

2022 ANNUAL REPORT

Kentucky Stroke Encounter Quality Improvement Project



Kentucky Stroke Encounter Quality Improvement Project (SEQIP)



Kentucky Heart Disease and Stroke Prevention Task Force

SEQIP Registry 2020 Data Summary

2022 Annual Report



June 1, 2022

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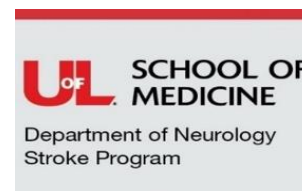
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Legislation

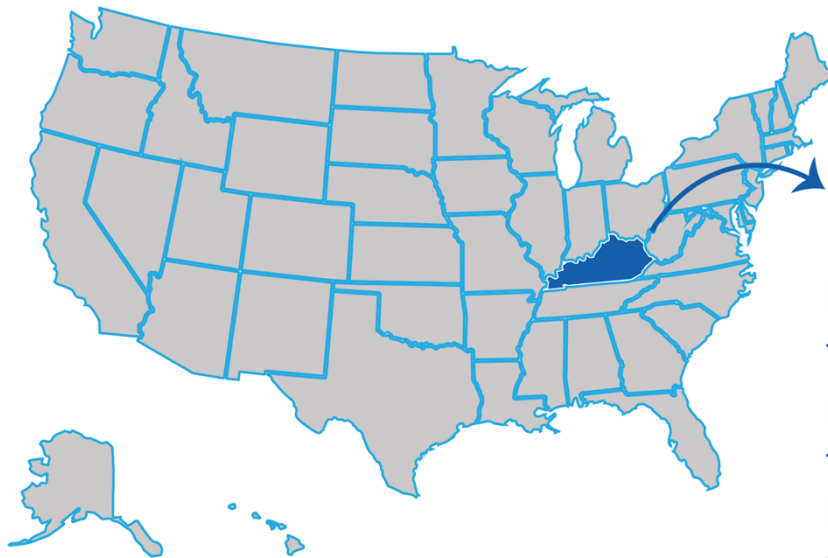
This data summary report is compiled pursuant to KRS 211.575, which requires the Kentucky Department for Public Health (KDPH) to establish and implement a plan to address continuous quality improvement for stroke care. KDPH is required to provide an annual report to the Governor and the Legislative Research Commission that includes data, related findings and recommendations to improve the delivery of stroke care efforts in Kentucky. The complete annual SEQIP reports can be accessed at <https://khdsptaskforce.com/resources/seqip/annual-seqip-report/>.



IMPACT OF STROKE

IN KENTUCKY

ACROSS THE NATION



5th

Kentucky had the fifth highest mortality rate for stroke in the United States in 2019.¹

DEATHS FROM STROKE

Stroke was the 6th highest cause of death in Kentucky, resulting in 2,328 stroke deaths in 2020.²

HEALTH INEQUITY

African Americans or Blacks continued to have a higher mortality rate than whites in Kentucky.¹

PREVALENCE

4.7% of Kentuckians reported they had experienced a stroke at some time in their life.³



STROKE IN KENTUCKY

PREVENTABLE DEATHS

40%

of Kentuckians reported they had hypertension, the number one risk factor for stroke.³

IMPROVING THE DEATH RATE⁴

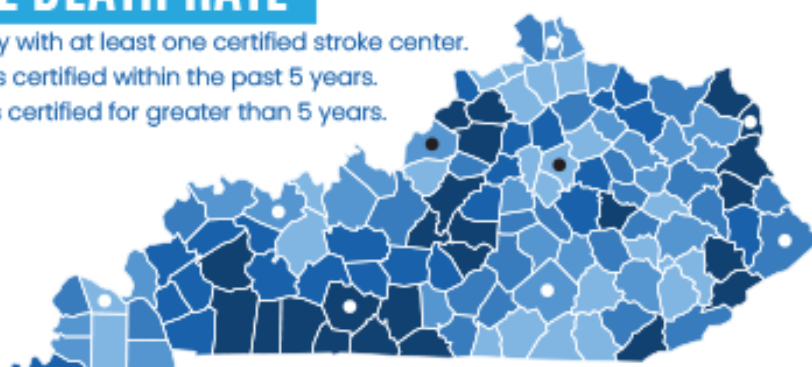
Each dot represents a county with at least one certified stroke center.

White dots are stroke centers certified within the past 5 years.

Black dots are stroke centers certified for greater than 5 years.

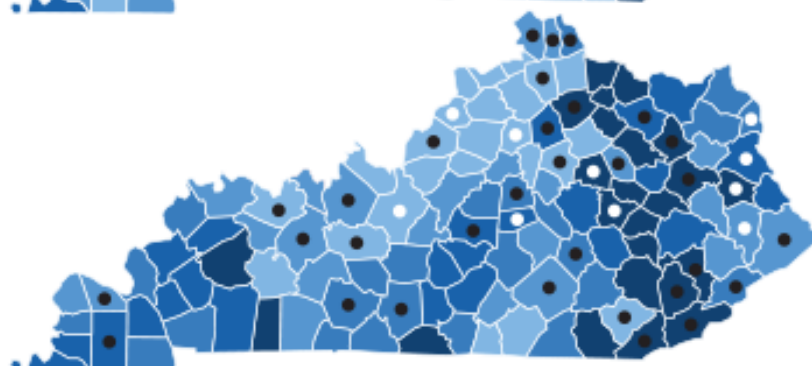
2006-2008 Rate Per 100,000

50.8 - 87.9
88.0 - 95.4
95.5 - 103.0
103.1 - 110.1
110.2 - 147.0



2017-2019 Rate Per 100,000

30.3 - 38.4
38.5 - 41.6
41.7 - 45.5
45.6 - 51.1
51.2 - 64.6



KENTUCKY HEALTH CARE COSTS

In 2020, the total charges for inpatient hospital stay for stroke* and transient ischemic attack* collectively, was more than \$756 million.⁵

Sources and notes:

1. CDC NCHS. Stats of the States. Stroke Mortality by State https://www.cdc.gov/nchs/pressroom/ssomap/stroke_mortality/stroke.htm. Accessed September 2021.

2. CDC Wonder. <http://wonder.cdc.gov/>. Accessed February 2022.

3. Kentucky Behavioral Risk Factor Surveillance. Kentucky Cabinet for Health and Family Services. 2021 Crude Prevalence.

4. CDC Interactive Atlas of Heart Disease and Stroke. <https://ncod.cdc.gov/DHDSAtlas/?state=State>. Accessed September 2021.

5. Kentucky Hospital Inpatient Claims: 2020. Kentucky Cabinet for Health and Family Services, Office of Health Policy. In 2020, inpatient hospital stays for stroke* and transient ischemic attack* resulted in total charges of \$756,131,386.

* ICD-10 codes: I60-I69, I63-I639, G450-G452, G458-G459.

Infographic prepared by the Kentucky Heart Disease and Stroke Prevention Program, 2022.

Executive Summary

A stroke, also called a brain attack, occurs when blood flow to the brain is reduced or cut off and brain cells begin to die from lack of oxygen. The effects of a stroke depend on the severity of the brain damage but range from temporary weakness or numbness of the arm or leg to permanent paralysis, balance problems, loss of the ability to speak or process information correctly and sometimes death. There are two types of strokes, ischemic and hemorrhagic. Ischemic strokes are caused by loss of blood flow to the brain due to blockage of a blood vessel. Hemorrhagic strokes are caused by bleeding into the brain due to rupture of a blood vessel.

Stroke is a leading cause of death and disability in the United States and reduces mobility in more than half of stroke survivors who are 65 years of age and older. Kentucky has a higher death rate for stroke than the national average and one of the highest rates in the nation. In 2019, stroke was the fifth leading cause of death in Kentucky. In 2020, stroke dropped to sixth place due to a high number of deaths being attributed to COVID-19. The high morbidity and mortality (as seen in the infographics on pages 5 and 6) are, in part, due to Kentuckians having higher prevalence rates of the common risk factors for stroke, namely: high blood pressure, high cholesterol, smoking, overweight/obesity, etc., in comparison to the nation. In addition to the high morbidity and mortality, there is a significant economic burden associated with the disease. The inpatient hospital charges for stroke and transient ischemic attack (TIA)* are substantial as detailed in the table below.

2020 Inpatient hospital charges for stroke and TIA* by patient Area Development District (ADD)

Area Development District	Cases	Average length of stay	Average charge	Total charges
01 - Purchase	488	4.20	\$47,464	\$23,162,274
02 - Pennyrite	362	4.15	\$43,040	\$15,580,450
03 - Green River	383	3.89	\$46,717	\$17,892,575
04 - Barren River	657	5.27	\$48,126	\$31,619,025
05 - Lincoln Trail	715	5.05	\$58,748	\$42,004,747
06 - KIPDA	2,329	5.31	\$79,022	\$184,041,157
07 - Northern Kentucky	841	4.69	\$36,927	\$31,055,967
08 - Buffalo Trace	128	6.27	\$76,264	\$9,761,847
09 - Gateway	231	4.94	\$61,763	\$14,267,149
10 - FIVCO	335	3.68	\$45,618	\$15,281,922
11 - Big Sandy	368	5.32	\$73,213	\$26,942,290
12 - Kentucky River	403	7.03	\$78,636	\$31,690,468
13 - Cumberland Valley	555	6.02	\$69,961	\$38,828,262
14 - Lake Cumberland	526	5.89	\$81,013	\$42,613,082
15 - Bluegrass	1,824	5.31	\$83,497	\$152,297,693
Out of State	929	5.43	\$85,137	\$79,092,477
Total	11,074	5.20	\$68,280	\$756,131,386

Source: Kentucky Hospital Inpatient Claims: 2020, Kentucky Cabinet for Health and Family Services, Office of Health Policy.

*ICD-10 codes: I60-I609, I61-I619, I63-I639, G450-G452, G458-G459.

The Kentucky Stroke Encounter Quality Improvement Project (SEQIP) is a statewide quality improvement initiative created by the Kentucky Heart Disease and Stroke Prevention Task Force - Cardiovascular Health Delivery Systems Subcommittee, the Kentucky Heart Disease and Stroke Prevention (KHDSPP) Program and the American Heart Association/American Stroke Association (AHA/ASA). SEQIP was created in 2009 to advance stroke systems of care (SSOC) in Kentucky by developing collaboration among member hospitals to improve evidence-based performance measures for stroke care.

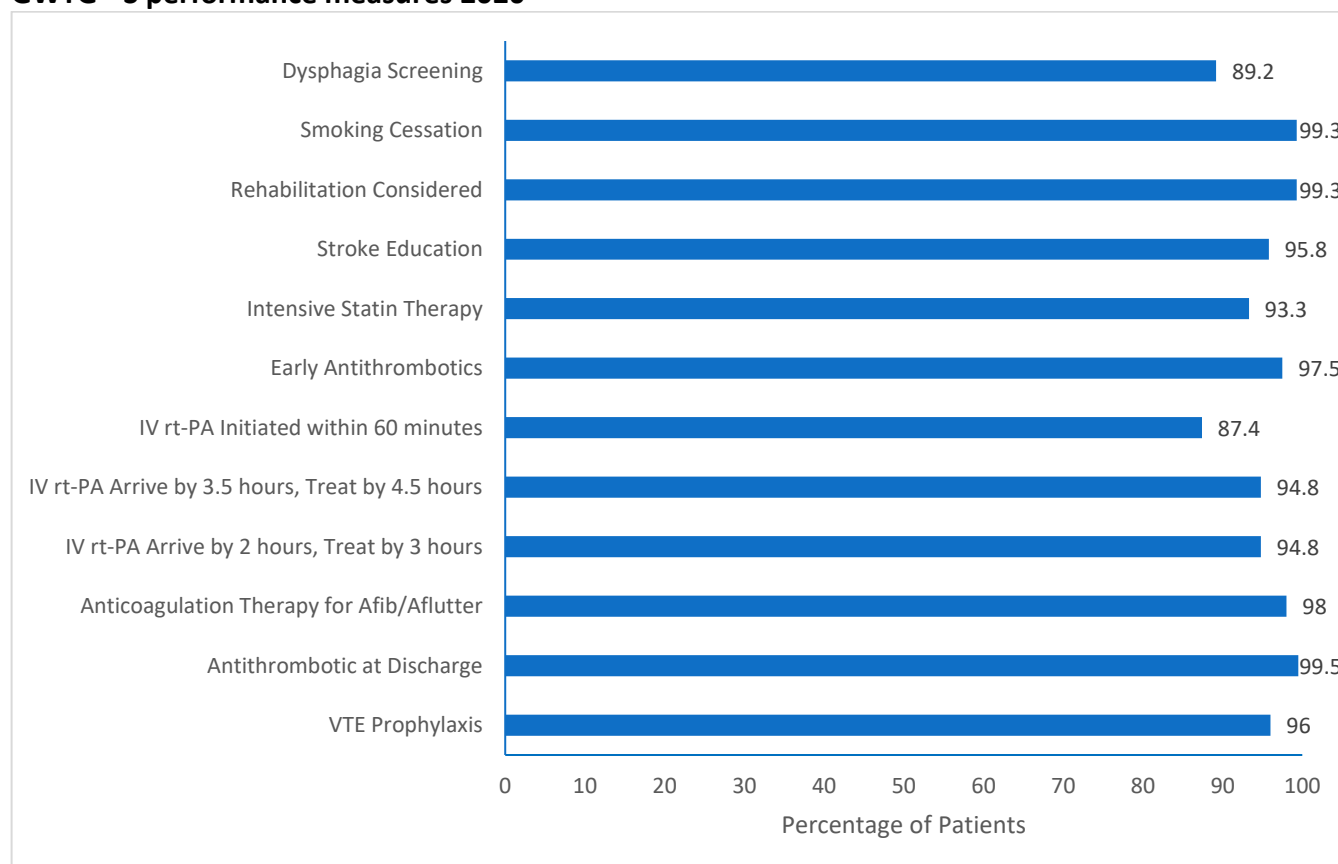
“Time is brain” and stroke is a medical emergency. Upon recognition of stroke symptoms, activation of emergency medical services (EMS) is recommended for rapid transport to the hospital where patients can be evaluated immediately upon arrival and evaluated for emergent treatment options to reverse symptoms.

SEQIP hospitals monitor evidence-based performance measures endorsed by the AHA/ASA and The Joint Commission (TJC) certification body as well as Det Norske Veritas (DNV) and Healthcare Facilities Accreditation Program (HFAP) for the treatment and management of stroke patients from hospital to discharge. The 12 performance measures are:

- Dysphagia screen performed before oral intake.
- Smoking cessation counseling during hospital stay.
- Rehabilitation is considered.
- Stroke education is provided.
- Intensive statin therapy prescribed at hospital discharge.
- Antithrombotics prescribed by hospital day 2.
- Time to IV alteplase administration $\leq$ 60 minutes.
- Patients arrive at hospital within 2 hours and treated with intravenous tissue plasminogen activator (IV rt-PA) within 3 hours.
- Patients arrive at hospital within 3.5 hours and treated with IV rt-PA within 4.5 hours.
- Anticoagulation for atrial fibrillation/flutter at discharge.
- Antithrombotics prescribed at discharge.
- Venous thromboembolism (VTE) prophylaxis.

Participation in the Kentucky stroke registry is required per KRS 211.575 for all hospitals in Kentucky that are certified by TJC as a primary stroke center (PSC) and comprehensive stroke center (CSC). In 2015 acute stroke ready hospital (ASRH) certification was approved by TJC. In 2018 thrombectomy-capable stroke center (TSC) certification was added. SEQIP members and AHA/ASA advocacy staff recently proposed a change in legislation that would require all certified stroke centers in Kentucky to participate in the state registry, which was passed in the 2022 session. The data presented in this report are based on 23 of the 25 certified PSC and CSC hospitals (Appendix A) submitting data to the Kentucky stroke registry via Get With The Guidelines®-Stroke (GWTG®-S). The nationally recognized goal for performance measures by the AHA/ASA and stroke center certifying bodies is >85% achievement for each measure. SEQIP hospitals met this goal for all 12 measures during calendar year 2020.

GWTG®-S performance measures 2020



Significant progress has been made in reducing stroke death rates in Kentucky over the last 12 years. As seen in the infographics on pages 5 and 6, death rates tend to be lower in counties adjacent to or where certified stroke centers are located. The maps comparing stroke mortality from 2006-2008 and 2017-2019 show the impact stroke centers have had on lives saved as stroke mortality has decreased in areas where stroke centers have been certified for five years or more. This attests to SEQIP's success of creating a SSOC and highlights the need to continue improving access to stroke care in Kentucky by sustaining SEQIP, increasing the number of certified stroke centers and ongoing collaboration and implementation of processes to deliver evidence-based stroke treatments.

Recommendations

The SEQIP steering committee is recommending the funding of SEQIP in the amount of \$500,000-\$1,000,000. The funds will help SEQIP continue the objectives and action items identified in the KHDSP Task Force Strategic Map and Plan: 2020-2023 (Appendix B). These include increasing the number of stroke certified hospitals in Kentucky, increasing participation in SEQIP to expand sharing of best practices and quality improvement plans, improving data collection, educating the public and strengthening the stroke continuum of care.

In addition, the SEQIP steering committee is requesting a legislative change to the deadline for the SEQIP report to September 1, which will allow for the most recent data from the previous calendar year to be included in the annual report.

Cardiovascular/Cerebrovascular Disease in Kentucky

What is Cardiovascular disease?

Cardiovascular disease (CVD) is a term that refers to several conditions involving the heart and blood vessels including heart disease, heart attack, stroke, hypertension, congestive heart failure, arrhythmia and others.¹

What is Cerebrovascular disease?

Cerebrovascular disease includes all disorders that impact blood flow to the brain. Cerebrovascular diseases include stroke, TIA, aneurysms, vascular dementia or vascular malformations.² Many of these conditions involve narrowed or blocked blood vessels² and contribute to the heavy burden of chronic diseases in Kentucky.

A stroke, also called a 'brain attack', occurs when blood flow to the brain is reduced or cut off, and brain cells begin to die from lack of oxygen.³ The effects of a stroke depend on the severity of the brain damage but range from temporary weakness or numbness of the arm or leg to permanent paralysis, balance problems, loss of the ability to speak or process information correctly and sometimes death.³ A TIA occurs when a blood clot temporarily blocks blood flow to the brain.² The symptoms occur suddenly and usually resolve within minutes.² There are two types of strokes, ischemic and hemorrhagic.² Ischemic strokes are caused by loss of blood flow to the brain due to blockage of blood vessels and hemorrhagic strokes are caused by bleeding into the brain due to rupture of a blood vessel.² Nationally, ischemic strokes account for 87% of all strokes, while intracerebral hemorrhage accounts for 10% and subarachnoid hemorrhage for 3%.⁴ Stroke is a leading cause of disability in the United States and reduces mobility in more than half of stroke survivors who are 65 years of age and older.³

Some risk factors that increase the likelihood of a stroke are not able to be modified, such as age, gender, ethnicity and genetic or heredity factors.³ However, there are common risk factors that increase one's likelihood of having a stroke that can be modified or changed. Those risk factors include high blood pressure, high cholesterol, diabetes, smoking, being overweight or obese, not getting enough physical activity, not eating a balanced diet and drinking too much alcohol.³

The Burden of Stroke

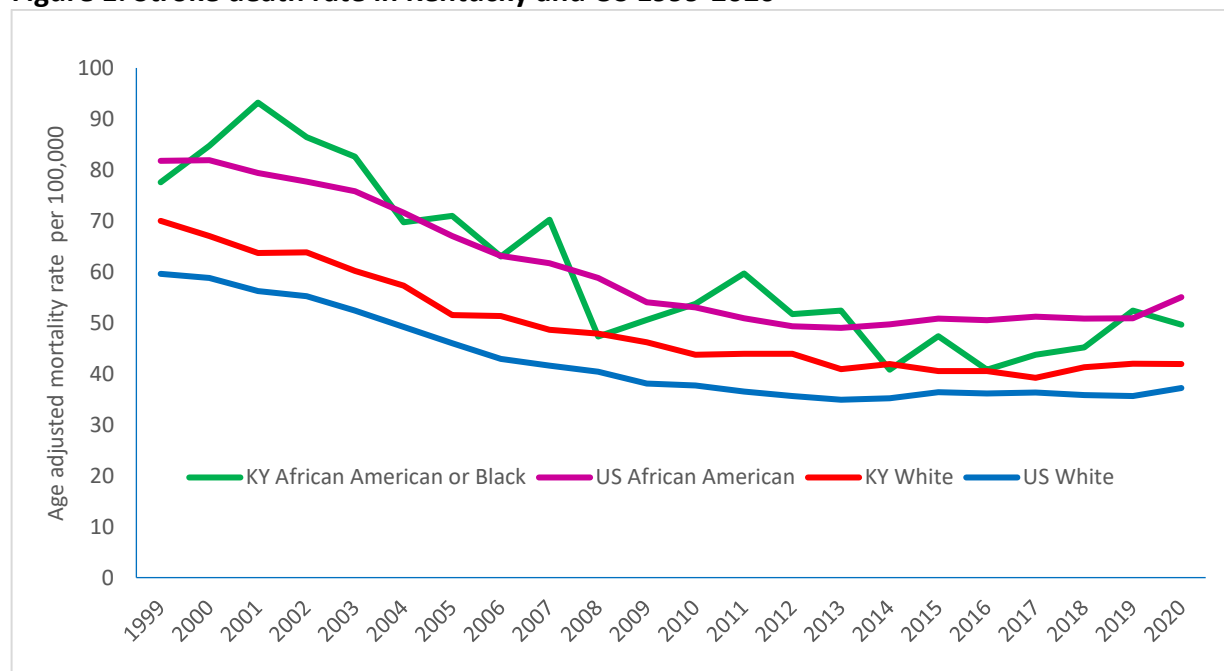
In 2020, stroke was the fifth highest cause of death nationally and the sixth highest in Kentucky (Table 1).⁵ Kentucky had a higher mortality rate than the rest of the nation and African Americans or Blacks continued to have a higher mortality rate than whites in Kentucky (Figure 1).⁵ There is a significant economic burden associated with the disease. Each inpatient hospital stay for stroke and TIA* incurs a charge with an average of approximately \$68,000 resulting in total charges of more than \$756 million as specified in the table on page 7.

*ICD-10 codes: I60-I609, I61-I619, I63-I639, G450-G452, G458-G459.

Table 1: Leading causes of death in Kentucky 2020

15 Leading causes of death in Kentucky 2020	Deaths	Percent of total deaths in KY
Heart disease	11,345	20.30
Cancer	10,181	18.22
COVID-19	4,132	7.39
Accidents (unintentional injuries)	3,950	7.07
Chronic lower respiratory diseases	3,236	5.79
Cerebrovascular diseases (stroke)	2,328	4.17
Alzheimer disease	1,719	3.08
Diabetes mellitus	1,549	2.77
Septicemia	951	1.70
Nephritis, nephrotic syndrome, and nephrosis (kidney disease)	908	1.62
Influenza and pneumonia	898	1.61
Chronic liver disease and cirrhosis	889	1.59
Suicide	801	1.43
Parkinson disease	589	1.05
Essential hypertension and hypertensive renal disease	447	0.80

Source: Centers for Disease Control and Prevention. CDC Wonder. <http://wonder.cdc.gov/>. 2022.⁵

Figure 1: Stroke death rate in Kentucky and US 1999-2020

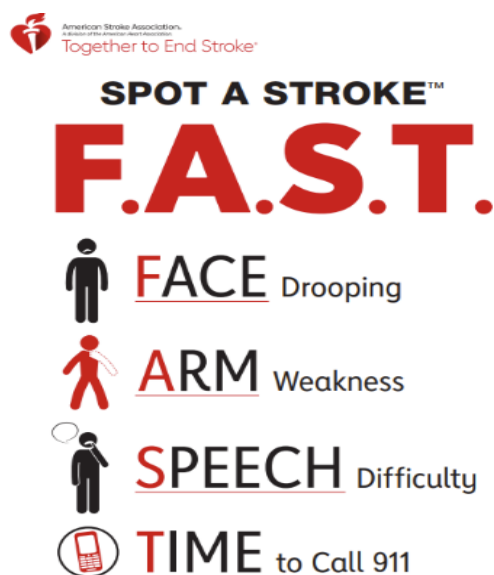
Source: Centers for Disease Control and Prevention. CDC Wonder. <http://wonder.cdc.gov/>. 2022.⁵

According to the 2021 Kentucky Behavioral Risk Factor Surveillance (KyBRFS) prevalence data, 4.7% of Kentuckians reported they had experienced a stroke at some time in their life.⁶ This is similar to the prevalence in 2020.⁷ Additionally, 40% of Kentuckians reported they had hypertension, the number one risk factor for stroke.⁶ The age-adjusted death rate from stroke varies by county, as shown in the infographic on page 6, when using stroke mortality data from 2017 through 2019, for individuals of all races, ethnicities and genders, aged 35 years and older.⁸ In general, counties with relatively closer access to a stroke center tend to have lower stroke mortality rates.

Early Stroke Treatment is Important

Stroke is a medical emergency. Early treatment may reduce long-term disability from stroke and prevent death. SSOC focuses on increasing recognition of stroke symptoms; activation of the EMS at the onset of symptoms, EMS triage protocols; receiving care at hospitals equipped to treat acute stroke by offering Food and Drug Administration (FDA) approved therapies; and a process for arranging emergent patient transfer to tertiary centers for advanced stroke care, as appropriate.

Figure 2: Symptoms of stroke



Source: American Stroke Association⁹

The timely recognition of stroke symptoms, aided by using the F.A.S.T. acronym (face drooping, arm weakness, speech difficulty and time to call 911), can facilitate stroke recognition, seeking emergent, time sensitive medical evaluation and transport to facilities where access to treatments capable of reversing or minimizing stroke effects are available.

Stroke Encounter Quality Improvement Project (SEQIP)

SEQIP was created in 2009 as a voluntary statewide stroke quality improvement initiative of the Kentucky Heart Disease and Stroke Prevention Task Force - Cardiovascular Health Delivery Systems Subcommittee, KHDSP and AHA/ASA.

The mission of SEQIP is to advance SSOC and reduce stroke disparities in Kentucky by:

- Establishing a network of professionals that will encourage and support collaboration among stroke care providers in Kentucky;
- Providing opportunities to share information and resources related to stroke program development and proficiency across the continuum of care in Kentucky;
- Promoting quality, improving outcomes and standardizing acute stroke care through collegiality and use of evidence-based practice guidelines.



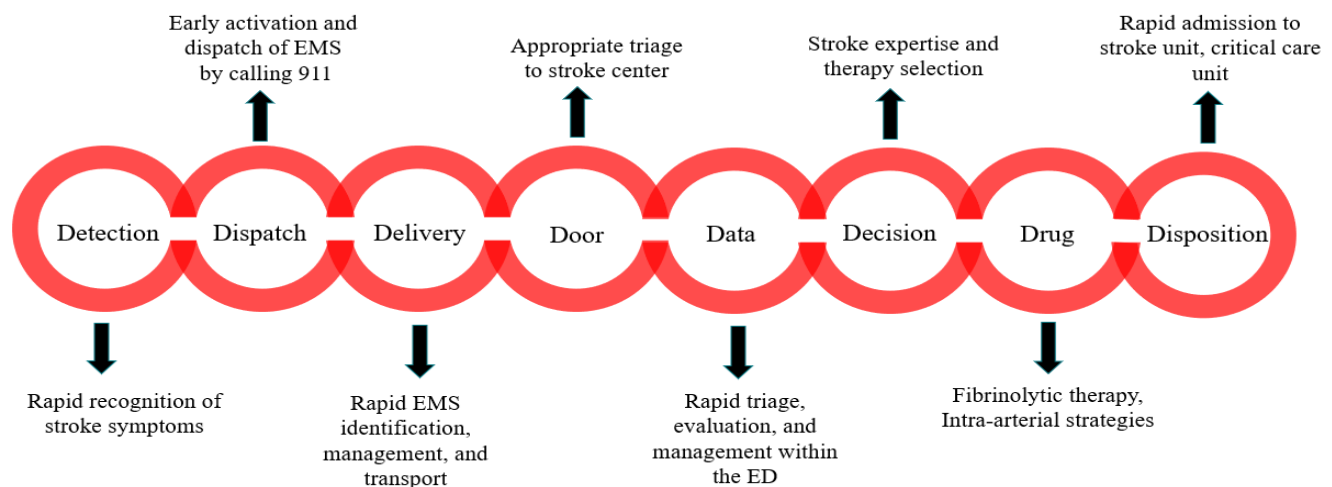
SEQIP includes hospitals that are stroke certified by TJC, DNV or HFAP as comprehensive, thrombectomy-capable, primary and acute stroke ready, as well as hospitals seeking to advance stroke care in the community in which they serve. Membership also includes EMS personnel, advocacy personnel, public health officials and community leaders. Participation in SEQIP is voluntary and open to all hospitals and stakeholders in Kentucky and surrounding areas interested in reducing the burden of stroke and improving access to stroke care.

TJC stroke certification levels for hospitals as of 2020 are described below¹⁰:

- **Acute Stroke Ready Hospital (ASRH):** typically rural, always has a stroke team available with physicians privileged in the diagnosis and treatment of acute stroke or have telemedicine available within 20 minutes, have computerized tomography (CT) and laboratory testing available constantly, can deliver intravenous thrombolysis around the clock and have transfer protocols in place when a higher level of care is needed.
- **Primary Stroke Center (PSC):** typically, urban/suburban, must meet all ASRH requirements, have dedicated in-patient beds for the acute care of stroke patients, may have advanced radiology imaging available around the clock, may be capable of performing endovascular therapy (clot retrieval) and can potentially admit hemorrhagic strokes.
- **Thrombectomy-Capable Stroke Center (TSC):** typically, urban/suburban, must meet all PSC requirements, have advanced imaging capabilities, meet standards for performing endovascular thrombectomy (clot retrieval) and providing post-procedural care, possibly admit hemorrhagic stroke patients and potentially perform research.
- **Comprehensive Stroke Center (CSC):** typically urban, must meet all TSC requirements, as well as be able to meet concurrently the emergent needs of multiple complex stroke patients, admit hemorrhagic stroke patients, have neurosurgical capability around the clock and performs research.

SEQIP was developed to improve SSOC by sharing best practices across geopolitical boundaries. At inception, sixteen (16) hospitals certified as a stroke center or pursuing stroke center certification were geographically chosen by the AHA and invited by KHDSP to represent the state. The number of SEQIP hospitals has increased as listed in Appendix A. SEQIP works to encourage hospitals to become stroke certified, increase their certification level and improve their overall quality of patient care through quality improvement processes. Members identify and participate in quality improvement initiatives (based on outcomes data from the Kentucky stroke registry) to reduce disparities in stroke care and increase reperfusion therapies by impacting the stroke chain of survival, namely the D's of Stroke Care (Figure 3).¹¹

Figure 3: D's of stroke care



Source: Adapted from Ashcraft, S., Wilson, S.E., Nystrom, K.V., et al., 2021.¹¹

SEQIP Goals:

- To adopt evidence-based guidelines and standards for practice.
- To implement evidence-based integrated cerebrovascular systems of care.
- To support and advance the quality of care available to stroke patients in Kentucky.
- To share best practices and encourage collaboration among members.
- To identify and map certified stroke centers in the state.
- To engage and recruit hospitals to seek certification as a CSC, TSC, PSC and ASRH.
- To evaluate quality data and identify opportunities for collaboration with partners outside of SEQIP.
- To address the entire SSOC including pre-hospital stroke care, stroke rehabilitation, transitions of care and patient outcomes.
- To develop and disseminate an annual report to the Governor and Legislature, including recommendations for improving SSOC.
- To support the passage of state policies that advance the implementation of SSOC.

SEQIP Data Registry

Stroke cases are added to the SEQIP registry by individual hospital data abstractors, in real-time and after patient discharge. The AHA requires all data for the calendar year be entered in the registry by March 31 of the following year for consideration of a GWTG®-S award status. Because of this potential lag in reporting time, data for the yearly SEQIP report is not from the prior calendar year (i.e., calendar year 2020 data was not completely entered until March 31, 2021). This reporting deadline means the annual SEQIP report aggregates data from two calendar years prior to the report publication date.

SEQIP utilizes the performance measures developed by the AHA/ASA's nationally recognized GWTG®-S hospital-based quality improvement program recognized by TJC and the Centers for Disease Control and Prevention (CDC). This program provides hospitals with a data collection platform, decision support and performance improvement methodologies to improve patient outcomes and uses a dataset with patient confidentiality standards.

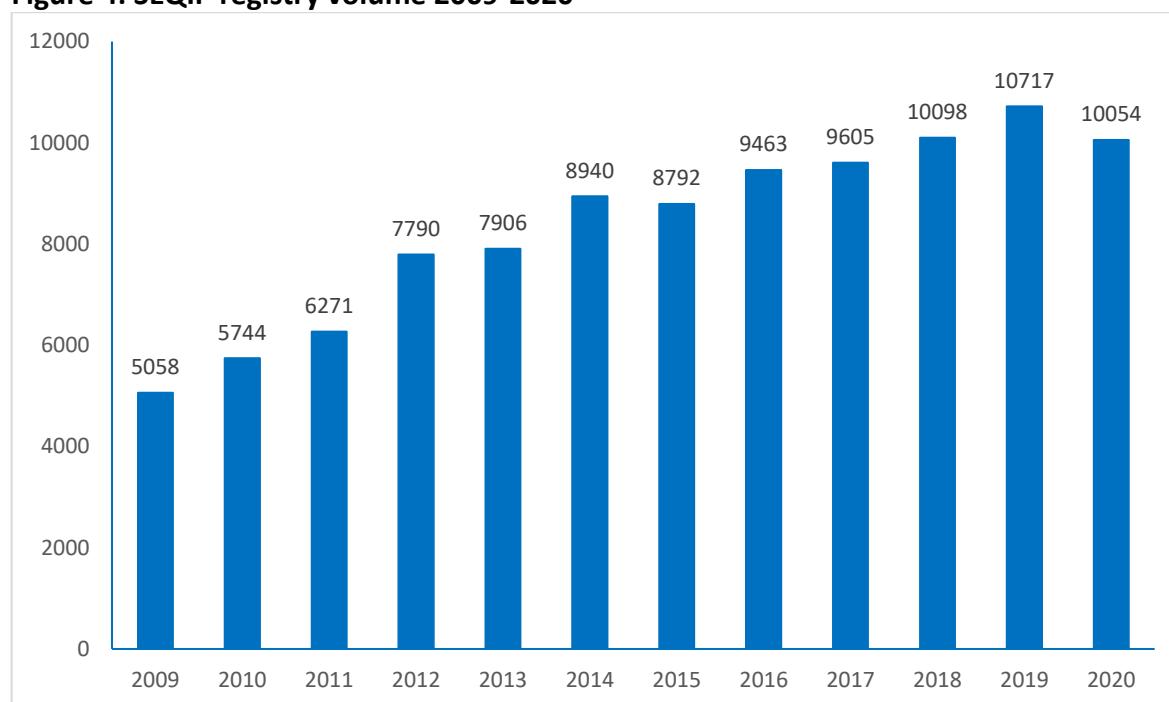
Participation in the SEQIP data registry is required per KRS 211.575 for all hospitals in Kentucky that are certified by TJC as PSC and CSC. In 2015, ASRH certification was approved by TJC and in 2018, TSC certification was added. SEQIP members and AHA/ASA advocacy staff recently proposed a change in legislation that would require all certified stroke centers in Kentucky to participate in the state registry which was passed in the 2022 session.

SEQIP collects data on measures related to stroke care that are for the treatment and management of stroke from hospital admission to discharge. The standardized, evidence-based performance measures are data driven and patient-centered to help hospitals monitor and improve acute stroke care processes and clinical outcomes. The charts on the following pages are based on performance measure data reported by the participating hospitals for the calendar year 2020.

The data presented in this report are based on 23 of the 25 comprehensive and primary certified stroke centers (Appendix A) submitting data to the Kentucky stroke registry via GWTG®-S. Data from additional centers will be reflected in future reports as more centers are certified and data use agreements are obtained. Notations are made for those hospitals that submit stroke patient data to the Kentucky stroke registry and for those that are required to report by Kentucky statute.

Figure 4 shows the growth of the SEQIP registry by annual volume since inception of SEQIP in 2009 when 5,058 cases were entered to over 10,000 cases entered in 2020. A decrease in the volume of hospitalized stroke patients was seen across the nation as well as in Kentucky in 2020, believed to be related to the COVID-19 pandemic.¹² As SEQIP continues to grow and more hospitals submit data, the number of cases will increase, expanding the generalizability of SEQIP data to the state of Kentucky. Based on 2020 Kentucky hospital inpatient claims data, provided by the Cabinet for Health and Family Services, the Kentucky stroke registry recorded 91% of all stroke and TIA* cases in Kentucky.

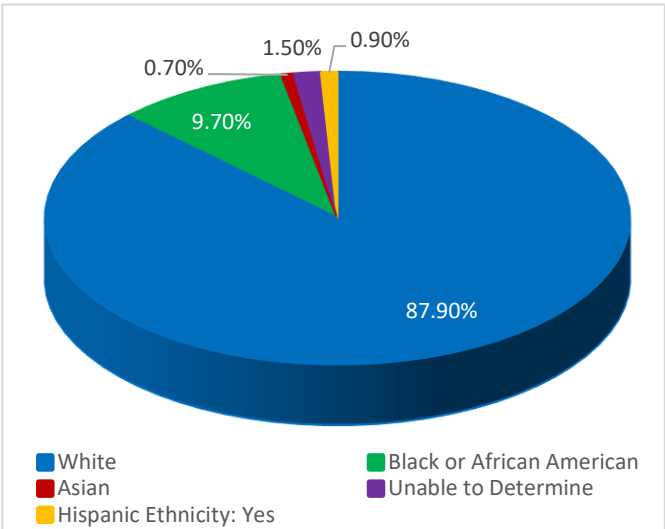
Figure 4: SEQIP registry volume 2009-2020



*ICD-10 codes: I60-I609, I61-I619, I63-I639, G450-G452, G458-G459.

SEQIP Patient Demographics

Figure 5: SEQIP patient race 2020



Note: American Indian or Alaska Native and Native Hawaiian or Pacific Islander are not included in the chart below due to very small numbers and privacy protections.

Stroke patients in Kentucky registry data are primarily white at 88%, followed by African American/Blacks at approximately 10%, with other identified races representing about 2% of all cases (Figure 5). SEQIP patients constituted a similar percentage of males and females (Figure 6). Stroke is occurring at a younger age than national statistics with 41% of strokes occurring in those under the age of 65 (Figure 7). Unfortunately, a likely contributor to this is the fact that Kentucky exceeds the national average in known risk factors for stroke (Figure 8).

Figure 6: SEQIP patient gender 2020

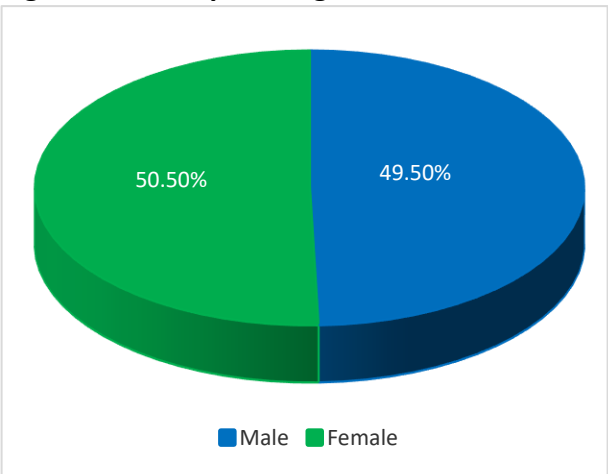


Figure 7: SEQIP patient ages 2020

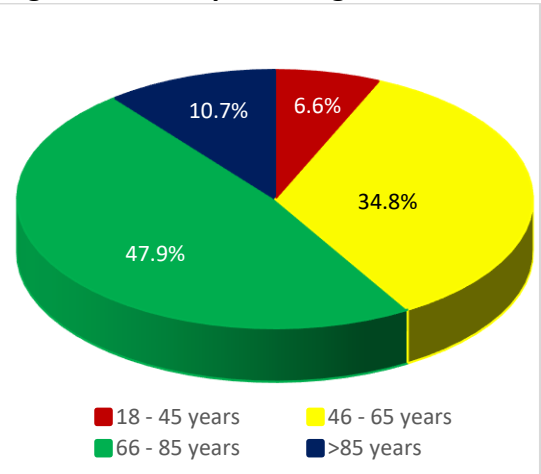
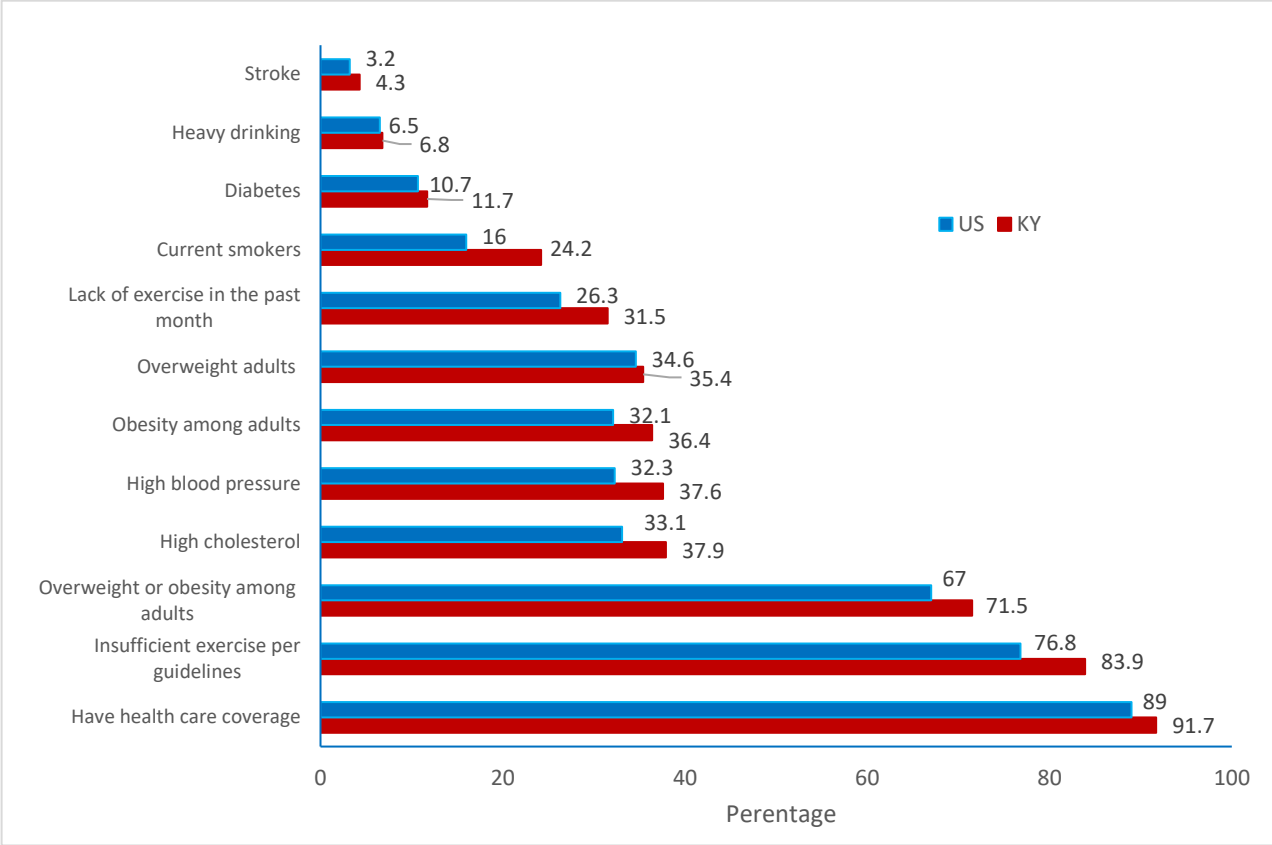


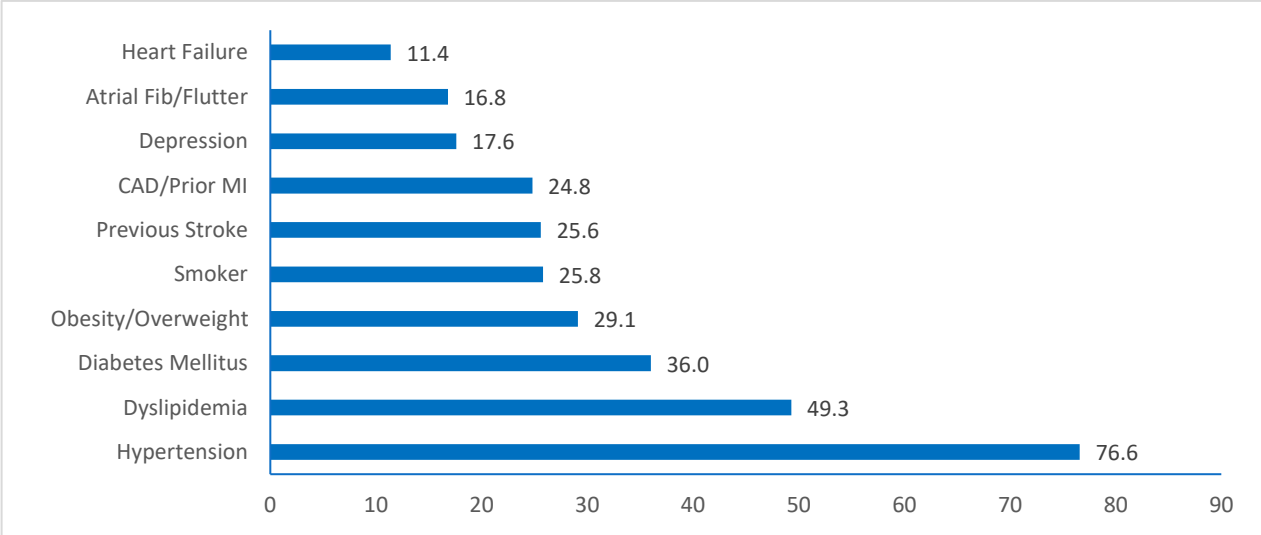
Figure 8: Stroke risk factors prevalence in adults in Kentucky compared to the US 2019



Source: CDC, BRFSS Prevalence & Trends Data, 2019.⁷

Registry data show stroke patients in Kentucky have common stroke risk factors. 76.6% had hypertension, 49.3% had high cholesterol, 36% had diabetes, 29.1% were overweight/obese, 25.8% were smokers, 25.6% had a previous stroke, 24.8% had a prior myocardial infarction or coronary artery disease and 16.8% had atrial fibrillation/flutter (Figure 9).

Figure 9: Most common stroke risk factors of SEQIP patients 2020



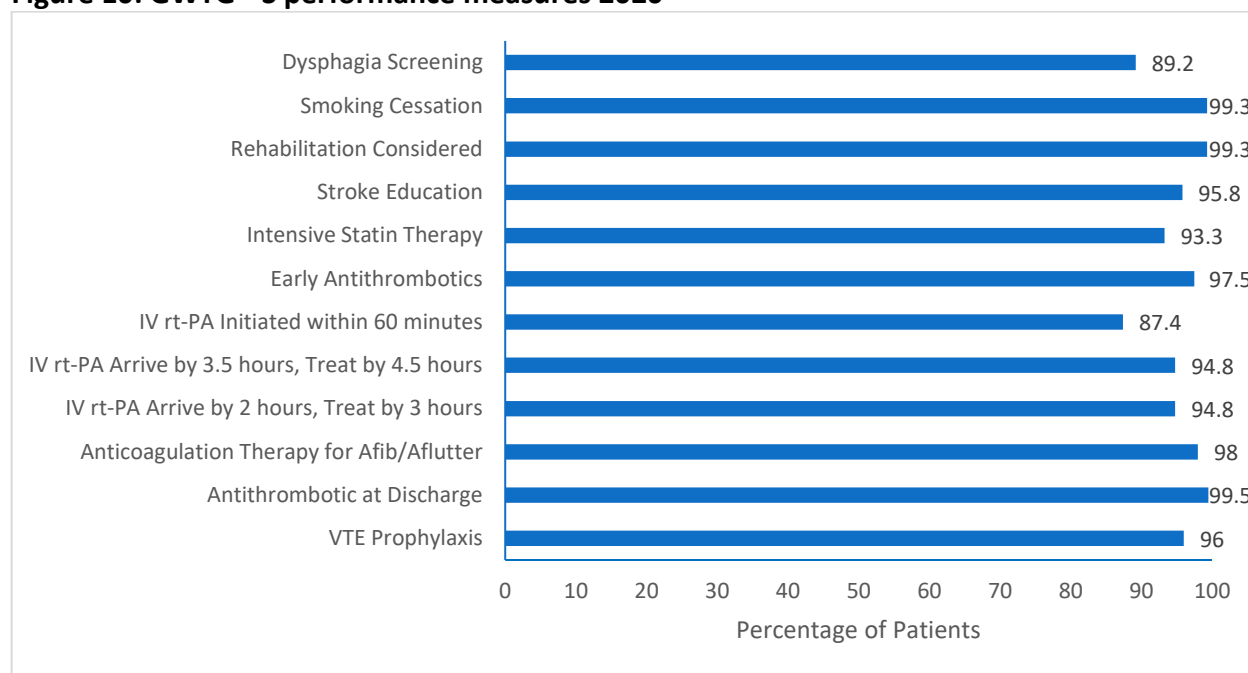
Stroke Performance Measures

Stroke performance measures focus on:

- Delivering time sensitive acute stroke therapies to eligible patients;
- Providing appropriate medications proven to reduce the risk of recurrent stroke;
- Educating patients and families on their risk for recurrent stroke and what they can do to prevent a stroke from happening again by making lifestyle changes;
- Preventing complications during hospitalization;
- Providing access to rehabilitation specialists to aid in recovery; and
- Ensuring appropriate follow up care post hospitalization.

The nationally recognized goal for performance measures by the AHA/ASA and stroke center certifying bodies is >85% achievement for each measure. SEQIP hospitals met this goal for all 12 measures during calendar year 2020 (Figure 10).

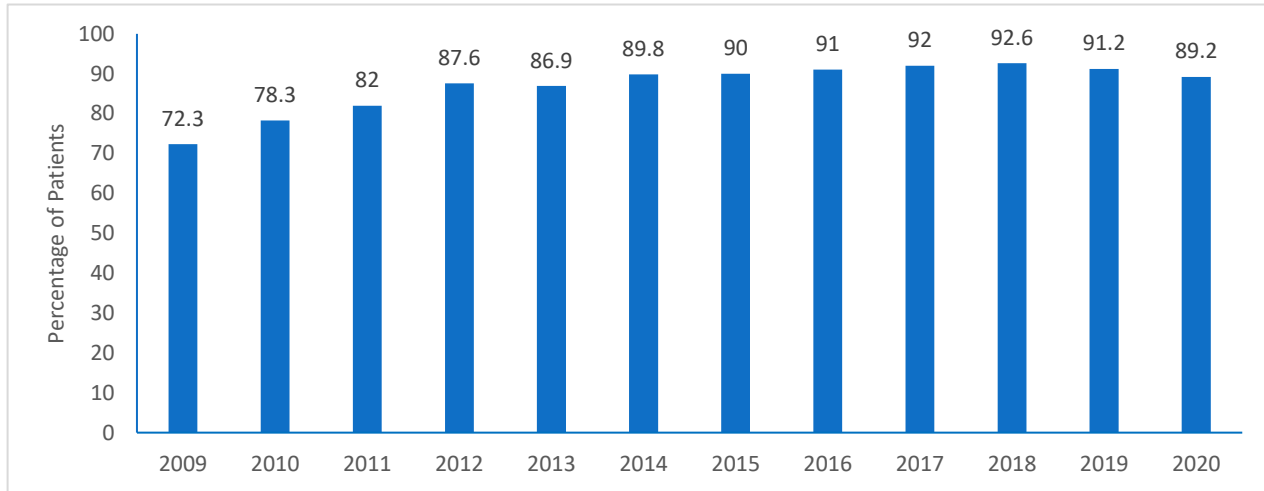
Figure 10: GWTG®-S performance measures 2020



Dysphagia Screening

Measure: The percent of stroke patients who undergo screening for dysphagia with an evidence-based bedside testing protocol approved by the hospital before being given any food, fluids or medication by mouth. In 2009, 72.3% of patients were screened for dysphagia before given any food, fluids, or medication by mouth. In 2020, 89.2% of patients were screened for dysphagia, a 16.9% change.

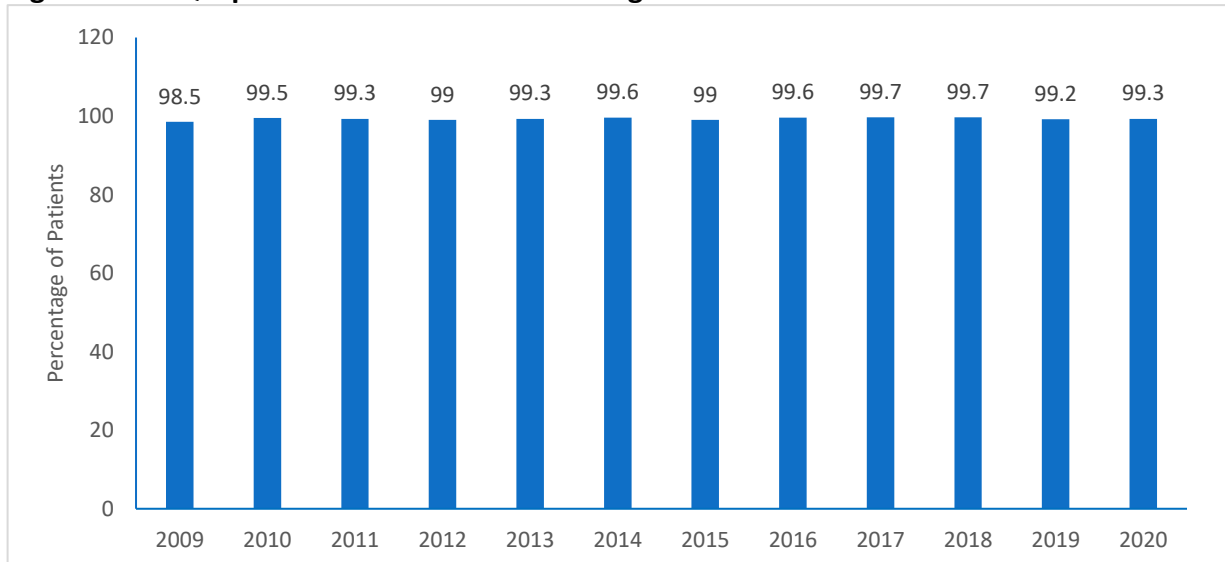
Figure 11: SEQIP dysphagia screening 2009-2020



Smoking Cessation

Measure: The percent of patients with ischemic stroke, hemorrhagic stroke or TIA with a history of smoking cigarettes, who are, or whose caregivers are, given smoking cessation advice or counseling during hospital stay. In 2009, 98.5% of eligible patients were counseled on smoking cessation. In 2020, 99.3% of eligible patients were counseled on smoking cessation, a 0.8% change.

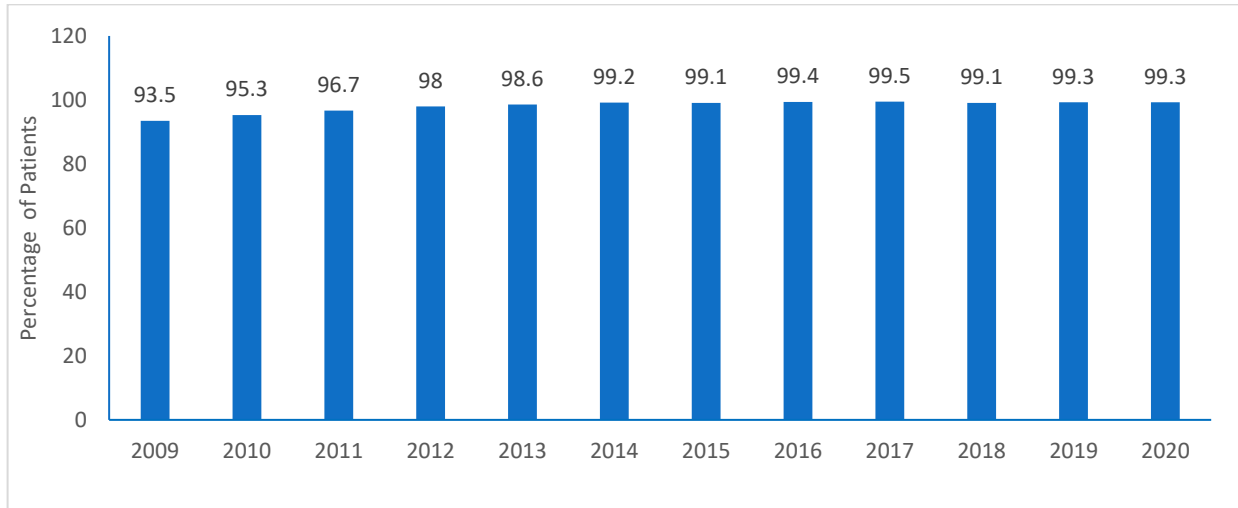
Figure 12: SEQIP patients counseled on smoking cessation 2009-2020



Rehabilitation Considered

Measure: The percent of patients with stroke who were assessed for rehabilitation services. In 2009, 93.5% of eligible patients were assessed for rehabilitation services. In 2020, 99.3% of eligible patients were assessed for rehabilitation, a 5.8% change.

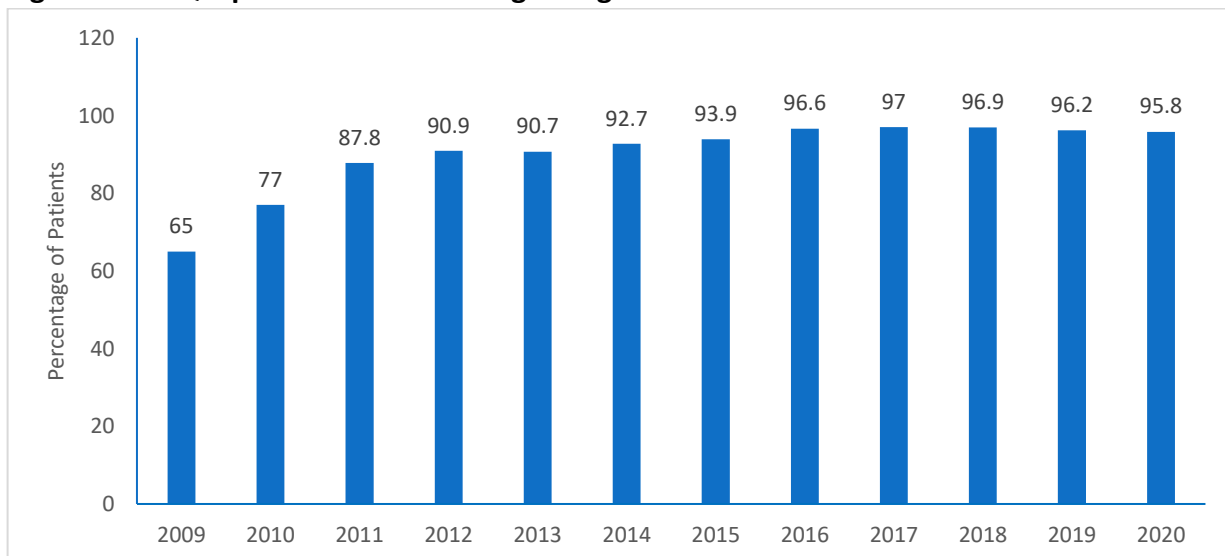
Figure 13: SEQIP patients assessed for rehabilitation services 2009-2020



Stroke Education

Measure: The percent of patients with stroke or TIA or their caregivers who were given education and/or educational materials during the hospital stay addressing all the following: personal risk factors for stroke; warning signs of stroke; activation of emergency medical system; the need for follow-up after discharge; and medications prescribed. In 2009, 65.0% of eligible patients were given stroke educational information. In 2020, 95.8% of eligible patients were given stroke educational information, a 30.8% change.

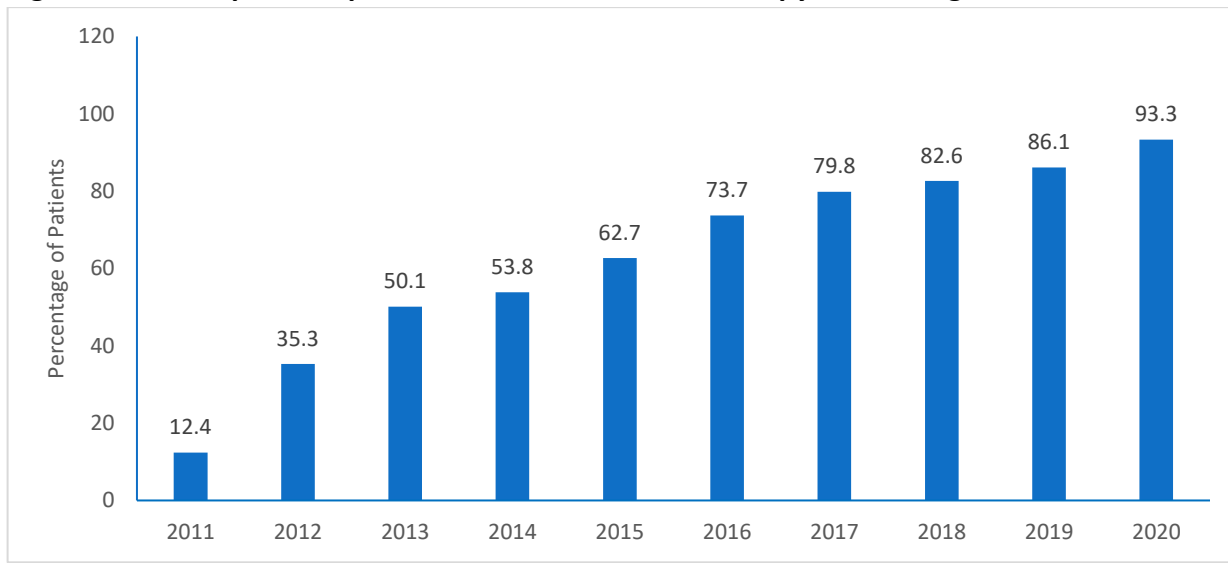
Figure 14: SEQIP patients or their caregivers given stroke education 2009-2020



Discharged on Intensive Statin Medication

Measure: Percentage of ischemic stroke and TIA patients who are prescribed high-intensity statin therapy at discharge, or if greater than 75 years of age, are prescribed at least moderate-intensity statin therapy at discharge. This measure began in 2011. 12.4% of eligible patients were discharged with a high intensity statin medication prescription in 2011. In 2020, 93.3% of eligible patients were discharged on a statin, an 80.9% change.

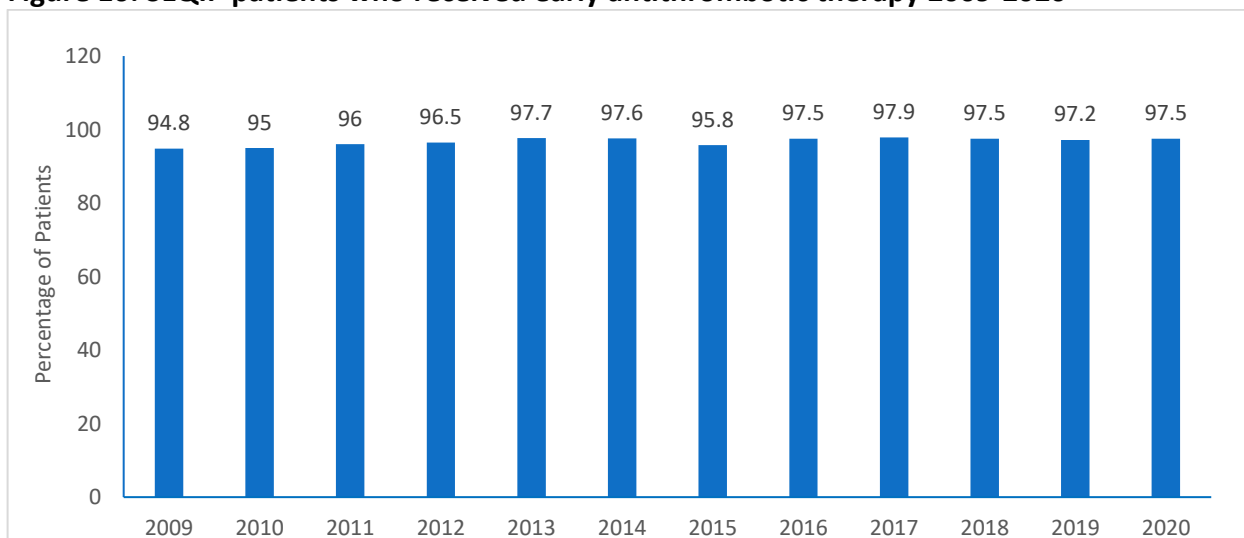
Figure 15: SEQIP patients prescribed intensive statin therapy at discharge 2011-2020



Early Antithrombotics

Measure: The percent of patients with ischemic stroke or TIA who receive antithrombotic therapy by the end of hospital day two. In 2009, 94.8% of eligible patients received antithrombotic therapy by the end of hospital day two. In 2020, 97.5% of patients received early antithrombotic therapy, a 2.7% change.

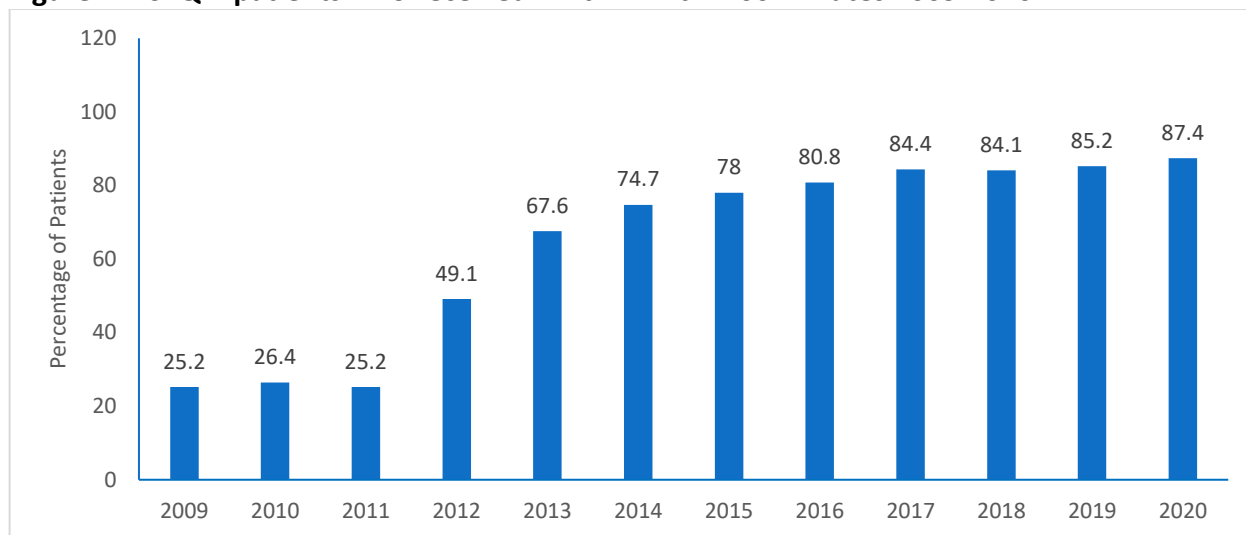
Figure 16: SEQIP patients who received early antithrombotic therapy 2009-2020



IV Alteplase (rt-PA) Initiated Within 60 Minutes

Measure: The percent of acute stroke patients receiving IV rt-PA therapy during the hospital stay who have a time of 60 minutes or less from hospital arrival to initiation of thrombolytic therapy administration (door-to-needle) time. In 2009, 25.2% of eligible patients received IV rt-PA within 60 minutes of arriving at the hospital. In 2020, 87.4% of eligible patients received IV rt-PA within 60 minutes, a 62.2% change.

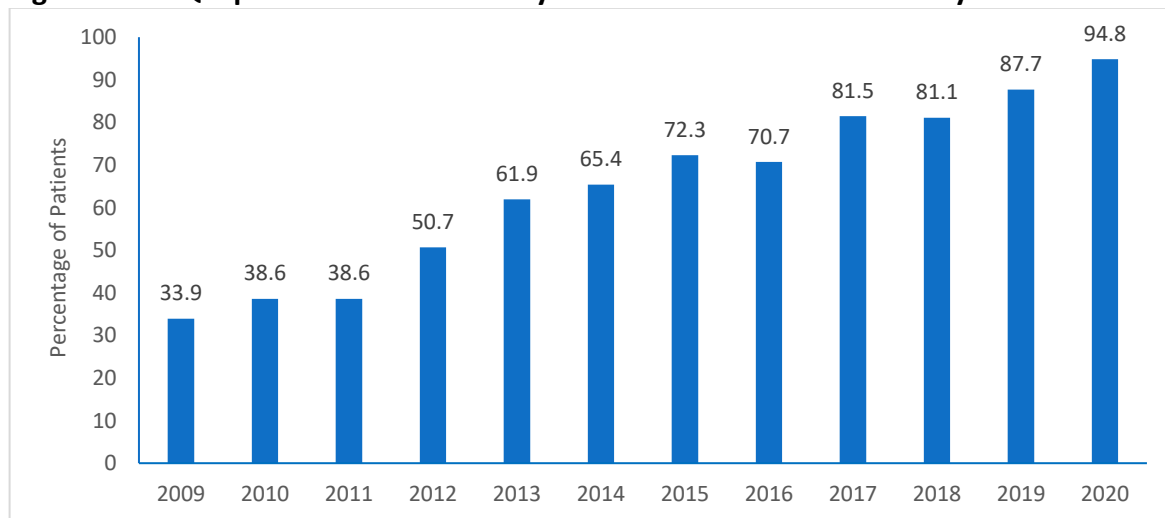
Figure 17: SEQIP patients who received IV rt-PA within 60 minutes 2009-2020



IV Alteplase (rt-PA) Initiated Within 4.5 Hours

Measure: The percent of acute stroke patients arriving at the hospital within 3.5 hours of time last known well and for whom IV rt-PA is initiated at the hospital within 4.5 hours of time last known well. In 2009, 33.9% of eligible patients received IV rt-PA within 4.5 hours of time last well known. In 2020, 94.8% of eligible patients received IV rt-PA within 4.5 hours, a 60.9% change.

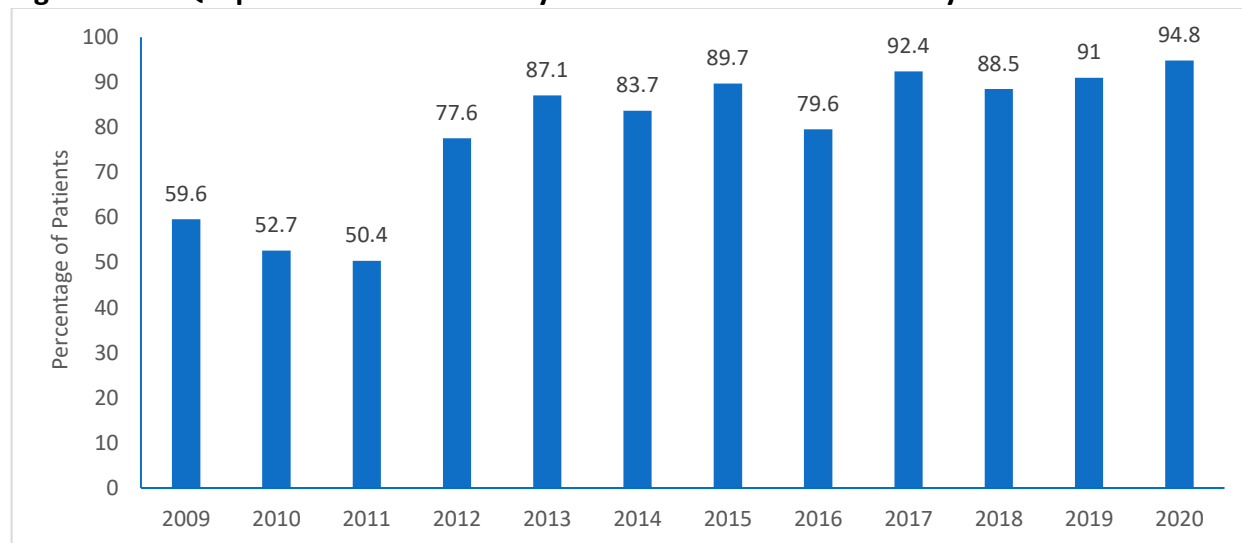
Figure 18: SEQIP patients who arrived by 3.5 hour & received IV rt-PA by 4.5 hours 2009-2020



IV Alteplase (rt-PA) Initiated Within 3 Hours

Measure: The percent of acute stroke patients arriving at the hospital within 2 hours of time last known well and for whom IV rt-PA is initiated at the hospital within 3 hours of time last known well. In 2009, 59.6% of eligible patients received IV rt-PA within 3 hours of time last known well. In 2020, 94.8% of patients received IV rt-PA within 3 hours, a 35.2% change.

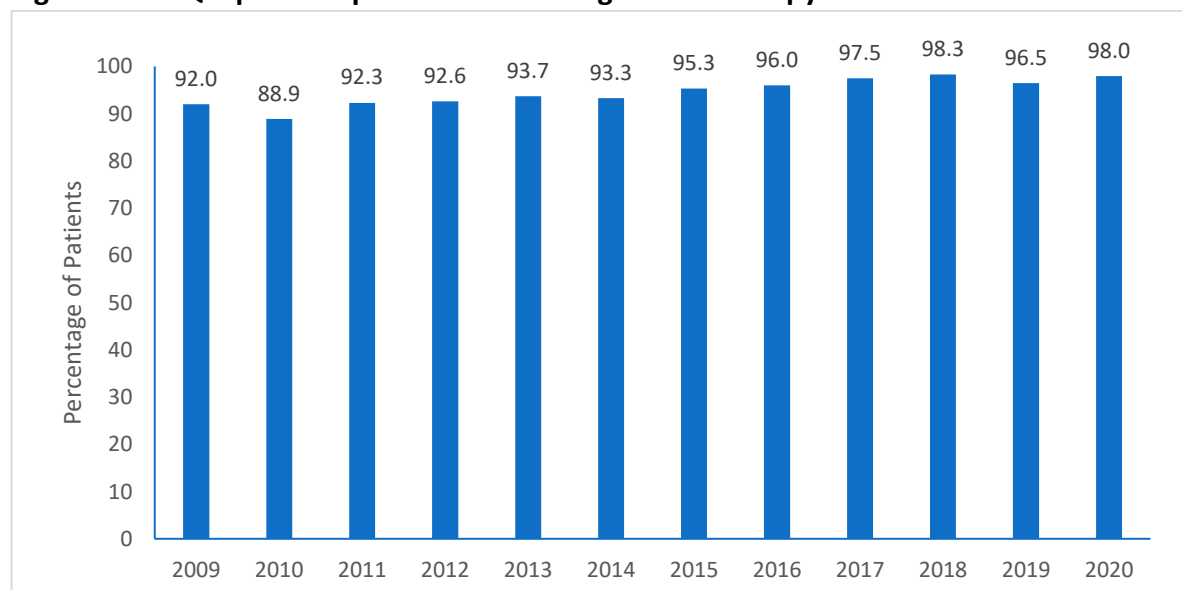
Figure 19: SEQIP patients who arrived by 2 hours & received IV rt-PA by 3 hours 2009-2020



Anticoagulation Therapy

Measure: The percent of patients with ischemic stroke or TIA with atrial fibrillation/flutter who are discharged on anticoagulation therapy. In 2009, 92.0% of eligible patients were prescribed anticoagulation therapy upon discharge. In 2020, 98.0% of eligible patients were prescribed anticoagulation therapy, a 6.0% change.

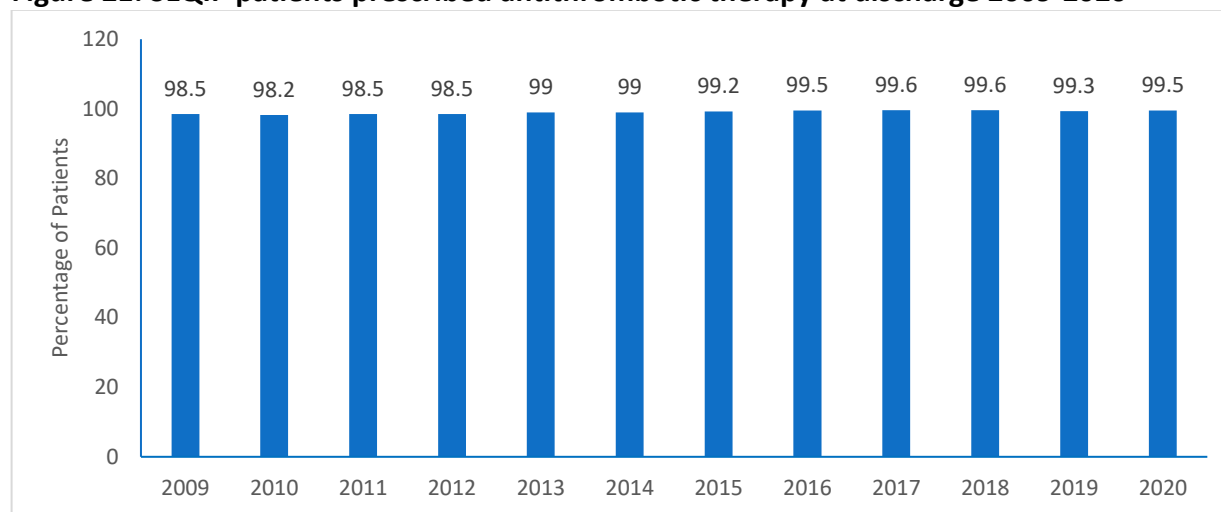
Figure 20: SEQIP patients prescribed anticoagulation therapy 2009-2020



Antithrombotics at Discharge

Measure: The percentage of patients with an ischemic stroke or a TIA prescribed antithrombotic therapy at discharge. In 2009, 98.5% of eligible patients were prescribed antithrombotic therapy upon discharge. In 2020, 99.5% of eligible patients were prescribed antithrombotic therapy at discharge, a 1.0% change.

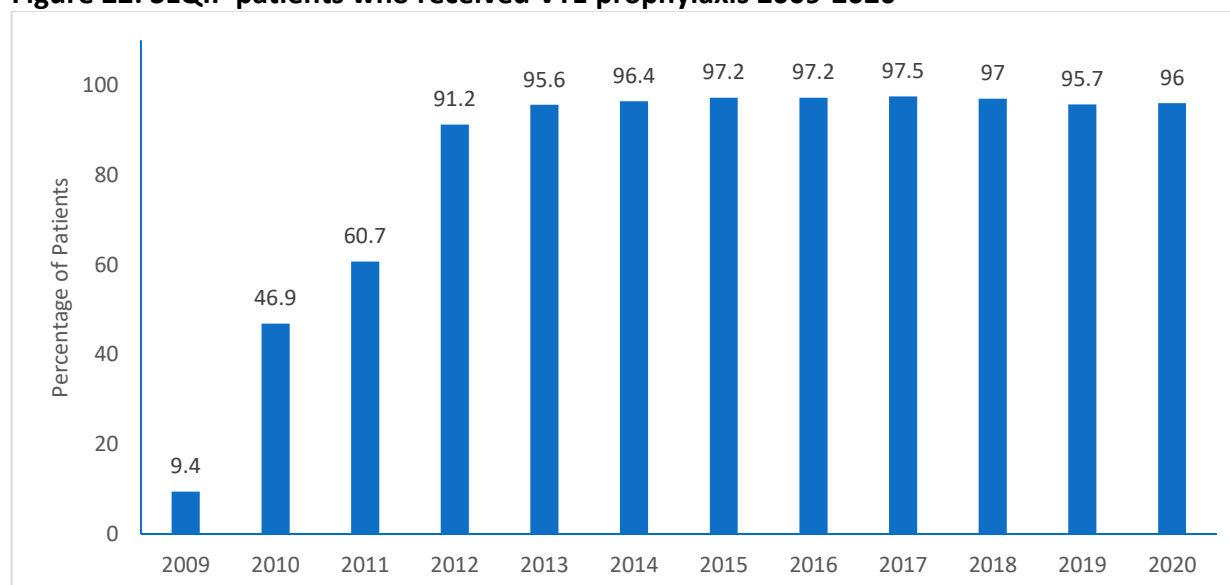
Figure 21: SEQIP patients prescribed antithrombotic therapy at discharge 2009-2020



VTE Prophylaxis

Measure: The percent of patients with an ischemic stroke, hemorrhagic stroke or a stroke not otherwise specified who receive VTE prophylaxis the day of or the day after hospital admission. In 2009, 9.4% of eligible patients received VTE prophylaxis by the end of hospital day two. In 2020, 96% of eligible patients received VTE prophylaxis, an 86.6% change.

Figure 22: SEQIP patients who received VTE prophylaxis 2009-2020



SEQIP members review performance data annually to evaluate current quality improvement processes, identify and discuss opportunities for implementing new initiatives and set goals for the upcoming year. SEQIP also collaborates with the KHDSP Task Force to identify opportunities for collaboration with other programs in KDPH to advance SSOC.

Current SEQIP Initiatives

The KHDSP Task Force along with the KDPH have developed a strategic map outlining strategies and objectives to improve SSOC since 2006. In 2019, the Kentucky Heart Disease and Stroke Prevention Strategic Map and Plan was updated for 2020-2023. SEQIP members were active participants in the development and creation of the map and are committed to furthering the initiatives outlined in the plan for continued improvement in SSOC.

The strategic map is utilized as a directive for SEQIP work groups. SEQIP has created the following subcommittees (Table 2) to address the stroke continuum of care and chain of survival. The committee work is directed by a committee chair and supported by the SEQIP steering committee. Efforts to improve care delivery in Kentucky over the last twelve (12) years have been successful, as reflected in the data. This is due to collaboration across geopolitical boundaries throughout the commonwealth among hospitals, the EMS community, public health officials, legislators and community members.

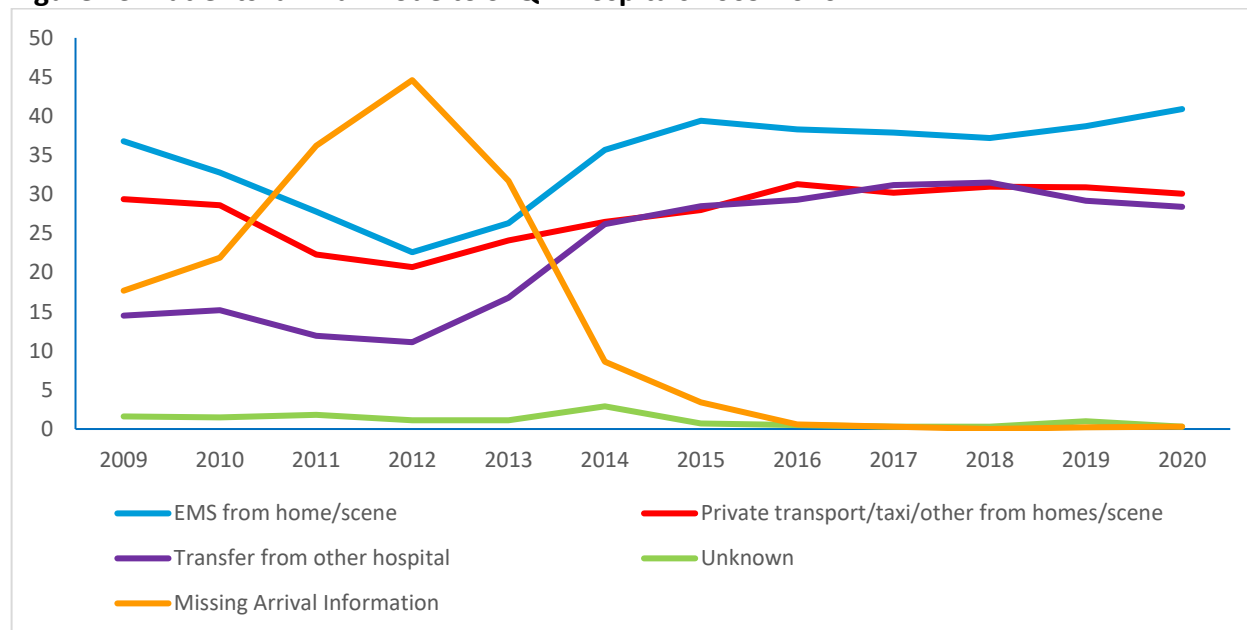
Table 2: SEQIP subcommittees

SEQIP subcommittee	Committee chair
EMS outreach and education	Lacy Shumway – University of Kentucky Regional Extension Center
Disease specific care certification initiatives - Acute stroke ready certification - Primary stroke center certification - Thrombectomy-capable certification - Comprehensive stroke certification	Lisa Bellamy, BHS, RN, CPHQ – UK Healthcare/Norton Healthcare Stroke Care Network Rachel Jenkins, MSN, RN – Appalachian Regional Healthcare Betty McGee, MSN, RN, CEN – St. Elizabeth Healthcare Polly Hunt, BSN, RN – King’s Daughter’s Hospital, Ashland Abby Loechler, MPH – American Heart/Stroke Association
Data analysis and performance improvement	Chauncey Evers, BA, BSN, RN – UofL Healthcare
Navigating the stroke continuum of care	Carrie Crockett, MSSW, CSW – UofL Healthcare
Community and public health education and outreach	Natalie Littlefield, MPH – Kentucky Heart Disease and Stroke Prevention Program
Door in door out (DiDo)	Bill Singletary, BA, BSN, RN, MBM - The Medical Center
Door to device	Lindsey Siewert, MSN, APRN, CCRN – Norton Healthcare, Brownsboro

In addition to the performance measures above, SEQIP is working to improve collaboration with EMS agencies across the commonwealth to expand best practices by educating Kentuckians to call 911 at the onset of stroke symptoms for transport to the hospital, performing a stroke screening and severity scale as part of their assessment and to notify stroke centers prior to arrival at the hospital.

Nationally, hospitalized stroke patients utilize EMS 50-60% of the time for transport to the hospital.¹³ Transport mode to the hospital for stroke patients in Kentucky has been variable throughout the years, nevertheless utilization in 2020 was around 41% by EMS, followed by private vehicle (30%) and interfacility transfers (28%) (Figure 23).

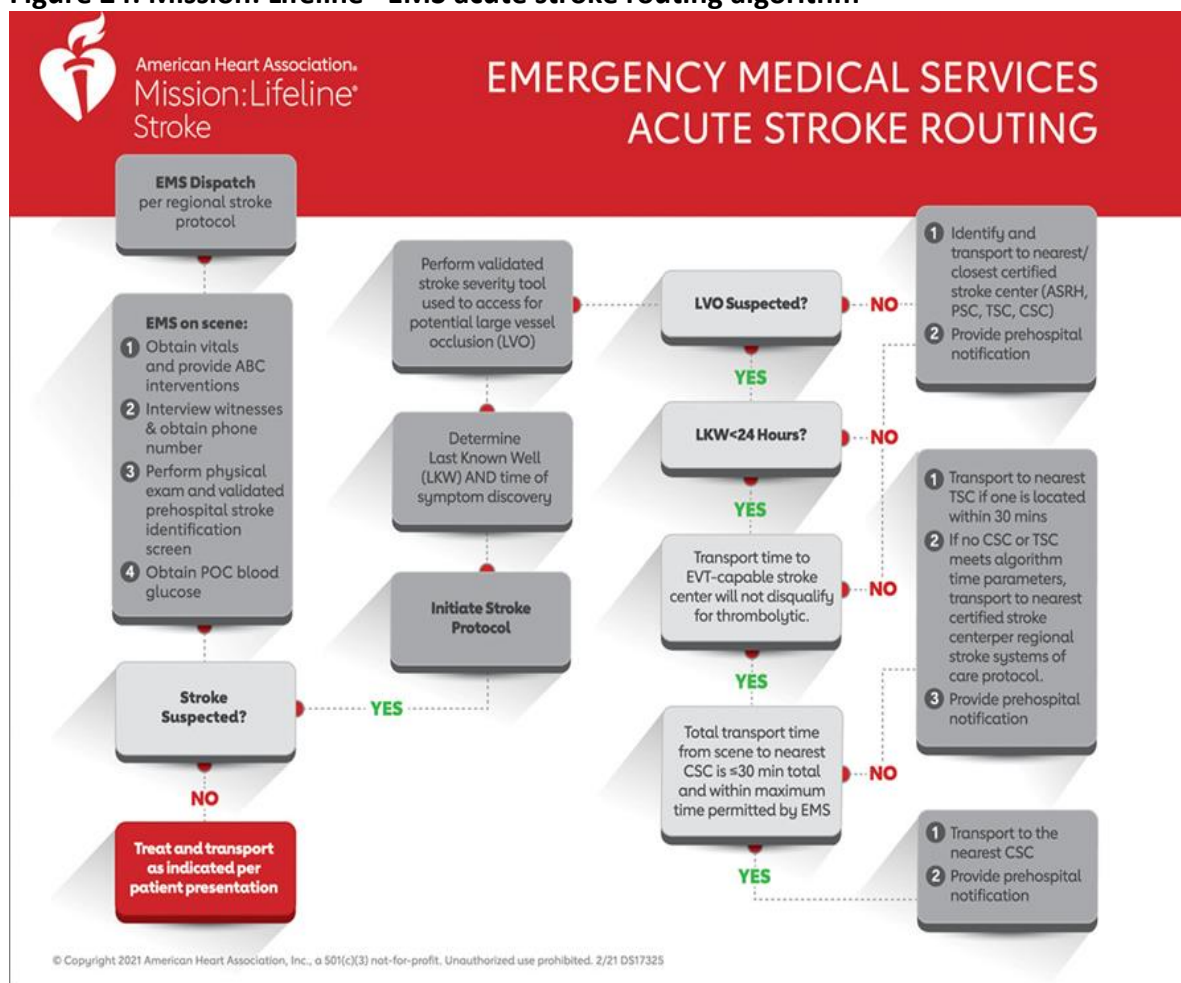
Figure 23: Patients' arrival mode to SEQIP hospitals 2009-2020



Stroke screening scales are recommended for utilization by EMS to identify stroke patients in the field for transport to a stroke center capable of delivering the clot busting drug alteplase to eligible patients. A validated stroke severity scale should be performed when there is a positive stroke screening scale to potentially identify stroke patients with a large vessel occlusion (LVO) eligible for endovascular thrombectomy (EVT). Treatment with IV alteplase and EVT are time sensitive and delays in providing these acute treatments lead to worse outcomes.^{14,15}

In 2018, the Kentucky Board of Emergency Medical Services (KBEMS) added performing a stroke severity scale and a prenotification algorithm to their recommended stroke triage protocol. The KBEMS also endorsed the Mission: Lifeline® EMS acute stroke routing algorithm (Figure 24)¹⁶ recommending transport to a CSC for those patients with a positive stroke severity scale if transport could be provided to the higher level of care without delaying arrival by more than thirty (30) minutes.

Figure 24: Mission: Lifeline® EMS acute stroke routing algorithm

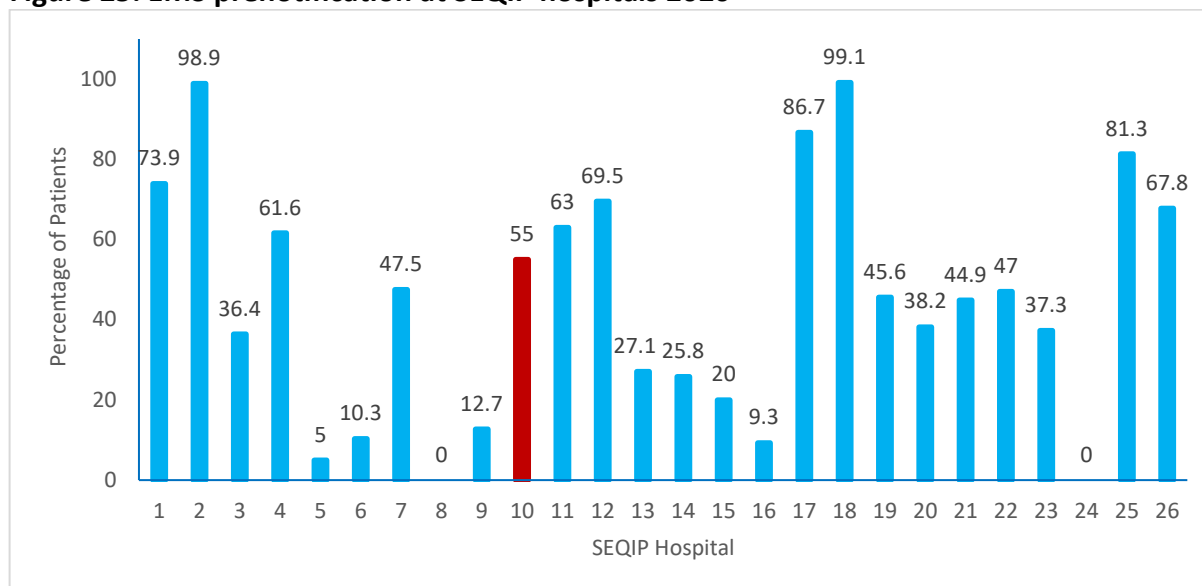


Source: Jauch, E., Schwamm, L., Panagos, P., et al., 2021.¹⁶

Unfortunately, utilization of a stroke severity scale by EMS throughout Kentucky has been inconsistent and most agencies have not adopted a scale as part of their field protocols. The reasons for this are variable throughout the state. SEQIP is working to identify EMS agencies who do not have a stroke severity scale as part of their transport protocols. SEQIP will work with them to adopt a scale, provide staff education on performing the scale and implementing the scale into their protocols. To begin this work, in 2020 Louisville based hospital systems collaborated to start a pilot with air ambulance services to utilize the Cincinnati Prehospital Stroke Severity Scale or a validated scale of their choice. The pilot for ground services will be phased in later as it was delayed due to the COVID-19 pandemic and staff turnover.

Over the years, data collection for hospital prenotification has been difficult to collect in Kentucky due to missing documentation in the EMS run sheet or the hospital record. Nationally, hospital prenotification occurs in 67% of EMS transports.¹⁵ Based on data available, in 2020 hospital prenotification throughout Kentucky was inconsistent by facility/region (Figure 25). For the entire SEQIP group, on average advanced prenotification occurred in 55% of EMS transports. Efforts are ongoing with EMS agencies and the KBEMS to increase hospital access to prehospital data via run sheets.

Figure 25: EMS prenotification at SEQIP hospitals 2020

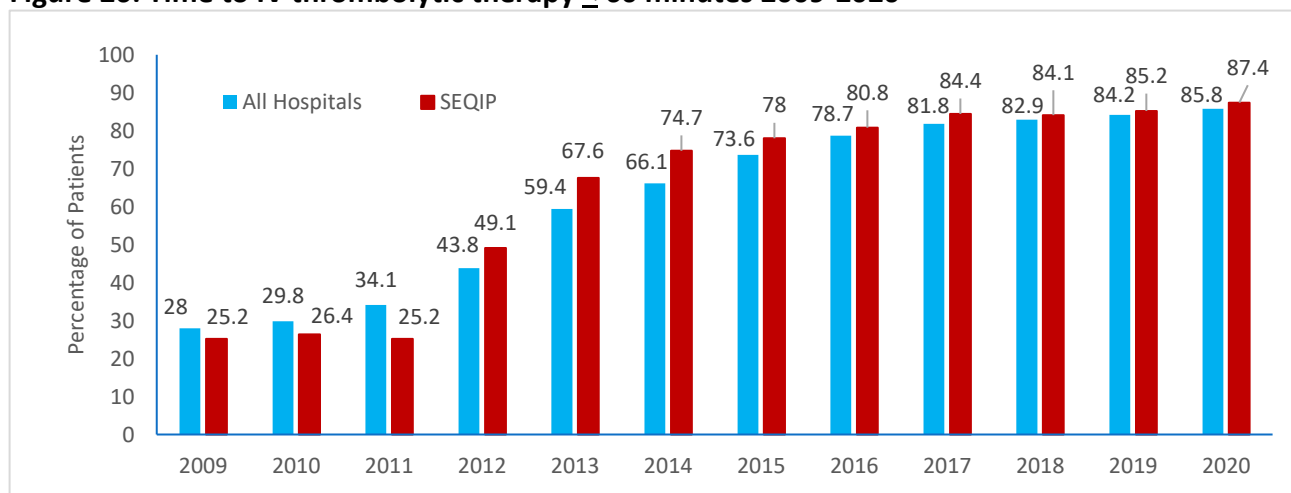


Note: The bar in red represents the average EMS prenotification by SEQIP member hospitals.

Reperfusion Therapies

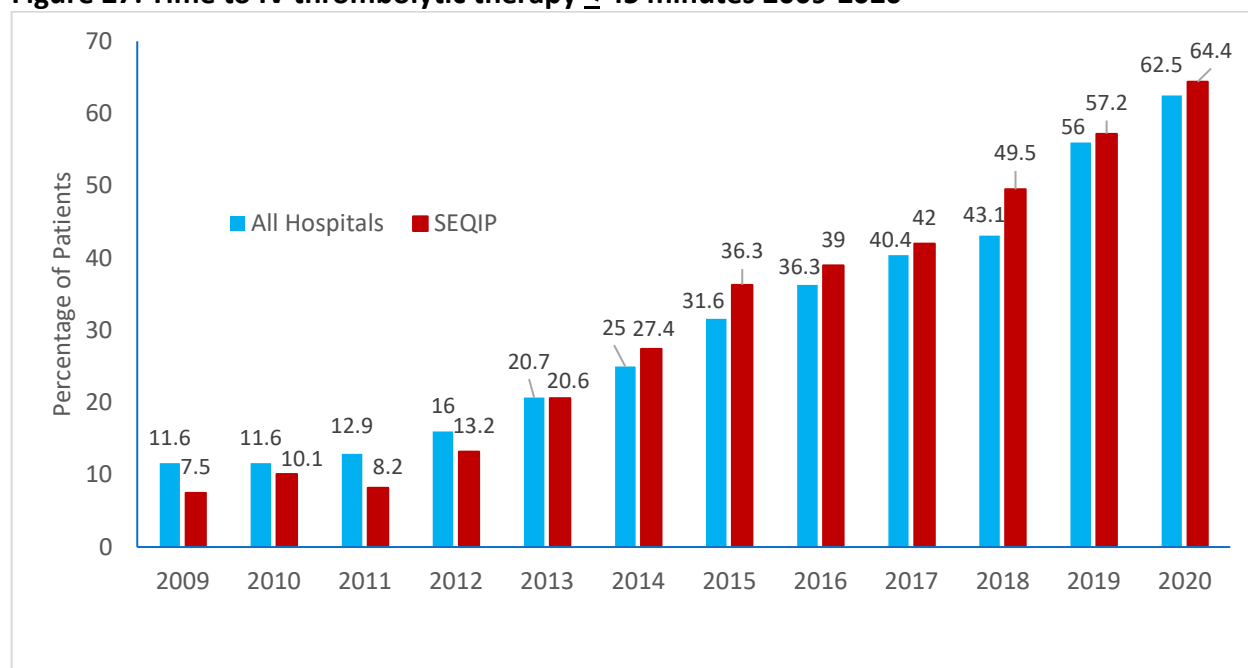
“Time is brain” and outcomes are better the faster reperfusion therapies can be delivered to restore blood flow to the brain in the setting of ischemic stroke. Hospitals need to have streamlined processes upon EMS arrival to deliver IV alteplase and EVT therapies to appropriate patients. SEQIP member hospitals have made it a priority to deliver the IV clot busting drug as soon as safely possible. The national quality measure for door to drug time is ≤ 60 minutes, however, national recommendations in 2020 endorsed a door to drug time of ≤ 45 minutes and even ≤ 30 minutes if safely possible. SEQIP hospitals are performing well in the effort to “save brain”. Kentucky is outperforming the nation in door to drug delivery with IV alteplase as seen in the graphs below.

Figure 26: Time to IV thrombolytic therapy ≤ 60 minutes 2009-2020



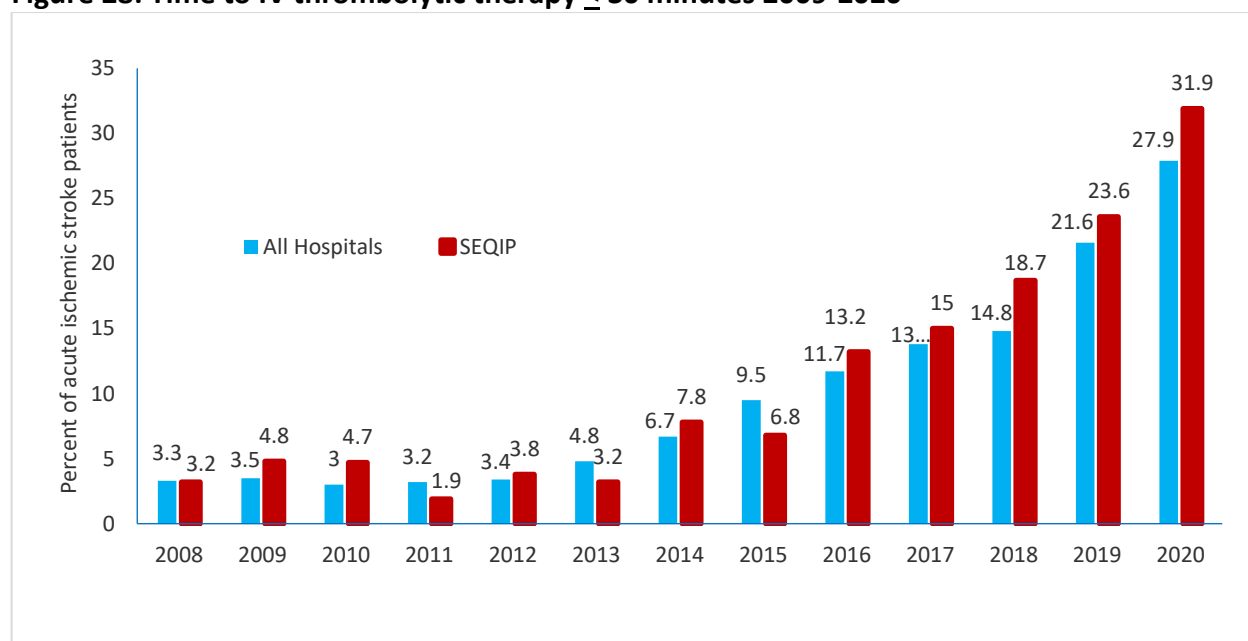
Note: All hospitals refer to all GWTG®-S registry hospitals.

Figure 27: Time to IV thrombolytic therapy $\leq$ 45 minutes 2009-2020



Note: All hospitals refer to all GWTG®-S registry hospitals.

Figure 28: Time to IV thrombolytic therapy $\leq$ 30 minutes 2009-2020



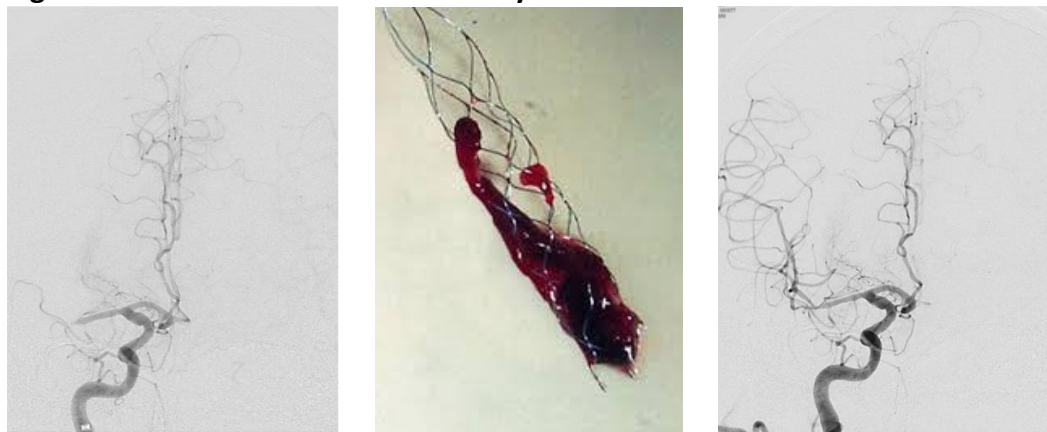
Note: All hospitals refer to all GWTG®-S registry hospitals.

The greatest risk with administering the IV clot busting drug is bleeding throughout the body or the brain. The expected bleeding risk, based on prior clinical trials, is up to 6% when stringent inclusion and exclusion criteria are followed. In Kentucky, delivering the clot busting therapy faster has not resulted in increased bleeding. The bleeding transformation rate for SEQIP hospitals is currently 2.5% and has never exceeded the expected risk of up to 6% since data collection began in 2009.

Endovascular Thrombectomy

A physician threads a catheter through a blood vessel (artery) in the arm or leg directly up to the blood vessel in the brain where the clot is blocking blood flow to brain tissue. The clot is then removed by inserting a device into the blood clot and pulling the clot out restoring blood flow to the brain (Figure 29).

Figure 29: Endovascular thrombectomy



Note: Photographs courtesy of Dr. Kerri Rimmel, University of Louisville.

Recommended hospital time goals for EVT therapy are arrival to puncture of the blood vessel within 90 minutes; and restoration of blood flow by opening the vessel and retrieving the blood clot within 120 minutes of arrival to the hospital.

In 2020, five hospitals in Kentucky could perform EVT and contributed data to the stroke registry. The median time from arrival to skin puncture to gain access to the blood vessel was 86 minutes. Ninety percent of the time physicians were able to open the blood vessel and restore blood flow to the brain with a median time of 103 minutes from arrival. Outcomes for these patients were also favorable: 44% of patients improving to only a slight disability - unable to carry out all pre-stroke activities, but able to look after self without daily help. The table below reflects how SEQIP hospitals are comparing to other EVT facilities (Table 3) in the country.

Table 3: Endovascular thrombectomy performance

Performance measure	Kentucky SEQIP hospitals	All GWTG-S® stroke registry hospitals performing EVT
Arrival time to skin puncture	86 minutes (median)	70 minutes (median)
Arrival to opening blood vessel	103 minutes (median)	92 minutes (median)
Percent of patient's blood flow restored	90%	86%
Percent of patient's blood flow restored within 120 minutes of arrival	66%	68%
Favorable outcome	44% of patients	41% of patients

Source: GWTG®-S registry.

In 2020, to improve hospital processes for EVT therapy, the Door to Device committee was established. In the same year, 40% of patients were transferred to a tertiary center for their stroke care. When patients are transferred to a higher level of care to receive treatment, the time goal is less than 90 minutes from arrival to the initial facility to transfer of the patient en route to the tertiary center. This is called door in door out (DiDo). The DiDo Committee has established best practices, which have been shared nationally with recommendations for hospitals to achieve this goal.¹⁷ Work continues in Kentucky to establish and improve these processes at hospitals. Only 12% of patients were transferred within the DiDo recommended time frame of ≤ 90 minutes in 2020.

SSOC should support local and regional initiatives to increase stroke awareness.¹³ SEQIP continues to work with the KHDSP to provide standardized messaging materials on stroke warning signs, risk factors and stroke prevention. These materials are reviewed and updated annually by the subcommittee and are available on the KHDSP website for download.

SEQIP is also addressing stroke care post discharge through the Navigating the Stroke Continuum of Care Committee and has created tools for patients and stroke center staff to help navigate the healthcare system. Thus far, the following tools have been created:

- Community resource list;
- Preparing for follow up appointments;
- Questions to ask during follow up appointments;
- List of stroke support groups;
- Importance of having a primary care provider; and
- Pseudobulbar affect educational handout.

These tools are available for use and download on the SEQIP website.

Recommendations

The impact of stroke centers is evident in reducing stroke mortality. As noted in the infographic on page 6, death rates have decreased in counties adjacent to or where certified stroke centers are located. The maps comparing stroke mortality from 2006-2008 to 2017-2019 show the impact stroke centers have had on lives saved as stroke mortality has decreased the most in areas where stroke centers have been certified for 5 years or more. Sustaining SSOC is vital to the health of Kentuckians.

The SEQIP steering committee is recommending the funding of SEQIP in the amount of \$500,000-\$1,000,000. The funds will help SEQIP continue to work on the objectives and action items identified in the KHDSP Task Force Strategic Map and Plan: 2020-2023 (Appendix B).

In addition, the SEQIP steering committee is requesting a legislative change to the deadline for the SEQIP report to September 1. This will allow the steering committee to include the most recent data from the previous calendar year in the annual report.

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Appendix A: Kentucky Hospitals Submitting Data to the Kentucky Stroke Registry

2020 Certified hospitals	Hospitals whose data are included in this report	Hospitals required to submit data per KRS 211.575
Baptist Health, LaGrange	√	√
Baptist Health, Lexington	√	√
Baptist Health, Louisville	√	√
Baptist Health, Paducah	√	√
Frankfort Regional Medical Center		√
Greenview Regional Hospital		√
Hardin Memorial Hospital	√	√
Jackson Purchase Medical Center	√	√
Jewish Hospital	√	√
King's Daughter's Medical Center	√	√
Lake Cumberland Regional Hospital	√	√
Norton Audubon Hospital	√	√
Norton Brownsboro Hospital	√	√
Norton Hospital	√	√
Norton Women's & Children's Hospital	√	√
Owensboro Health Regional Hospital	√	√
Pikeville Medical Center	√	√
Saint Joseph Hospital	√	√
St Elizabeth Healthcare, Edgewood	√	√
St Elizabeth Healthcare, Florence	√	√
St. Elizabeth Healthcare, Fort Thomas	√	√
Sts. Mary and Elizabeth Hospital	√	√
The Medical Center at Bowling Green	√	√
University of Kentucky Hospital	√	√
University of Louisville Hospital	√	√

Appendix B: KHDSP Task Force Strategic Map and Plan: 2020-2023

KHDSP Task Force Strategic Map and Plan: 2020-2023		SEQIP Progress and Gap Analysis
Objective: Improve statewide cerebrovascular systems of care		Performed Q4 2021
Strategy 1	Action Items	
Continue to identify and improve current cerebrovascular systems of care.	Continue to identify and map certified stroke centers by certification levels as defined by KRS 216B.0425 and disseminate to Kentucky Board of Emergency Medical Services (KBEMS). - Acute stroke ready hospitals - Primary stroke centers - Thrombectomy-capable stroke centers - Comprehensive stroke centers	Achieved Map is updated quarterly.
	Continue collaboration with Kentucky Hospital Association's (KHA) Rural Hospital Flexibility Program.	
	Continue to partner with Kentucky hospitals to increase acute stroke treatments (intravenous tissue plasminogen activator and mechanical thrombectomy).	Improved Continue as goal 2020-2023.
	Assess inter-facility emergent transfer needs to meet recommended time goals.	Partially Met Gap analysis has been performed with 32 certified stroke centers to identify barriers; door in door out (DiDo) committee has developed best practices for stroke centers to follow to meet recommended transfer times.
	Continue to identify EMS agencies which have a field transport protocol for stroke and provide expert consultation/evaluation to ensure said protocols are up to date with the most current science.	Gap Working with KBEMS to identify which agencies use the recommended state protocol vs. KBEMS medical director approved protocols.
	Partner with KBEMS to determine stroke specific data points available for capture.	Achieved First KBEMS annual stroke report created in 2019; KBEMS continues to identify methods for improving data collection.
	Implement pilot project for EMS feedback, training and education to improve local stroke systems of care.	Partially Met Pilot started with Louisville hospital systems and air medical ambulances; ground implementation delayed due to COVID-19 pandemic.
	Continue collaboration with the KBEMS subcommittee, cardiac and stroke care.	Achieved SEQIP leaders serve on the committee and participate in meetings.

	Disseminate and provide access to current evidence-based dispatch protocols for stroke.	Gap Need to identify best practices for stroke dispatch protocols.
	Partner with KBEMS for continued development of inter-facility transport protocols for all stroke subtypes.	Gap Need to develop acute ischemic stroke without thrombolytic therapy and hemorrhagic stroke protocols.
	Disseminate KBEMS inter-facility transport protocols at local and regional levels.	Partially Met Current protocols available but not well utilized due to paper documentation tool.
Strategy 2	Action Items	
Continue Stroke Encounter Quality Improvement Project (SEQIP) through FY 2023.	Assess current SEQIP members for continued participation by March 2020.	Achieved
	Recruit at least one hospital pursuing thrombectomy-capable certification by March 2022.	Achieved Currently one thrombectomy-capable stroke center certified in 2021.
	Continue to utilize registry to develop and implement an action plan around quality metrics and education.	Achieved
	Continue to develop and disseminate stroke registry data summary in accordance with KRS 211.575, which goes to the Governor and Legislative Research Commission and includes recommendations for improving stroke systems of care.	Achieved
Strategy 3	Action Items	
Continue to engage and support hospitals maintaining and achieving stroke center certification.	Disseminate the Kentucky state plan for stroke systems of care and statewide map to target hospitals by December 2020.	Achieved
	Continue to provide support for stroke program development to target hospitals.	Achieved
	Update and disseminate stroke resources through Kentucky Heart Disease and Stroke Prevention (KHDSP) Task Force website (KHDSPtaskforce.com) annually.	Achieved Website created with resources updated quarterly.
Strategy 4	Action Items	
Continue collaboration among healthcare systems and public health to disseminate standardized messaging.	Implement action items from Goal A – Objective 1A: Strategy 1: Promote and reinforce healthy behaviors and standardized messaging.	Achieved SEQIP committee meets quarterly.

Appendix C: Glossary of Acronyms

ADD	Area Development District
AHA	American Heart Association
ASA	American Stroke Association
ASRH	Acute Stroke Ready Hospital
CDC	Centers for Disease Control and Prevention
COVID-19	Coronavirus Disease 2019
CSC	Comprehensive Stroke Center
CT	Computerized Tomography
CVD	Cardiovascular Disease
DiDo	Door In Door Out
DNV	Det Norske Veritas
EMS	Emergency Medical Services
EVT	Endovascular Therapy
FDA	Food and Drug Administration
GWTG [®] -S	Get With the Guidelines [®] -Stroke
HFAP	Healthcare Facilities Accreditation Program
IV	Intravenous
KBEMS	Kentucky Board of Emergency Medical Services
KDPH	Kentucky Department for Public Health
KHA	Kentucky Hospital Association
KHDSP	Kentucky Heart Disease and Stroke Prevention Program
KyBRFS	Kentucky Behavioral Risk Factor Survey
LVO	Large Vessel Occlusion
PSC	Primary Stroke Center
rt-PA	Recombinant Tissue Plasminogen Activator
SEQIP	Stroke Encounter Quality Improvement Project
SSOC	Stroke Systems of Care
TIA	Transient Ischemic Attack
TJC	The Joint Commission
TSC	Thrombectomy-Capable Stroke Center
VTE	Venous Thromboembolism