Overview of Organized Approaches to Improving Stroke Care in Virginia
Organized approaches to improving stroke care and systems across Virginia have strengthened over the past decade. In 2006, VDH and the American Heart Association/American Stroke Association (AHA/ASA) followed the Recommendations for the Establishment of Stroke Systems of Care to spearhead the development of a work plan designed to be a strategic roadmap for improving stroke systems (Task Force, 2005). In 2007, the legislative Joint Commission on Health Care (JCHC) conducted a study to develop strategies to address stroke prevention and care across the Commonwealth. The JCHC staff convened a cross-sectional subject matter expert workgroup that met several times to review stroke systems of care in Virginia. Notably among the recommendations approved by the JCHC was the requirement that VDH convene a Virginia Stroke Systems Task Force (VSSTF) (Virginia Stroke Systems, 2007).

Since its creation in 2007, the VSSTF has addressed improvement in Virginia's stroke systems by convening strategy meetings focused on the stroke systems work plan, topics referred from the stroke systems workgroup, outcome analysis of interventions, and other stroke issues and concerns as necessary. Membership includes hospitals, EMS, government entities, not-for-profit organizations, professional associations, legislators, telemedicine and pharmaceutical companies, and healthcare professionals including, but not limited to, neurologists, nurses, emergency medicine physicians, pharmacists, physical therapists, and speech-language pathologists. With the large number of hospital-designated stroke coordinators within VSSTF, the Virginia Stroke Coordinator Consortium (VSCC) emerged in 2009 to promote evidence-based care in hospitals,

improve statewide and local collaborative partnerships, and serve as mentors, coaches, and resources for Virginia hospitals (Virginia Stroke Coordinators, 2009).

With a commitment to improving the quality of stroke care and building effective stroke systems, VSCC raised awareness of stroke center certification and acute stroke treatments in hospitals. In recent years, VSCC has focused on improving acute ischemic stroke care by reducing door-to-needle times for eligible patients treated with intravenous tissue plasminogen activator (tPA), also known as alteplase, among hospitals statewide. In 2015, the VSSTF, VSCC, and VDH created the Southwest Stroke Task Force (SWSTF) to support geographic regions with high mortality due to stroke but low access to healthcare services. The SWSTF focused their efforts on increasing stroke center certification, implementing EMS triage protocols, decreasing door-to-needle times, and expanding use of tele-stroke consultation.

In addition to ongoing stroke improvement efforts through the VSSTF and VSCC, the VDH Office of Emergency Medical Services (VDH OEMS) maintains the Virginia Stroke Triage Plan pursuant to the Code of Virginia § 32.1-111.3 (§ 32.1-111.3, 2018). The 2017 Virginia Stroke Triage Plan established a strategy through formal regional stroke triage plans that incorporate each region's geographic variations and acute stroke care capabilities and resources. This strategy sets forth a uniform set of criteria for the pre-hospital and inter-hospital triage and transport of acute stroke patients. Among the eleven EMS regional councils, regional stroke triage plans were developed using these statewide criteria and augmented to account for local variation of resources and capacity among EMS and hospitals.

The 2018 General Assembly passed legislation, HB 1197 and SB 867, which enabled VDH to establish the VSCQI Advisory Group. The summary legislation as passed states:

> ***Stroke care quality improvement.*** *Provides that the Department of Health shall be responsible for stroke care quality improvement initiatives in the Commonwealth. Such initiatives shall include (i) establishing systems to collect data and information about stroke care in the Commonwealth, (ii) facilitating information and data sharing and collaboration among hospitals and health care providers to improve the quality of stroke care in the Commonwealth, (iii) requiring the application of evidence-based treatment guidelines for transitioning patients to community-based follow-up care following acute treatment for stroke, and (iv) establishing a process for continuous quality improvement for the delivery of stroke care by the statewide system for stroke response and treatment. The bill also directs the Department of Health to convene a group of stakeholders, which shall include representatives of (a) hospital systems, including at least one hospital system with at least six or more stroke centers in the Commonwealth, recommended by the Virginia Hospital and Healthcare Association; (b) the Virginia Stroke Systems Task Force; and (c) the American Heart Association/American Stroke Association, to advise on the implementation of stroke care quality improvement initiatives. The provisions of the bill making the Department of Health responsible for stroke care quality improvement initiatives in the Commonwealth have a delayed effective date of January 1, 2019.*

The Code of Virginia was amended by adding in Article 2.1 of Chapter 4 of Title 32.1 a section numbered 32.1-111.15:1 (Appendix A).

In June 2021, VDH began implementation of the CDC PCNASP. VDH's approved "CDC PCNASP Virginia Proposal" aligns with the core requirements of the 2018 legislation, and the CDC PCNASP work plan has been adopted as the updated work plan for this continued work.

Background on Stroke Burden and Stakeholder Collaborations
Stroke Burden
Stroke is the fifth leading cause of death in the United States and the fourth leading cause of death in Virginia. Virginia belongs to the Stroke Belt, a region of southeastern states recognized for its high incidence of stroke and prevalence of cardiometabolic conditions, including hypertension, diabetes, hypercholesterolemia and obesity. In 2020, 4,082 Virginians died from stroke compared to 3,774 stroke-related deaths in 2018. Stroke death rates have steadily increased since 2016, when the age-adjusted stroke death rates per 100,000 population were at the lowest rate in decades (Vital Event Statistics Program, 2022). As shown in Figure 1, the age-adjusted stroke death rates per 100,000 population steadily increased from 37.2 in 2016 to 39.9 in 2020.

TRENDS IN AGE-ADJUSTED DEATH RATES FROM CEREBROVASCULAR DISEASE IN VIRGINIA, 2016-2020
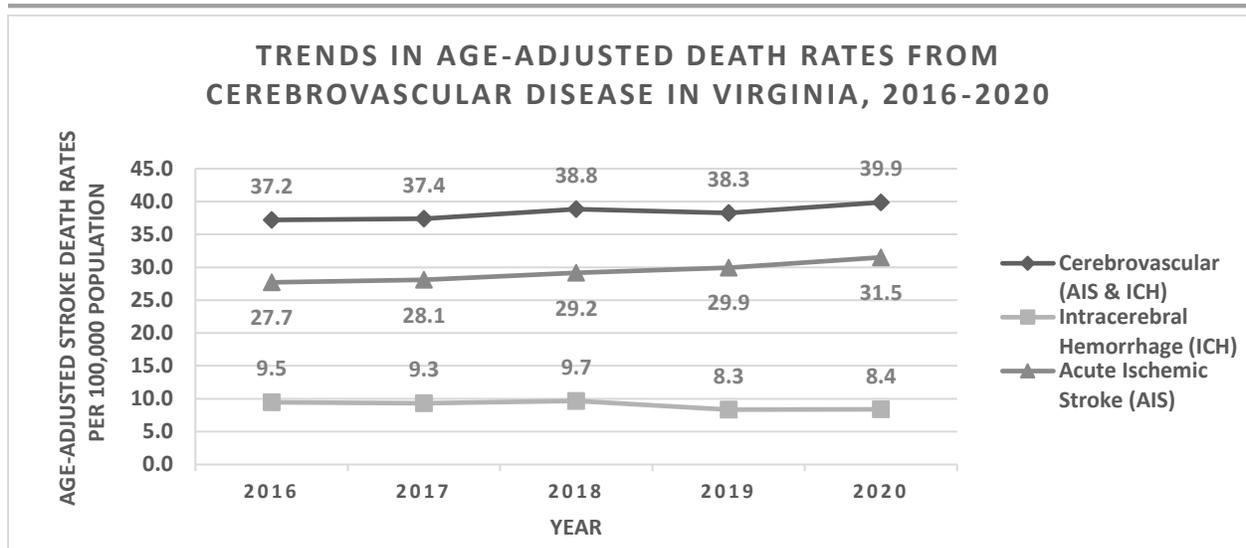
Figure 1. Trends in Age-adjusted Death Rates from Cerebrovascular Disease in Virginia, 2016-2020. ICD-10 Codes I60-I69 (Cerebrovascular), I60-I62 (Intracerebral Hemorrhage (ICH)), I63-I69 (Acute Ischemic Stroke (AIS)). Data Source: Vital Event Statistics Program, Office of Information Management, Virginia Department of Health.

Stroke death can occur at any age, however, advanced age is the strongest predictor of death from stroke in Virginia. In Figure 2, the 45-54 age group had an age-specific death rate per 100,000 population of 11.5, followed by 35.0 for ages 55-64, 82.2 for ages 65-74, 271.6 for ages 75-84, and 1071.3 for ages 85 and older (Vital Event Statistics Program, 2022).

In Figure 3, the Black or African American racial group has the highest age-adjusted stroke death rate per 100,000 population among the racial groups at 50.8 compared to the 38.3 Virginia rate for 2016-2020 combined data. Additionally, males show slightly higher rates of stroke death than females (Vital Event Statistics Program, 2022).

Age-specific Death Rates with an Underlying Cause of Cerebrovascular Disease in Virginia, 2020

(Figure: Bar chart titled "Age-specific Death Rates with an Underlying Cause of Cerebrovascular Disease in Virginia, 2020")

Ages (Years)	Age-specific Stroke Death Rates per 100,000 Population
0-4	1.2
5-14	0.2
15-19	0.4
20-24	1.0
25-34	1.5
35-44	3.7
45-54	11.5
55-64	35.0
65-74	82.2
75-84	271.6
85+	1071.3

Figure 2. Age-specific Death Rates with an Underlying Cause of Cerebrovascular Disease in Virginia, 2020. ICD-10 Codes I60-I69 (Cerebrovascular), I60-I62 (Intracerebral Hemorrhage (ICH)), I63-I69 (Acute Ischemic Stroke (AIS)). Data Source: Vital Event Statistics Program, Office of Information Management, Virginia Department of Health.

Age-adjusted Death Rates with an Underlying Cause of Cerebrovascular Disease by Demographics in Virginia, 2016-2020

(Figure: Bar chart titled "Age-adjusted Death Rates with an Underlying Cause of Cerebrovascular Disease by Demographics in Virginia, 2016-2020")

Demographic	Age-adjusted Stroke Death Rates per 100,000 Population
VIRGINIA TOTAL	38.3
WHITE	37.0
BLACK OR AFRICAN AMERICAN	50.8
ASIAN OR PACIFIC ISLANDER	26.4
AMERICAN INDIAN OR ALASKA NATIVE	15.0
HISPANIC	21.0
OTHER, NON-HISPANIC	38.9
FEMALE	37.7
MALE	38.5

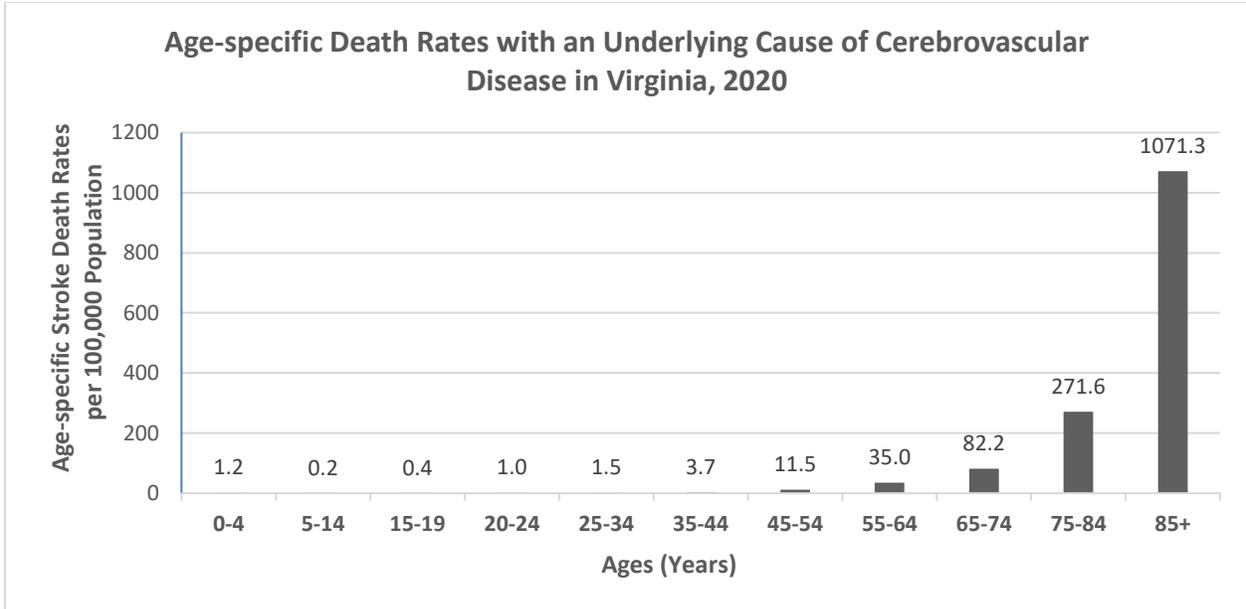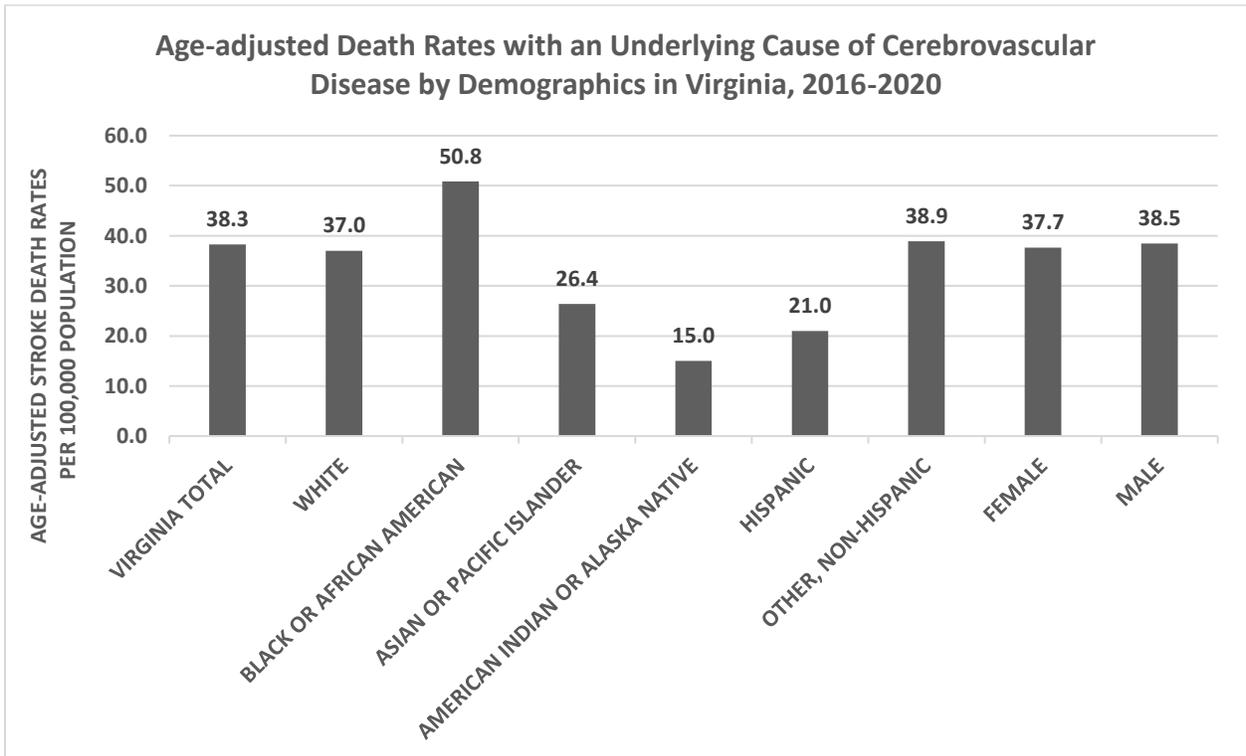**Figure 3. Age-adjusted Death Rates with an Underlying Cause of Cerebrovascular Disease by Demographics in Virginia, 2016-2020. ICD-10 Codes I60-I69 (Cerebrovascular), I60-I62 (Intracerebral Hemorrhage (ICH)), I63-I69 (Acute Ischemic Stroke (AIS)). Data Source: Vital Event Statistics Program, Office of Information Management, Virginia Department of Health.**

Figures 4 and 5 show similar results for stroke hospitalization rates. In Figure 4, advanced age was the strongest predictor in age-specific hospitalization rates per 100,000 population. A combined data set of 2016-2020 hospitalization data from the Virginia Health Information (VHI) Inpatient Database reveal ages 75 and older have the highest stroke hospitalization rate at 77.92 compared to 33.95 for ages 65-74. The rate decreases further to 25.55 for ages 55-64 (VHI Inpatient Discharge Database, 2022).
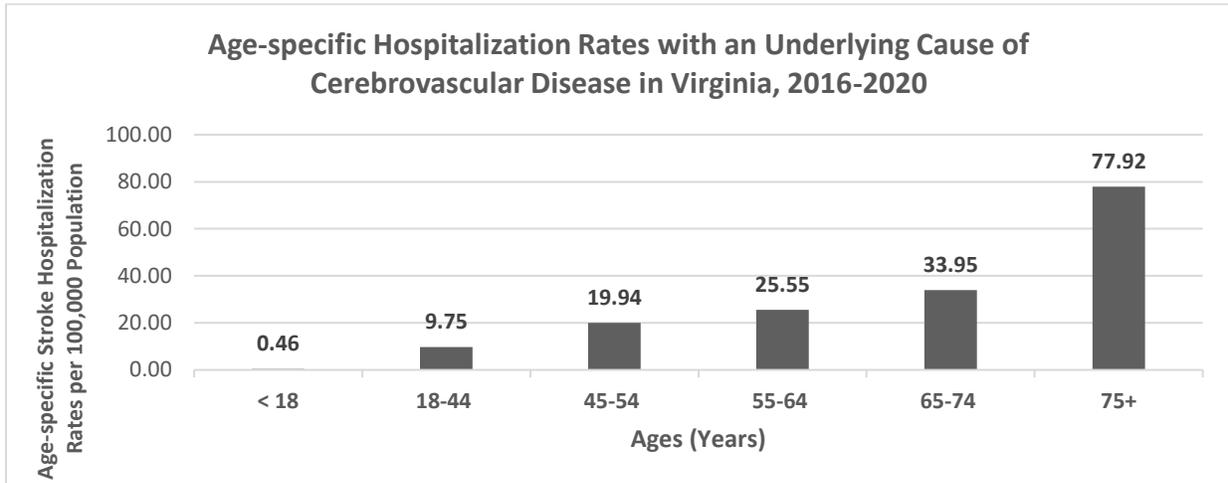
Figure 4. Age-specific Hospitalization Rates per 100,000 Population with an Underlying Cause of Cerebrovascular Disease in Virginia, 2016-2020. ICD-10 Codes I60-I62 (Intracerebral Hemorrhage (ICH)), I63-I69 (Acute Ischemic Stroke (AIS)), G45 (Transient Ischemic Attack (TIA)), I60-I69 and G45 (All Stroke/TIA). Data Source: Inpatient discharge dataset provided to Virginia Department of Health by Virginia Health Information Discharge Database, 2022.
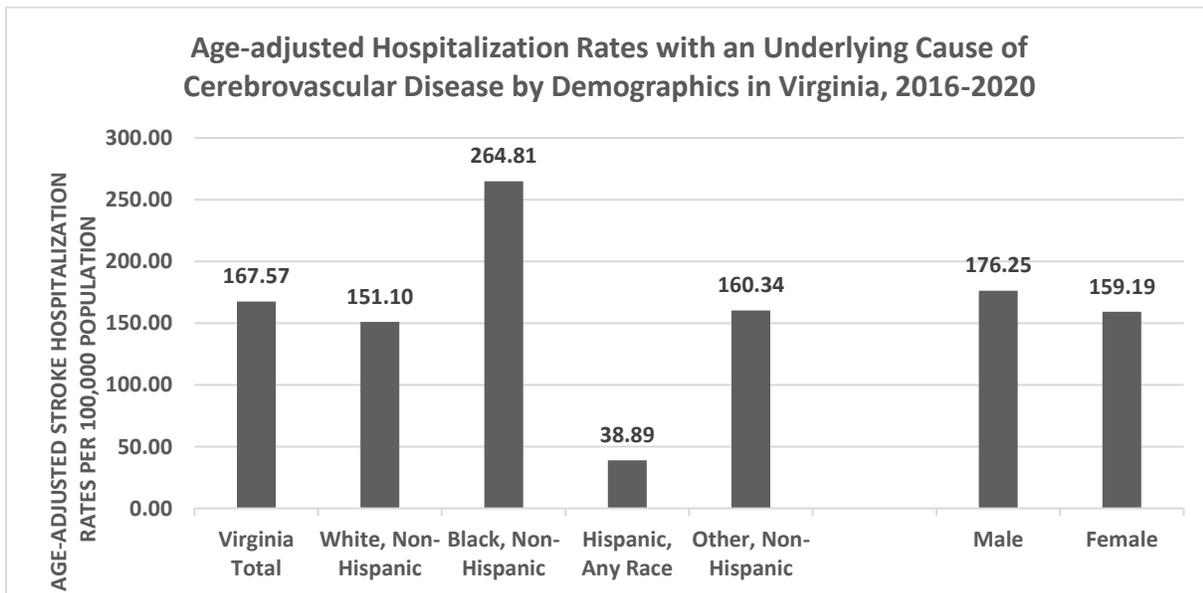
Figure 5. Age-adjusted Hospitalization Rates per 100,000 Population with an Underlying Cause of Cerebrovascular Disease by Demographics in Virginia, 2016-2020. ICD-10 Codes I60-I62 (Intracerebral Hemorrhage (ICH)), I63-I69 (Acute Ischemic Stroke (AIS)), G45 (Transient Ischemic Attack (TIA)), I60-I69 and G45 (All Stroke/TIA). Data Source: Inpatient discharge dataset provided to Virginia Department of Health by Virginia Health Information Discharge Database, 2022.

In Figure 5, the Black, Non-Hispanic racial group has the highest age-adjusted stroke hospitalization rate per 100,000 population among racial groups at 264.81 compared to the 167.57 Virginia rate for 2016-2020 combined data. Males show a higher rate of stroke hospitalization compared to females, at 176.25 and 159.19 respectively (VHI Inpatient Discharge Database, 2022).

In addition to the stroke death and hospitalization disparities in age and race, the data indicate stroke death and hospitalization rate disparities in counties and cities across the Commonwealth of Virginia. In 2019, the VSCQI Advisory Group prioritized geographic areas based on age-adjusted stroke mortality rates from 2014 to 2018. As shown in Table 1, 2016-2020 stroke mortality data were compared with the 2014-2018 data to show whether death rates increased or decreased across the target counties and cities.

The target counties and cities with the highest age-adjusted stroke mortality rates per 100,000 population for 2016-2020 were Franklin City at 96.3, Martinsville City at 94.42, and Galax City at 82.64. The target cities with the largest increase from 2014-2018 to 2016-2020 combined data were Galax City at +12.55 and Martinsville City at +9.78. The target counties and cities with the largest decrease (improvement) in stroke death rates were Highland County at -23.15 and Surry County at -18.88 (Vital Event Statistics Program, 2022).

The VSCQI Advisory Group continues to initiate partnerships to support hospitals that serve the target counties and cities with the highest stroke death rates in each of the five health planning regions – Central, Eastern, Northern, Northwest, and Southwest. A snapshot of the breakdown of hospitals providing the majority of stroke admissions for each of the target counties and cities is shown in Table 2. For example, in the Southwest region, Martinsville City has 76.4% of their stroke admissions in SOVAH Memorial Hospital of Martinsville & Henry County, followed by Carilion Medical Center at 17.0%, and then SOVAH Danville Regional Medical Center at 3.2% (VHI Inpatient Discharge Database, 2022). Hospital proximity does not necessarily determine where patients are admitted for stroke. The AHA/ASA evidence-based guidelines and Virginia's Stroke Triage Plan provides state and regional guidance and protocols for paramedics to screen and triage patients to the most appropriate hospital for stroke care (§ 32.1-111.3, 2018). For instance, Carilion Medical Center in Roanoke has the largest percentage of Lexington City's stroke admissions at 36.4%. Virginia hospitals become certified as stroke centers through three certifying agencies – The Joint Commission (TJC), Det Norske Veritas (DNV), and Healthcare Facilities Accreditation Program (HFAP). As of December 2021, there are seven Comprehensive Stroke Centers (CSC), one Primary Stroke Center Plus supplemental levels of stroke care (PSC+), thirty-nine Primary Stroke Centers (PSC), seven Acute Stroke Ready Hospitals, and eleven stroke rehabilitation certified facilities (Virginia Stroke Coordinators Consortium, 2021).

Table 1. Virginia Stroke Priority Geographic Areas by Mortality Age-adjusted Rates, 2014-2018 and 2016-2020 Comparison.

Region	Locality	Local Health Department	Stroke Mortality 2014-2018	Stroke Mortality 2016-2020	Stroke Mortality Change (+ / -)
Central	Greensville County	Crater	64.76	63.43	-1.33
	Brunswick County	Southside	59.44	59.53	0.09
	Nottoway County	Piedmont	59.13	53.97	-5.16
	Petersburg City	Crater	58.65	65.10	6.45
	Surry County	Crater	57.96	39.08	-18.88
	Mecklenburg County	Southside	56.97	60.28	3.31
	Hopewell City	Crater	49.93	44.49	-5.44
Eastern	Franklin City	Western Tidewater	93.2	96.93	3.73
	Portsmouth City	Portsmouth	52.67	47.68	-4.99
	Lancaster County	Three Rivers	52.66	58.78	6.12
	Norfolk City	Norfolk	50.01	53.09	3.08
	Hampton City	Hampton	47.33	42.89	-4.44
	Accomack County	Eastern Shore	45.56	51.32	5.76
	Mathews County	Three Rivers	44.48	35.87	-8.61
Northern	Manassas City	Prince William	49.75	46.00	-3.75
	Fairfax City	Fairfax	41.11	49.95	8.84
Northwest	Highland County	Central Shenandoah	60.66	37.51	-23.15
	Lexington City	Central Shenandoah	60	54.99	-5.01
	Buena Vista City	Central Shenandoah	53.67	44.49	-9.18
	Harrisonburg City	Central Shenandoah	48.99	47.57	-1.42
	Staunton City	Central Shenandoah	48.17	41.44	-6.74
	Warren County	Lord Fairfax	44.16	47.87	3.71
	King William County	Rappahannock	44.14	51.49	7.35
	Caroline County	Rappahannock	42.46	39.53	-2.93
Southwest	Martinsville City	West Piedmont	84.64	94.42	9.78
	Covington City	Alleghany	74.77	64.23	-10.54
	Galax City	Mount Rogers	70.09	82.64	12.55
	Radford City	New River	67.57	62.29	-5.28
	Lynchburg City	Central Virginia	61.13	64.97	3.84
	Appomattox County	Central Virginia	59.56	58.82	-0.75
	Danville City	Pittsylvania-Danville	54.72	52.85	-1.87
	Salem City	Alleghany	51.26	51.97	0.71
	Amherst County	Central Virginia	50.55	47.20	-3.35

Notes: Localities were categorized by Virginia Health Planning Region and sorted by Age-adjusted Mortality Rate. The top quartile of each region was then selected to indicate priority localities. (Virginia Department of Health, Office of Vital Records).

Table 2. Stroke Mortality per 100k Population and Percent Admission by Hospital by Locality, 2016-2020.

Region	Locality	All-Stroke Mortality per 100k Population	Hospital 1		Hospital 2		Hospital 3	
			Hospital Name	% Stroke Admissions in Locality	Hospital Name	% Stroke Admissions in Locality	Hospital Name	% Stroke Admissions in Locality
Central	Petersburg City	65.10	Southside Regional Medical Center	56.1%	VCU Health System	19.6%	CJW Medical Center	14.1%
Eastern	Franklin City	96.93	Southampton Memorial Hospital	31.0%	VCU Health System	20.2%	Sentara Obici Hospital	19.4%
Northern	Fairfax City	49.95	Inova Fairfax Hospital	68.6%	Inova Fair Oaks Hospital	19.9%	Virginia Hospital Center	3.5%
Northwest	Lexington City	54.99	Carilion Medical Center	36.4%	Carilion Stonewall Jackson Hospital	32.4%	Augusta Health	16.2%
Southwest	Martinsville City	94.42	SOVAH Memorial Hosp. Martinsville & Henry County	76.4%	Carilion Medical Center	17.0%	SOVAH Danville Regional Medical Center	3.2%

Stakeholder Collaborations

VDH continues to facilitate cross-sector collaboration across the continuum of stroke care. VDH leads the VSCQI Advisory Group, co-leads the VSSTF, and supports the VSCC. VDH meets bi-weekly with the VSSTF and VSCC Co-Chairs and planning teams to identify speakers, professional development and peer learning opportunities, and logistics for quarterly statewide meetings. VDH convenes the VSCQI Advisory Group quarterly, and its work groups meet monthly and as necessary. Clinical experts with experience in stroke care co-lead the following work groups with VDH: Data Council, Acute Stroke Treatment Strategies (ASTS), and Hospital and EMS Transitions of Care. VDH expanded the scope of established coalitions and broadened stakeholder collaborations as a result of the approved CDC PCNASP work plan.

Continued work through the VSCQI Advisory Group, VSSTF, and VSCC partnerships help to achieve the strategies and activities in the CDC PCNASP work plan – outlined in the 2021 Report to the Virginia General Assembly – Data-Driven Action Steps and Statewide Capacity Building Pursuant to Stroke Care Quality Improvement in Virginia, where the roles of expanded stakeholder collaborations are defined. All CSC and PSC+ hospitals will lead activities outlined in the first year of the work plan and serve as mentors to all other hospitals in the following years. Virginia Hospital and Healthcare Association (VHHA) will be a critical partner in hospital engagement, data analysis, and quality improvement facilitation to all hospitals. EMS regional councils will lead engagement and quality improvement among EMS agencies. Sheltering Arms Institute (SAI) will work with CSC and PSC+ hospitals to create in-patient rehabilitation clinical guidelines and scale the VDH toolkit to all in-patient rehabilitation facilities. Unite Us will create a specific focus on stroke transitions of care and engagement of patient navigators through their state referral system. Kwikpoint, VHHA, Medical Society of Virginia (MSV), and Virginia Pharmacists Association (VPhA) will spread the Stroke Smart Virginia campaign to all hospitals, primary care practices, federally qualified health centers

(FQHCs), free clinics, and pharmacies, in addition to establishing a Stroke Smart Virginia public awareness campaign.

Stroke Smart Virginia: Increasing Stroke Awareness and Reducing Health Disparities
Every minute a person is untreated after experiencing a stroke, nearly 1.9 million neurons, or brain cells that transmit signals to different parts of the body, are lost (Saver, 2006). The effects of brain cells dying present as the typical signs and symptoms of stroke (American Heart Association, 2017):
- Sudden numbness or weakness in the face, arm, or leg, especially on one side of the body;
- Sudden confusion, trouble speaking, or difficulty understanding speech;
- Sudden trouble seeing in one or both eyes;
- Sudden trouble walking, dizziness, loss of balance, or lack of coordination; and
- Sudden severe headache with no known cause.

If any one of these signs and symptoms is present, the individual should call 9-1-1 immediately so that EMS can transport the patient to the most appropriate hospital for stroke care. This guidance has led to the popular phrase, "Time is Brain," because every second and minute matter to save brain cells and prevent disability and death (Saver, 2006). At the hospital, emergency department physicians and the stroke care team assess the time that the patient was last well (last known well, or LKW) and determine if the patient meets the window for treatment of under three to four and a half hours after symptom onset (Get With The Guidelines, 2019). Despite improvements in the time that patients arrive to the hospital and are given thrombolytic treatment, many patients do not receive thrombolytic treatment due to being outside of the treatment window. In a National Inpatient Sample of 563.087 patients who had an acute ischemic stroke between 2005 and 2011, only 3.8% received thrombolytic treatment. Furthermore, disparities persisted in receiving thrombolytic treatment whereby Blacks were 38% less likely, Hispanics were 25% less likely, women were 6% less likely, and residents of the Stroke Belt, including Virginia, were 31% less likely to receive thrombolytic treatment (American Heart Association, 2017). Efforts are needed to increase public awareness about stroke so that individuals can recognize the signs and symptoms of stroke and call 9-1-1 immediately to receive treatment within the treatment window.

According to the 2019 AHA/ASA Guidelines, public health leaders are encouraged to design and implement public education programs to raise awareness of the recognition of stroke signs and symptoms and the need to seek emergency care by calling 9-1-1. These programs are advised to be designed to reach racially and ethnically diverse populations. To that end, Virginia has launched a public health education campaign called Stroke Smart Virginia. Stroke Smart Virginia aims to educate the public about the importance of stroke awareness, increase knowledge about the signs and symptoms of stroke, and encourage calling 9-1-1 if any of the signs and symptoms of stroke are present. Stakeholders leading Stroke Smart Virginia include Kwikpoint, VDH, Virginia EMS Regional Councils, VSSTF and VSCC. To promote the campaign, stakeholders provide magnets, wallet cards and posters to community-based organizations, hospitals, EMS, pharmacies, schools, and faith-based organizations. Stroke Smart Virginia materials have been tailored to reach and resonate with target populations so that the messages are easily understood and are reflective of diverse audiences. Materials have also been translated to Spanish. By raising awareness about stroke through Stroke Smart Virginia, all

Virginians can act quickly to recognize the signs and symptoms of stroke and call 9-1-1 immediately. In a formal declaration of the Commonwealth of Virginia's commitment to raising stroke awareness, former Governor Ralph S. Northam proclaimed Virginia a Stroke Smart Commonwealth on December 6, 2021 (Appendix B).

Legislative Requirements – Implementation Process and Recommendations
Implement Systems to Collect Data and Information about Stroke Care
Legislation Implementation Process
In June 2021, VDH began implementation of the CDC PCNASP grant, which requires state recipients to implement a state-wide stroke registry, collect and monitor stroke care data defined by CDC's stroke data elements, and submit de-identified aggregate data to CDC's nationally recognized data set platform with confidentiality standards. The VDH and VSCQI Advisory Group have adopted the CDC stroke data elements for the Virginia Stroke Registry.

The CDC provided a Coverdell Data Elements Manual to guide hospitals and EMS in collecting and reporting stroke care data on a quarterly basis. The CDC PCNASP currently funds 13 recipients, including Virginia. Recipients are required to collect and report data elements as part of standardized data reporting for the Coverdell Program. Data elements are used by the CDC and its recipients to describe, monitor, and assess progress and performance of the program.

Data for the 163 data elements can be separated into two sections: Pre-hospital and In-hospital. There are four additional administrative data elements that will precede both sections and will be used to append the Pre-hospital and In-hospital data files together. These four administrative data elements bring the total number of data elements to 167.

The Coverdell Data Elements Manual includes information about technical specifications for the data element variables included in each of the categories, guidance for their submission, and conventions for processing the data. Specifications for each data element include variable name, prompt, format, source of data, denominator population, acceptable values, description, and use for data analysis. Variables are reported for each patient. The values for each patient establish a record for the patient's hospital visit. The manual is organized as follows:

- **Pre-hospital**. This section includes eight data element variables. It includes data about the pre-hospital aspect within the stroke continuum of care. It includes EMS arrival, EMS departure, patient age and gender, as well as the performance of a stroke screen and glucose level.
- **In-hospital**. This section contains 155 data element variables. It includes data about the in-hospital aspect within the stroke continuum of care and collects demographic information including age, gender, race, ethnicity, and insurance status. Additional data collected includes EMS information, date and time of hospital arrival, hospital admission status, comfort measures, medications taken prior to admission, medical history, admission data, tele-stroke, imaging, patient last known to be well, first discovery of stroke-like symptoms, National Institutes of Health (NIH) Stroke Scale score, stroke treatment, other complications, active bacterial or viral infection at admission or during hospitalization, date of discharge from hospital, principal discharge ICD-10-CM diagnosis, clinical diagnosis related to stroke that was ultimately responsible for the current admission, discharge disposition, functional status at discharge, antihypertensive

treatment at discharge, lipid treatment, atrial fibrillation, antithrombotics at discharge, smoking counseling, stroke education, and rehabilitation.

- **Administrative**. This section contains four data element variables that are necessary for analytical utility, data quality, and program fidelity. These are state Federal Information Processing Standards (FIPS), unique patient identifier, residential zip code, and unique hospital identifier. These data elements assist with monitoring program fidelity, where the expectation is to serve participants disproportionately impacted by high prevalence of risk factors for stroke events, and stroke outcomes.

The CDC PCNASP data elements are further described in Table 3.

Table 3. CDC PCNASP Data Elements (Edition 1, 2021).

Category	Data Elements
Demographic	Age, Gender, Race, Ethnicity, Health Insurance
Intake	EMS Notification, Hospital Arrival, Comfort Measures, Medications
Medical History	Diabetes Mellitus (DM), Prior Stroke, Transient Ischemic Attack (TIA), Carotid Stenosis, Myocardial Infarction (MI) or Coronary Artery Disease (CAD), Peripheral Arterial Disease (PAD), Valve Prosthesis, Congestive Heart Failure (CHF), Sickle Cell Disease, Pregnancy, Atrial fibrillation (A-fib), Telestroke, e-Cigarette, Dyslipidemia, Hypertension (HTN), Dementia, Emerging Infectious Disease, Severe Acute Respiratory Syndrome – Coronavirus 1 (SARS-COV-1), Severe Acute Respiratory Syndrome – Coronavirus 2 (SARS-COV-2), Middle East Respiratory Syndrome (MERS), Other infectious respiratory pathogen
Admission	Date Admitted, Ambulatory status prior to stroke/TIA, Symptoms completely resolve
Imaging	Brain Imaging performed after arrival, computed tomography / magnetic resonance imaging (CT/MRI), Date and Time, Findings, Acute Vascular or Perfusion Imaging performed
Stroke Onset	Date and time of last known well, patient discovery, National Institute of Health (NIH) Stroke Scale performed, NIH score
Thrombolytic Treatment	Intravenous (IV) thrombolytic initiated, date and time, type of thrombolytic used (Alteplase, Tenecteplase) and dose, reasoning if tenecteplase, Imaging if beyond 4.5 hour window, IV thrombolytic at outside hospital or EMS mobile stroke unit, catheter-based treatment, Date and time of intra-arterial (IA) alteplase or mechanical endovascular reperfusion (MER) initiation at hospital
Complications	Complications of thrombolytic therapy, Reasons for no thrombolytics 0-3 hour window, Exclusions, IV thrombolytics delay
Other Treatment Options	Early Antithrombotics, Venous Thromboembolism (VTE) Prophylaxis, Other Therapeutic Anticoagulation
Hospital Discharge	Dysphagia Screening, Other In-Hospital Complications, Other Complications, Active bacterial or viral infection at admission or during hospitalization, Date of Discharge, Principal discharge International Classification of Diseases, 10th Revision (ICD-10-CM) diagnosis, Clinical Diagnosis related to stroke, Discharge Disposition, Functional Status at Discharge, Antihypertensive treatment, Lipid Treatment, Atrial Fibrillation, Antithrombotics at Discharge, Smoking Counseling, Stroke Education, Rehabilitation

Under the CDC PCNASP, VDH submits de-identified, aggregate stroke care data to the Secure Access Management Services (SAMS) portal, CDC's nationally recognized data set platform with confidentiality standards. To pilot data collection and reporting, VDH targeted all thirteen

CSCs, PSC+s and Thrombectomy-Capable Centers in 2021-2022. These 13 hospitals utilize the AHA/ASA Get With The Guidelines (GWTG), which has a Coverdell layer for collecting and reporting data to the CDC PCNASP. In addition, VDH and VHHA have partnered to guide five non-stroke certified hospitals in conducting a trial of the Virginia Stroke Registry. These five non-stroke certified hospitals are located in underserved counties and cities with a high burden of stroke hospitalization and mortality rates. Currently, EMS data is available to VDH through the existing Memorandum of Agreement with the Emergency Services Organization (ESO) and OEMS through the trauma registry.

In 2022-2023, VDH anticipates a full launch of the Virginia Stroke Registry. By testing the Virginia Stroke Registry in 2021-2022, the automated data transfer methods, inter-rater reliability, and re-abstraction methods will be completed and ready to scale to additional hospitals. VDH will expand participation in the Virginia Stroke Registry 41 PSCs and 10 additional non-stroke certified hospitals or acute-stroke ready hospitals. At full launch, the EMS layer of stroke data will overlay hospital stroke data. This will allow the patient record to link between EMS and hospitals from pre-hospital to post-hospital, enabling VDH, EMS and hospitals to track a patient's journey throughout the continuum of stroke care.

Recommendations
The VSCQI Advisory Group recommends use of the CDC PCNASP data elements for the Virginia Stroke Registry data elements. These data elements align with the GWTG, TJC, DNV, and HFAP data elements. In addition, it is recommended that all hospitals and EMS agencies are to be encouraged to participate in the Virginia Stroke Registry, notwithstanding the requirement of CSC, PSC, and PSC+ hospitals to submit data to VDH.

Facilitate Data Sharing and Collaboration
Legislation Implementation Process
VDH will continue to develop the Virginia Stroke Registry and finalize the contract with a vendor in 2022. There is consideration to facilitate data sharing and collaboration through a health data exchange concept similar to the OEMS health data exchange with the trauma registry. In 2021, OEMS selected ESO as the vendor for the trauma registry for hospitals and EMS agencies. A key feature to facilitate hospital and EMS data sharing is the ESO Health Data Exchange. This bi-directional data exchange platform allows EMS and hospitals to share time-sensitive patient data electronically and translates the information automatically from any prehospital electronic patient care report (ePCR) system to any hospital electronic medical record (EMR) system. Furthermore, this overlay of hospital and EMS data allows VDH to share outcome reports with hospital and EMS partners. VDH is exploring implementing a similar platform for the Virginia Stroke Registry.

Recommendations
The VSCQI Advisory Group recommends the inclusion of a health data exchange as a bi-directional data exchange platform within the Virginia Stroke Registry. The benefits of a health data exchange include, but are not limited to:
- Facilitation of data and information sharing among VDH, hospitals and EMS agencies;
- Continuity of care connecting EMS prehospital care data with hospital care data;

- Stroke outcome data that provides a complete picture of the patient journey from the time of the 911 call to the time of patient discharge from the hospital;
- Integration between prehospital and hospital systems saves significant time and allows emergency department staff to focus on patient care; and
- Accuracy of hospital EMS communication regarding patient outcomes.

Apply Guidelines for Transitioning Patients to Community-Based Follow-up Care
Legislation Implementation Process
Under the CDC PCNASP, VDH established a partnership with Unite Us to create a post-discharge stroke transitions of care pathway, create referral flags for organizations with community health workers (CHWs), and provide access to hospitals with the Unite Us Insights Dashboard to identify community level gaps in access to healthcare, social services, mental health services, and community resources. The partnership with Unite Us builds on the existing partnership between VDH, VHHA, and Unite Us established in 2020 when the Commonwealth of Virginia allocated $10 million in federal Coronavirus Aid, Relief, and Economic Security (CARES) Act funding to establish Unite Virginia, a statewide technology platform designated to connect vulnerable Virginians to health and social services (WRIC, 2020).

Building on the rapid expansion of the statewide referral network, VDH has partnered with Unite Us to focus specifically on stroke transitions of care and community-based referrals for follow-up care. Unite Us will work with the CSC and PSC+ hospitals to define and identify specific pathways to medical, rehabilitation, social, and mental health services and community-based resources for patients who are discharged from a hospital after a stroke event. For underserved and under-resourced counties and cities, the forthcoming Unite Us health equity dashboard will identify patient clinical and social needs and trigger hospitals and community stakeholders to find ways to fill gaps in care. Patients will be connected to patient navigators who will assist with connecting them to the appropriate resource through the Unite Us network. The advantage of utilizing Unite Us is two-fold. Health systems can have access to a unified, statewide network of clinical and community resources through Unite Us, whose reach extends to where the patient resides which is often outside of the hospital service area. In addition, the patient will be assisted by dedicated patient navigators within Unite Us and CHWs employed by hospitals or external community-based organizations. When the patient is discharged, hospital social workers, patient navigators or CHWs can focus their attention on the patients that remain within the hospital.

In order to trial a new post-discharge stroke transitions of care model that enables community-based follow-up care, Unite Us onboarded hospitals to the Unite Us platform, fully integrated hospital EHRs with Unite Us, and tested post-discharge stroke transitions of care pathways with hospitals in 2021-2022. A breakdown of the progress Unite Us has achieved through hospital engagement across the five health planning regions is described in Table 4.

Between 2021 and 2022, Unite Us fully onboarded 16 hospitals and 13 community-based organizations. With EHR agreements in place, Unite Us has 75 hospitals with full EHR integration, which allows hospital users to utilize Unite Us through their hospital EHR system rather than enter into a separate platform. To date, only one hospital in the Eastern Region has pilot-tested the Unite Us stroke post-discharge transitions of care pathway.

Table 4. Unite Us Engagement with Hospitals for Post-discharge Stroke Transitions of Care, 2021-2022.

	Unite Us Onboarding - Pending Status (# of Hospitals)	Unite Us Onboarding – Fully Live Status (# of Hospitals)	Unite Us Full EHR Integration (# of Hospitals)	Unite Us Stroke Transitions of Care Pilot (# of Hospitals)	Unite Us Fully Live Status – (# of Community-based Organizations)
Central	14	2	16	0	4
Eastern	18	2	19	1	2
Northern	11	0	8	0	3
Northwest	13	3	12	0	2
Southeast	17	9	20	0	2
Total	**73**	**16**	**75**	**1**	**13**

With a statewide referral platform in place, Virginia hospitals have the ability to refer patients for community-based follow-up care and services beyond the limitations of the hospital stroke coordinator or care manager. By entering patients into Unite Us, patients are connected to resources based on their assessed needs. This evidence-based practice puts into implementation the VSCQI Advisory Group's *Transitions to Community-based Follow-up Care* and *Follow-up Care after Acute Stroke Treatment,* which was officially recommended in the 2020 Report to the Virginia General Assembly.

Recommendations
The VSCQI Advisory Group recommends hospital use of Unite Us, or any similar statewide referral platform, to alleviate the burden from hospital stroke coordinators and care managers of connecting patients to necessary services post-discharge. It is beyond the physical capacity of stroke coordinators and care managers to assess and refer patients to needed resources. Many stroke coordinators may also have limited knowledge of local resources and services beyond the immediate service area of the hospital from which a patient may be transported for stroke care. It is recommended that general funds be allocated annually to continue to sustain a statewide referral system.

Establish a Process for Continuous Quality Improvement
Legislation Implementation Process
The VSCQI Advisory Group has established a process for continuous quality improvement for hospitals and EMS. The VDH stroke registry epidemiologist, funded through the CDC PCNASP grant, will analyze the quantitative and qualitative data from the Virginia Stroke Registry and the hospital and EMS inventory surveys to create tailored, quarterly reports for hospitals and EMS agencies. These reports will inform hospitals and EMS agencies about their stroke care data and outcomes, and they will help identify opportunities for implementing quality improvement, increasing capacity and changing stroke protocols.

Through the Virginia Stroke Registry, participating hospitals and EMS agencies will have access to their own data at any time. Designated users from the hospitals and EMS agencies can analyze their data within the stroke registry platform, in addition to receiving a full quarterly report from VDH. Once the stroke data is received in the pilot phase of 2022, the analytics and data visualization will be finalized and reflective of hospital and EMS feedback. When the

Virginia Stroke Registry is fully launched in June 2023, a regular dissemination schedule of quarterly reports will be established.

Another critical component to the quarterly stroke reports is the information collected from the hospital and EMS inventory surveys. In 2019, VDH and the VSCQI Advisory Group developed capacity needs assessment surveys for both hospitals and EMS concerning stroke care and quality improvement. The surveys were scheduled to be disseminated to all hospitals and EMS agencies in February 2020, however, they were ultimately postponed due to the COVID-19 pandemic. As cases of COVID-19 began to increase in early 2020, hospitals and EMS agencies were preoccupied with prioritizing their COVID-19 response. The VSCQI Advisory Group decided to postpone distribution of the hospital and EMS stroke care capacity surveys until July 2022. In March 2022, the CDC established a PCNASP Community of Practice to update the questions to the CDC PCNASP hospital and EMS inventory surveys.

A sample of the key questions asked are as follows:
- Does your facility have a protocol for identifying populations at highest risk for stroke events?
- Does your facility submit data to a statewide integrated data management system (e.g. Virginia Stroke Registry)?
- Does your facility use a referral tracking system to support transitions of care for stroke patients post-discharge?
- Has your facility implemented changes in protocols through systematic quality improvement methods and interventions to improve stroke care practices and patient care?
    - What changes were made?
- Does your facility have established processes (e.g., patient care protocols, feedback loops) for coordination of transitions of care for those at highest risk for stroke events and stroke patients throughout the stroke system of care?
- Does your facility monitor disparities in identification of stroke risk factors, stroke care, and referrals for populations at highest risk for stroke events compared to all stroke patients?
- Did your facility have an improvement in a selected performance measure of care based on identified performance gaps and quality improvement activities?

While the questions mirror CDC PCNASP's evidence based strategies and performance measures, state health departments have tailored and added questions to fit their respective landscape of stroke care. Based on the stroke care data that will be provided through the Virginia Stroke Registry and the capacity information provided by the hospital and EMS inventory surveys, VDH will provide annual recommendations about quality improvement based on the Acute Stroke Treatment Strategies (ASTS) workgroup, a subgroup of VSCQI Advisory Group. These recommendations, referred to as *Recommendations for Establishing a Process for Continuous Quality Improvement for Stroke Care along the Continuum of Care,* were developed in 2020 and they incorporate the AHA/ASA Target Stroke Action Strategies (Appendix C). These recommendation were also officially recommended in the 2020 Report to the Virginia General Assembly.

Recommendations

The VSCQI Advisory Group recommends including the following actions for an established, continuous process for stroke care quality improvement:

- Analyze data from the Virginia Stroke Registry for trends in stroke care;
- Implement an annual hospital and EMS inventory survey to assess hospital and EMS agency capacity and protocols for stroke care along the continuum of care; and
- Provide quarterly reports for each hospital and EMS Council consisting of stroke data from the Virginia Stroke Registry, capacity information from the inventory surveys, and recommendations for stroke care quality improvement from the VSCQI Advisory Group's *Recommendations for Establishing a Process for Continuous Quality Improvement for Stroke Care along the Continuum of Care.*

Summary of Recommendations

A summary of key VSCQI Advisory Group recommendations that are detailed in the preceding sections of this report for each of the legislative requirements are targeted to stakeholder entities and include the following:

- VDH, hospitals and EMS entities should focus collaborative efforts in the recommended, priority geographic areas (counties/cities) with the highest age-adjusted stroke mortality rates per health planning region.
- VDH should use the CDC PCNASP data elements for the Virginia Stroke Registry data elements as they align with the GWTG, TJC, DNV, and HFAP data elements. All hospitals and EMS agencies should be encouraged to participate in the Virginia Stroke Registry, notwithstanding the requirement of CSC, PSC, and PSC+ hospitals to submit data to the VDH.
- Under the Virginia Stroke Registry, hospitals and EMS agencies should participate in the health data exchange as a bi-directional data exchange platform within the Virginia Stroke Registry.
- Hospitals, Virginia Department of Social Services, Virginia Department of Behavioral Health and Developmental Services, and community-based organizations should participate in a statewide referral platform, such as Unite Us, to alleviate the burden from hospital stroke coordinators and care managers from connecting patients to necessary services post-discharge.
- VDH should implement the following actions as an established, continuous process for stroke care quality improvement:
  - Analyze data from the Virginia Stroke Registry for trends in stroke care;
  - Implement an annual hospital and EMS inventory survey to assess hospital and EMS agency capacity and protocols for stroke care along the continuum of care; and
  - Provide quarterly reports for each hospital and EMS Council consisting of stroke data from the Virginia Stroke Registry, capacity information from the inventory surveys, and recommendations for stroke care quality improvement from the VSCQI Advisory Group's *Recommendations for Establishing a Process for Continuous Quality Improvement for Stroke Care along the Continuum of Care.*

Conclusion

In 2019, VDH assessed the need for funding to hire staff for the development and maintenance of a statewide stroke registry. It was determined that three full-time employees were necessary to develop, implement, and maintain a Virginia Stroke Registry in fulfillment of the requirements of § 32.1-111.15:1 and would reduce the cost barriers experienced by small hospitals who wanted to participate in a stroke registry. In June 2021, VDH began implementation of the CDC PCNASP. This highly competitive grant provided $600,000 per year for a three year grant cycle. Virginia was one of 13 states awarded funding along with Arkansas, Georgia, Florida, Hawaii, Kentucky, Massachusetts, Michigan, Minnesota, New York, North Carolina, Ohio, and Wisconsin. The grant award provided VDH with funding to hire the three staff to fulfill the requirements of § 32.1-111.15:1.

Between 2021 and 2022, VDH, along with key stakeholders, has worked to develop a Virginia Stroke Registry, establish a stroke post-discharge transitions of care pathway through the Unite Us statewide referral system, and launch the Stroke Smart Virginia campaign. VDH welcomed former Governor Ralph S. Northam's proclamation of Virginia as a Stroke Smart Commonwealth. Looking ahead to 2023, VDH will continue to expand hospital and EMS participation in the Virginia Stroke Registry, secure data sharing between hospitals and EMS agencies through the Virginia Stroke Registry's Health Data Exchange, and utilize the Virginia Stroke Registry to establish a continuous process for quality improvement.

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Appendix A – Code of Virginia, Section 32.1 – 111.15:1

CHAPTER 276

An Act to amend the Code of Virginia by adding in Article 2.1 of Chapter 4 of Title 32.1 a section numbered 32.1-111.15:1, relating to stroke care quality improvement.

[H 1197]

Approved March 9, 2018

Be it enacted by the General Assembly of Virginia:

1. That the Code of Virginia is amended by adding in Article 2.1 of Chapter 4 of Title 32.1 a section numbered 32.1-111.15:1 as follows:

§ 32.1-111.15:1. Department responsible for stroke care quality improvement; sharing of data and information.

A. The Department shall be responsible for stroke care quality improvement initiatives in the Commonwealth. Such initiatives shall include:

1. Implementing systems to collect data and information about stroke care in the Commonwealth in accordance with subsection B;

2. Facilitating information and data sharing and collaboration among hospitals and health care providers to improve the quality of stroke care in the Commonwealth;

3. Requiring the application of evidence-based treatment guidelines for transitioning patients to community-based follow-up care following acute treatment for stroke; and

4. Establishing a process for continuous quality improvement for the delivery of stroke care by the statewide system for stroke response and treatment in accordance with subsection C.

B. The Department shall implement systems to collect data and information related to stroke care (i) that are nationally recognized data set platforms with confidentiality standards approved by the Centers for Medicare and Medicaid Services or consistent with the Get With The Guidelines-Stroke registry platform from hospitals designated as comprehensive stroke centers, primary stroke centers, or acute stroke-ready hospitals and emergency medical services agencies in the Commonwealth and (ii) from every primary stroke center with supplementary levels of stroke care distinction in the Commonwealth. Every hospital designated as a comprehensive stroke center, primary stroke center, or primary stroke center with supplementary levels of stroke care distinction shall report data and information described in clauses (i) and (ii) to the Department. The Department shall take steps to encourage hospitals designated as acute stroke-ready hospitals and emergency medical services agencies to report data and information described in clause (i) to the Department.

C. The Department shall develop a process for continuous quality improvement for the delivery of stroke care provided by the statewide system for stroke response and treatment, which shall include:

1. Collection and analysis of data related to stroke care in the Commonwealth;

2. Identification of potential interventions to improve stroke care in specific geographic areas of the Commonwealth; and

3. Development of recommendations for improvement of stroke care throughout the Commonwealth.

D. The Department shall make information contained in the systems established pursuant to subsection B and data and information collected pursuant to subsection C available to licensed hospitals and the Virginia Stroke Systems Task Force, and, upon request, to emergency medical services agencies, regional emergency medical services councils, the State Emergency Medical Services Advisory Board, and other entities engaged in the delivery of emergency medical services in the Commonwealth to facilitate the evaluation and improvement of stroke care in the Commonwealth.

E. The Department shall report to the Governor and the General Assembly annually on July 1 on stroke care improvement initiatives undertaken in accordance with this section. Such report shall include a summary report of the data collected pursuant to this section.

F. Nothing in this article shall require or authorize the disclosure of confidential information in violation of state or federal law or regulations, including the Health Insurance Portability and Accountability Act, 42 U.S.C. § 1320d et seq.

2. That the provisions of the first enactment of this act shall become effective on January 1, 2019.

3. That the Department of Health shall convene a group of stakeholders, which shall include representatives of (i) hospital systems, including at least one hospital system with at least six or more stroke centers in the Commonwealth, recommended by the Virginia Hospital and Healthcare Association; (ii) the Virginia Stroke Systems Task Force; and (iii) the American Heart Association/American Stroke Association, to advise on the implementation of the provisions of this act.

Appendix B – Proclamation of Virginia as a Stroke Smart Commonwealth

CERTIFICATE of RECOGNITION

By virtue of the authority vested by the Constitution of Virginia in the Governor of the Commonwealth of Virginia, there is hereby officially recognized:

STROKE SMART COMMONWEALTH

WHEREAS, 1 in 6 people will have a stroke in their lifetime, and 80% of families are affected; and

WHEREAS, stroke is the leading cause of long-term disability, putting a tremendous financial burden on society, individuals, and families; and

WHEREAS, there are life-saving treatments that must be administered within 3-4 hours once symptoms of a stroke begin; and

WHEREAS, stroke onset-to-911 time has not significantly changed for the last 25 years, with the majority of people not knowing how to spot a stroke or the importance of calling 911 immediately; and

WHEREAS, Virginia's public and private schools will be encouraged to make Stroke Smart: Spot-a-Stroke, Stop-a-Stroke, Save-a-Life, part of their training for all students, faculty, and families; and

WHEREAS, all health and safety-focused entities such as hospitals, clinics, medical practices, health departments, pharmacies, fire, EMS, public safety, Social Services and the Departments of Aging, and the Virginia Stroke Systems Task Force will be urged to participate in improving the Commonwealth of Virginia's stroke literacy to educate all employees, volunteers, and associated communities; and

WHEREAS, businesses, civic organizations, senior communities, faith-based organizations, and residents are encouraged to participate and contribute to the Stroke Smart: Spot-a-Stroke, Stop-a-Stroke, Save-a-Life campaign through active citizenship efforts; and

WHEREAS, the goal is to educate everyone in the Commonwealth of Virginia about stroke recognition and the importance of dialing 911 immediately, which will reduce the onset of stroke-to-911 interval to be measured by EMS and local hospital systems; and

WHEREAS, Virginia hopes to serve as a model for other communities, cities, counties, commonwealths, states, and the nation, thereby advancing the vision of a Stroke Smart America;

NOW, THEREFORE, I, Ralph S. Northam, proclaim the COMMONWEALTH OF VIRGINIA a STROKE SMART COMMONWEALTH, and I call this observance to the attention of all our citizens.

Governor
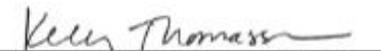
Secretary of the Commonwealth

Appendix C – AHA/ASA Target: Stroke Phases II and III Action Strategies

Target: Stroke Phase II	Target: Stroke Phase III
1. Hospital pre-notification by Emergency Medical Services 2. Rapid triage protocol and stroke team notification 3. Single call/paging activation system for entire stroke team 4. Use of a stroke toolkit containing clinical decision support, stroke-specific order sets, guidelines, hospital-specific algorithms, critical pathways, NIH Stroke Scale and other stroke tools 5. Timer or clock attached to chart, clipboard, or bed 6. Transfer directly to CT/MRI scanner 7. Rapid acquisition and interpretation of brain imaging 8. Rapid Laboratory Testing (including point-of-care testing) if indicated 9. Pre-mixing tPA medication ahead of time for high likelihood candidates 10. Rapid access to intravenous tPA in the ED/brain imaging area 11. Team-based approach 12. Rapid data feedback to stroke team on each patient's DTN time and other performance data	1. Rapid Administration of Alteplase 2. Rapid Acquisition and Interpretation of CT/MR Angiography 3. Rapid Acquisition and Interpretation of Additional Imaging 4. Pre-Notification and Rapid Activation of the Neurointerventional Team 5. Rapid Availability of the Neurointerventional Team 6. Timer or Clock Attached to Chart, Clip Board, or Bed 7. Transfer Directly to Neuroangiography (NA) Suite 8. Transfer Directly from Brain Imaging Suite to NA Suite 9. Endovascular Therapy Ready NA Suite 10. Team Based Approach 11. Anesthesia Access and Protocols 12. Prompt Data Feedback

Appendix D – Stroke Multidisciplinary Team Roles and Responsibilities

ROLE	RESPONSIBILITIES
Stroke Team:	
Medical Director	- The physician provides leadership and clinical governance and is knowledgeable of the specialty practices and techniques to lead and advise the team. - Responsible for development of new written care protocols as needed. - Responsible for routine review of all current protocols and orders ensuring the most up to date care standards are being implemented. - Conduct medical review of charts; address significant or potential medical care issues. - Correcting deficiencies and coordinating performance improvement peer review through bimonthly multidisciplinary stroke collaborative meetings. - Involved in the assessment of patients and provides consultative advice to other treatment physicians.
Stroke Program Coordinator	- Guide and foster development of a cohesive interdisciplinary team with a continuum focus. - Policy and Procedure development. - Responsible for regulatory and stroke certification/designation requirements. - Formal reporting on all aspects of the stroke program to committee and boards. - Implementation of quality methodology to improve performance. - Initiate quality improvement projects. - Community Outreach – organize programs, lectures for community groups. - Educational programs for EMS. - Provide ongoing education to staff on clinical care issues for stroke; i.e. nurses, providers, patient care assistants, therapists, radiology staff, etc. - Develop competency demonstration for staff. - Participate in interdisciplinary rounds. - Collect, validate, analyze, and disseminate data to drive process improvement initiatives.
ICU Unit Nurse Manager	- Maintains quality patient care through use of clinical expertise, nursing process, and effective supervisory skills. - In consultation with the stroke program coordinator and staff development, assists with DNV requirements, planning, coordination, implementation and evaluation of clinical education. - Provides tools/education/resources to ensure all quality indicators are met. - Assures that staff are provided the necessary orientation/training to ensure safe patient care. - Monitors the identification of learning needs of the staff, patient/family, and physicians. - Assures that quality educational programs are developed to meet those needs. - Participate in interdisciplinary rounds when possible.

Neuro Unit Manager	- Maintains quality patient care through use of clinical expertise, nursing process, and effective supervisory skills. - Provides tools/education/resources to ensure all quality indicators are met. - In consultation with the stroke program coordinator and staff development, assists with DNV requirements, planning, coordination, implementation and evaluation of clinical education. - Assures that staff are provided the necessary orientation/training to ensure safe patient care.
Other Members:	
ED Physician	- Demonstrate knowledge and understanding of stroke protocol. - Collaborate effectively with EMS, nursing staff, acute stroke team and hospitalist team. - Initiate stroke protocols concurrent with ED evaluation and management. - Implement interventions as indicated.
ED Nurse Manager	- Maintains quality patient care through use of clinical expertise, nursing process, and effective supervisory skills. - Provides tools/education/resources to ensure all quality indicators are met. - In consultation with the stroke program coordinator and staff development, assists with DNV requirements, planning, coordination, implementation and evaluation of clinical education. - Assures that staff are provided the necessary orientation/training to ensure safe patient care.
Neurologist	- Serve as consultant for patients with stroke/transient ischemic attack. - Coordinate acute care for stroke. - Implement interventions as indicated. - Determine appropriateness of aggressive intervention in collaboration with primary/attending.
Neurosurgeon	- Serve as consultant for patients with hemorrhagic stroke and patients with ischemic stroke requiring hemicraniectomy. - Implement interventions as indicated. - Determine appropriateness of aggressive intervention in collaboration with primary/attending.
Neuro Interventionist	- Serve as consultant for patients with acute stroke. - Perform imaging and procedures as indicated. - Implement interventions as indicated.
Attending Physician	- Coordinate overall medical management of patient - Implement interventions as indicated.
Advanced Practice Nurse	- Collaborate with the attending and specialist team on evidence-based care for stroke patients. - Demonstrate knowledge and understanding of stroke order-sets, protocols and appropriate management of stroke patients. - Implement interventions as indicated.
Nursing: RN certified in NIHSS	- Conduct NIHSS stroke scale assessment to evaluate progression/improvement of stroke deficit. - Assure that physician-ordered tests and procedures are planned and implemented in an efficient, patient-centered manner. - Conduct initial swallow screening before oral nutrition or medication is provided. - Provide stroke education to patient and family.

	● Implement a stroke plan of care. ● Communicate team suggestions with appropriate physician(s). ● Participate in interdisciplinary rounds.
Case Manager	● Coordinate discharge plan as targeted by the interdisciplinary team. ● Facilitate referrals to appropriate resources (rehab, outpatient therapies, wound care, etc.) based on initial assessment. ● Initiate connection to community supports, referrals as appropriate (e.g. community-based long-term care, Meals on Wheels, driving evaluations, support groups, etc.).
Physical Therapy: RPT	● Evaluate, treat patients for ambulation, bed mobility, transfers, and gait. ● Work with large muscle groups to maintain or restore function, mobility. ● Determine patient's in-hospital physical therapy goals; recommend level of continued physical therapy in appropriate setting (Rehab vs. SNF vs. Outpatient vs. Home Health). ● Identify and address safety concerns with respect to mobility and transfers. ● Provide patient/family education. ● Conduct Pre-Morbid Modified Rankin Scales to determine patient's baseline function; assess for physical and occupational therapy needs.
Occupational Therapy	● Evaluate and treat patient's functional abilities for self-care skills with the goal of maximizing independence in skills (bathing, dressing, toileting, feeding). ● Assess visual and cognitive skills; provide compensatory strategies for safe independent functioning. ● Assess occupational needs; provide maximizing skills. ● Determine patient's in-hospital occupational therapy goals; recommend level of continued occupational therapy in appropriate setting (rehabilitation, skilled nursing facility, home health, or outpatient setting). ● Provide patient/family education.
Speech Therapist	● Evaluate and treat dysphagia; assess for signs of aspiration. ● Assess speech/language, cognition, memory recall, and thought coordination. ● Use speech pathology assessment to identify special nutritional needs of patients. ● Provide patient/family education. ● Provide recommendations for appropriate texture/consistency of food.

Appendix E - Glossary of Terms

Acute Stroke Unit	A stroke unit providing acute care in the early stages post-stroke. Treatment and care during the acute phase of stroke are crucial and will include a number of tests to confirm the diagnosis, including a brain scan.
Aneurysm	A balloon-like bulge in the wall of an artery. The walls of an aneurysm are thin and weak and so they are more likely to burst and cause bleeding in the brain (a hemorrhagic stroke).
Angiography	An invasive procedure that uses x-ray imaging to detect blockage or narrowing in blood vessels.
Aphasia	The loss of ability to communicate normally resulting from brain damage, typically to the left side of the brain.
Apraxia	A neurological disorder exemplified by the inability to carry out familiar movements when commanded to do so. Persons with apraxia understand such commands, and are willing to carry them out, but are physically unable to perform the task.
Atherosclerosis	Hardening of the arteries.
Atrial Fibrillation	An irregular heart rhythm in which many impulses begin and spread through the atria. The resulting rhythm is disorganized, rapid and irregular and the atria (upper chambers of the heart) are not able to fully empty their contents into the ventricles (lower chambers of the heart).
Blood Vessels	Blood vessels form part of the circulatory system that transports blood throughout the body. There are three major types of blood vessels. Arteries carry the blood containing oxygen and nutrients away from the heart out to the rest of the body. Capillaries are tiny blood vessels within the tissues of the body, and veins carry blood containing waste products like carbon dioxide back toward the heart and lungs.

CT Scan	CT stands for computerized tomography and is a type of brain scan. It is a type of X-ray that is used to see what is going on inside the brain. It is particularly good at seeing whether a stroke is caused by a blockage or a bleed. It is a quick and painless test. People who have a suspected stroke should have a CT scan as soon as possible.
Hemorrhagic Stroke	This type of stroke takes place when a weakened blood vessel in the brain ruptures. A hemorrhage, or bleeding from the blood vessel, occurs suddenly. The force of blood that escapes from the blood vessel can also damage surrounding brain tissue. Hemorrhagic stroke is the most serious kind of stroke.
Hyperlipidemia	High cholesterol.
Hypertension	High blood pressure.
Ischemic Stroke	Type of stroke that occurs when a blood vessel in the brain develops a clot and cuts off the blood supply to the brain. Blood clots often result from a condition called "atherosclerosis," the build-up of fatty deposits within blood vessel walls.
Mobility	Capability of movement or of being moved. Examples include moving in bed, getting up from a chair or sitting on a toilet.
Paralysis	Inability to move part of the body.
Rehabilitation	Support to recover and adapt to the impact of illnesses and long-term conditions. It usually involves specific therapies such as physiotherapy, speech and language therapy or occupational therapy and often involves exercises to help the person recover any abilities they have lost and learn new techniques to compensate for any lasting effects

Reperfusion	The restoring of blood flow to an organ after blood flow had been cut off.
Skilled Nursing Facility	Facility that offers services including long-term nursing care and rehabilitation.
Thrombus	A blood clot that forms in a blood vessel in the brain.
TPA	Tissue plasminogen activator (TPA) is a thrombolytic agent, or "clot buster" medication, that can dissolve a blockage within an artery to restore blood flow to the brain.
Transient Ischemic Attack (TIA)	A TIA occurs when blood flow to a certain part of the brain is cut off for a short period of time, usually 15 minutes or less. A TIA is a warning sign that something is wrong. It should be treated as seriously as a stroke.

Appendix F
VSCQI Advisory Group's Recommendations for Defined Stroke Alert Process:

- EMS Pre-Hospital Notification

Early stroke recognition is essential to timely care. EMS should provide pre-hospital notification when a stroke is recognized or suspected in the field. Evidence clearly shows a pre-alert notification allows the hospital to mobilize resources, and it also shows faster door-to-imaging, door-to-needle (thrombolytic) times, symptom onset to needle times, and increased use of alteplase treatment within three hours (Powers, 2019). EMS pre-notification is recognized in Target: Stroke Phase II Best Practice Strategies (Target: Stroke Phase II #1, 2017).

- Transfer Directly to Computed Tomography or other Designated Stroke Assessment Area

A designated stroke assessment area should be identified as the first point of contact between EMS and the medical team receiving a patient with potential stroke from EMS transport. Potential stroke assessment areas could include computed tomography (CT) or emergency department (ED) triage/resuscitation area. Unless CT is not available or patient is unstable, the patient may be transported with the treating physician and nurse directly to CT on EMS gurney bypassing the ED bed where the neurologic exam and brain imaging are performed to determine eligibility for intravenous thrombolytic therapy (alteplase). Once the physician has read the CT as non-hemorrhagic and there are no other contra-indications, the initial bolus of alteplase may be delivered while the patient is still on the CT table.

Alternatively, the stroke assessment area may be a dedicated hallway space or area in the ED (preferably labeled for this particular use) where rapid assessment by the ED physician may occur to ensure hemodynamic and respiratory stability and to evaluate for other emergency diagnoses followed by prompt transport to the CT. Appropriate written protocols with explicit inclusion and exclusion criteria should be in place and this should include if the patient arrives to ED triage instead of by EMS. Protocols for the transport of stroke patients by EMS directly to CT and bypassing the conventional ED bed and full assessment process have been associated with door-to-needle times less than 30 minutes and substantial improvements in door-to-needle times reported by select centers. Transfer directly to CT is recognized as Target Stroke Phase II (Target: Stroke Phase II #6, 2017), and it is associated with significant reduction in door-to-needle times. The following outlines the steps needed for transition upon ED patient arrival ED patient arrival (note certain processes occur simultaneously):

1. Registration takes priority and is conducted upon arrival unless completed pre-arrival.
2. Upon arrival patient is assessed for hemodynamic/respiratory stability and, if stable, is transported directly to CT.
3. EMS gives report while patient is being transferred to weight stretcher.
4. Obtain weight and connect patient to monitor and obtain vital signs. Blood pressure may need treatment as per established stroke guidelines.
5. Check finger stick blood glucose (if not previously checked) and draw other laboratories, as indicated. Verify functioning intravenous line and determine whether additional lines are needed.
6. Perform focused clinical assessment, examination, and initial neurological exam. Patient education is initiated including working diagnosis, potential for alteplase and/or neurointervention.
7. Brain imaging is performed to exclude imaging contraindications to alteplase.
8. Review indications and potential contraindications for intravenous alteplase.
9. Monitor and treat patient as indicated.

10. If patient is determined to be a candidate, administer alteplase bolus and start continuous infusion in CT.
11. After alteplase is started, follow hospital-specific protocol for the next phase of acute stroke care, which may include additional vascular imaging, assessment for endovascular treatment, further acute care in the ED, admission to the stroke unit or transfer to another facility for admission.

- Rapid Access and Administration of Thrombolytics

The benefits of thrombolytics in patients with acute ischemic stroke are time-dependent. Each 15-minute reduction in time to initiation of alteplase treatment was associated with an increase in the percent improvement of walking independently at discharge (4%), being discharged to home rather than an institution (3%), decrease in symptomatic hemorrhagic transformation of infraction (4%) and decrease in the odds of death before discharge (4%) (Saver, 2013). Once eligibility has been determined, alteplase should be administered without delay. The thrombolytic should be readily available in the ED and can be retrieved and administered by the emergency medicine team. A useful strategy is to reconstitute the thrombolytic once the patient is identified as a possible thrombolysis candidate. High performing organizations reconstitute the thrombolytic immediately on identification of tPA-eligible patients to save time. Crucial steps to meet the metric include staff education and drug administration resources such as dosing charts. Rapid administration of alteplase is recognized as Target: Stroke Phase II and Phase III Best Practice Strategies (Target: Stroke Phase III #10, 2019).

- Triage/Algorithm for Large Vessel Occlusion Detection and Screening

Large vessel occlusion (LVO) accounts for up to 38% of acute ischemic stroke and is associated with devastating outcomes for patients, families and society. Five randomized controlled trials concluded that mechanical thrombectomy for acute stroke offers benefit. Two subsequent trials expanded the time window for mechanical thrombectomy, prompting changes to the 2018 stroke guidelines for patients presenting with acute stroke within 24 hours to be evaluated for LVO stroke so that treatment with thrombectomy can be performed as indicated (Sweid, 2019). The expanded time window for mechanical thrombectomy for appropriate patients allows more patients who could benefit from the procedure and lowers their risk of disability from stroke. In addition, earlier thrombectomy treatment is associated with better patient outcomes, including independent ambulation at discharge, discharge to home, functional independence and freedom for disability at discharge and at three months, and lower complications, including symptomatic intracranial hemorrhage and in-hospital mortality (Jahan, 2019). Important strategies include establishing an algorithm for LVO evaluation, which may include use of LVO scales to identify patients that need additional imaging and thrombectomy treatment with transfer process in place if required. It is crucial to understand that rigid selection criteria may deny evaluation to patients that may benefit from thrombectomy and that algorithms are needed to establish minimum standards for which patients should be evaluated for this potential treatment (Nogueira, 2019). Rapid acquisition and interpretation of additional imaging to evaluate for LVO and thrombectomy is recognized as Target: Stroke Phase III Best Practice Strategies (Target: Stroke Phase III #3, 2019).

VSCQI Advisory Group's Recommendations for Continuous Quality Improvement for the Delivery of Stroke Care:

- Prompt Data Feedback & Review of Key Performance Indicators

Continuous quality improvement implemented and evaluated by each stakeholder of the stroke system of care can be useful in improving patient care and outcomes (Powers, 2019). Accurately measuring and tracking time intervals and the system's performance in key indicators can equip the interdisciplinary collaborative team to identify areas for improvement and take appropriate action. A data monitoring and feedback system is essential in providing prompt feedback and developing recommendations on a case-by-case basis and at the organization and system levels.

Key performance indicators include, but should not be limited to the following: door-to-needle (thrombolytic/alteplase) times, alteplase treatment rates in eligible patients, door-in-door-out times for patients transferring to tertiary centers for specialty acute stroke care, door-to-intervention (thrombectomy) times, and patient outcome metrics including complication rates. Prompt data feedback is recognized as Target: Stroke Phase II (Target: Stroke Phase II #12, 2017) and Phase III Best Practice Strategies (Target: Stroke Phase III #12, 2019). Hospitals without local stroke expertise 24/7 should explore building relationships with stroke centers to facilitate more timely evaluation, decision-making and treatment. Telehealth solutions may be a critical component to support acute stroke teams.

- Multidisciplinary Collaboration for Process Improvement

Healthcare organizations should organize and implement a multidisciplinary quality improvement committee to evaluate quality benchmarks, indicators, evidence-based practices and outcomes (Powers, 2019). A multidisciplinary team is recommended to be effective in enhancing the number of stroke patients eligible for treatment and reducing time to treatment in stroke. The multidisciplinary team includes but is not limited to emergency medicine, neurology, nursing, pharmacy, quality, hospital administration, stroke coordinator, neurosurgery, case management, neuro intervention, allied health, hospitalist medicine and radiology. The team should meet on a regular basis to review processes, quality data, and clinical outcomes and make recommendations for process improvement.

A multidisciplinary committee was associated with decreased time to alteplase administration. It has also been shown to lower in-hospital mortality related to intracranial hemorrhage and increase the percent of patients discharged home. This process allows the identification of treatment barriers and facilitates team interventions to increase stroke treatment continuous quality improvement starting from the initial patient encounter through the ED. Stroke team activation and post stroke care can help improve patient outcomes (Powers, 2019). This team-based approach is recognized as Target: Stroke Phase II Best Practice Strategies (Target: Stroke Phase II, 2017). A multidisciplinary team can escalate barriers to senior leadership to improve processes. Hospital administration should provide resources to help maintain strategies for process improvement. Interprofessional collaboration of urban and rural centers is important in the coordination of care from a pre-hospital encounter to post stroke care. See Appendix D for example roles and responsibilities of a stroke multidisciplinary team.

Appendix G

VSCQI Advisory Group's Recommendations for Transitions to Community-based Follow-up Care:

- Systems should be in place to assist in the transfer of patient records and patient care from hospital to clinics and community.
- For patients going home after discharge for stroke, processes and mechanisms should be in place in the emergency department, acute care, primary care, rehabilitation, and community settings to address efficient communication between settings and healthcare providers.
- Transition of care programs implemented should be evidence- or practice-based (e.g., COMprehensive Post-Acute Stroke Services (COMPASS), Project Red, Reducing Avoidable Readmissions Effectively (RARE), Care Transitions Program®) (StratisHealth, 2020).

VSCQI Advisory Group's Recommendations for Follow-up Care after Acute Stroke Treatment:

- Ensure that transition plans are in place and followed so that the patient's care is coordinated between multiple caregivers. Interventions may include use of a care coach, transition coordinator, stroke navigator, or community health worker.
- The geographic locations of where the patient lives and where the patient was treated for stroke must be taken into consideration when making decisions about transitional care and services, particularly for patients receiving care across state lines or at hospitals at long distance due to state/regional stroke triage plans.
- The care model should support seamless care by ensuring access to appropriate and timely services, whether in-person, telephonically, or through telehealth technology.
- Patients and their caregivers should receive follow-up calls at several touch points post-discharge, i.e., within 72 hours, at two weeks, and at 30-days.
- At all post-discharge follow-up appointment, the primary care provider should discuss warning signs, patient's personal risk factors for stroke, when to call, diet, daily activities, a list of things to monitor and things to avoid. The appointment is also an opportunity to discuss end of life planning, assess social and economic barriers, reinforce and adjust the plan of care as necessary, and perform medication reconciliation and medication management.