

# TENNESSEE STROKE REGISTRY QUARTERLY REPORT

Volume 4, Issue 1

December 2019

This report is published quarterly using data from the Tennessee Stroke Registry.

## *Inside this report*

- Data on diagnosis, gender distributions, age distribution, arrival modes, insurance status, last known well to arrival, and medical history
- Data from April 2019 through June 2019
- Contact information for the Tennessee Stroke Registry

## Background

The Tennessee Stroke Registry (TSR) was created in 2009 through the Tennessee Stroke Registry Act of 2008. In July 2017, the legislation was updated with Tennessee House Bill 123, requiring all certified comprehensive and primary stroke centers in Tennessee to share their data with the TSR in order to improve stroke care in the state. The bill requires data to be provided from hospitals on a quarterly basis. The data are uploaded to the American Heart/American Stroke Association's Get With the Guidelines (GWTG) data system, Quintiles.

This is the second quarterly report of the calendar year, providing a summary of the TSR data for April through June 2019. The data are aggregate data from the 37 hospitals currently reporting to Quintiles. In this report, illustrations are made on similarities and differences between the quarters' data. In past, quarters were labeled in terms of the fiscal year. However, in this report, data from April through June of 2019 will be referred to as Quarter 2 of 2019. Other quarters will also be labeled as annual quarters. The limitations of this report include that data reported are based on the data provided to the Tennessee Stroke Registry from reporting hospitals and may not be inclusive of all strokes in the state of Tennessee.

## Variable Information\* GWTG Standard Measures

Measure	Numerator	Denominator
<b>Age</b>	Patients in specific age groups	Patients with a diagnosis of Ischemic stroke, TIA, Subarachnoid hemorrhage, or Intracerebral hemorrhage
<b>Co-morbidities</b>	Patients with co-morbidity	All patients
<b>Transportation times</b>	Patients arriving in time interval	Patients with a diagnosis of Ischemic stroke, TIA, Subarachnoid hemorrhage, Intracerebral hemorrhage, or Stroke not otherwise specified
<b>NIHSS reported</b>	NIH Stroke scale performed as part of initial evaluation AND Total Score is reported	Patients with a diagnosis of Ischemic stroke or Stroke not otherwise specified
<b>Time to Intravenous Thrombolytic Therapy</b>	Patients in time intervals based on time from patient arrival at the ED to time of administration of IV t-PA	Patients with a primary stroke diagnosis of ischemic stroke who received IV t-PA at my hospital
<b>Reasons for no IV-rtPA</b>	Patients in exclusion criteria group	Patients with a primary stroke diagnosis of ischemic stroke who arrived at the ED <270 minutes after the onset of stroke symptoms and had reason(s) why IV t-PA was not started at my hospital
<b>Reasons for no IV-rtPA beyond 60 min</b>	Patients grouped by reason	Patients with a primary stroke diagnosis of ischemic stroke in whom IV tPA was initiated greater than 60 minutes after hospital arrival
<b>Modified Rankin Scale at discharge</b>	Patients in each Modified Rankin Scale at discharge value	Patients with a diagnosis of Ischemic Stroke or Subarachnoid Hemorrhage or Intracerebral Hemorrhage or Stroke not otherwise specified
<b>Complication types</b>	Patients in each of the 4 combination groups (therapy received versus complication experienced)	Patients with a primary stroke diagnosis of ischemic stroke who received IV t-PA or intra-arterial thrombolytic therapy at my hospital
<b>Initial exam findings</b>	Patients grouped by exam finding	Patients with a diagnosis of Ischemic Stroke or TIA or Subarachnoid Hemorrhage or

		Intracerebral Hemorrhage or Stroke not otherwise specified
<b>Length of stay</b>	Patients grouped by stroke type	All patients
<b>GWTG/PAA Defect Free</b>	All patients which were included in the numerator for <u>all</u> of the measures that they were not excluded from	All patients which are included in the denominator for at least one of these measures: <ul style="list-style-type: none"> <li>• IV rt-PA 2 Hour</li> <li>• Early Antithrombotics</li> <li>• VTE Prophylaxis (for patients discharged on or after 4/7/2012)</li> <li>• DVT Prophylaxis (GWTG Historic) (for patients discharged before 4/7/2012)</li> <li>• Antithrombotics*</li> <li>• Anticoag for AF*</li> <li>• LDL 100 or ND-Statin *</li> <li>• Smoking Cessation</li> </ul>
<b>CDC/COV Defect Free</b>	All patients which were included in the numerator for all of the measures that they were not excluded from	All patients which are included in the denominator for at least one of these measures: <ul style="list-style-type: none"> <li>• IV rt-PA 2 Hour</li> <li>• Early Antithrombotics</li> <li>• VTE Prophylaxis</li> <li>• Antithrombotics</li> <li>• Anticoag for AF</li> <li>• LDL 100 or ND</li> <li>• Smoking Cessation</li> <li>• Dysphagia Screen</li> <li>• Stroke Education</li> <li>• Rehabilitation Considered</li> </ul>

\*Percentages in graphs are based on the number of cases per quarter.

## Variable Information

### Comprehensive Stroke Measures

The Comprehensive Stroke measure set consists of ten standardized measures. Data for these ten CSTK measures is collected in addition to the eight stroke core measures required for primary stroke center certification, elevating the performance measurement requirement for comprehensive stroke certification to a total of 18 measures.

The measures are as follows:

CSTK-01: National Institutes of Health Stroke Scale (NIHSS Score Performed for Ischemic Stroke Patients).

CSTK-03: Severity Measurement Performed for SAH and ICH Patients (Overall Rate)

CSTK-04: Procoagulant Reversal Agent Initiation for Intracerebral Hemorrhage (ICH)

CSTK-05: Hemorrhagic Transformation (Overall Rate)

CSTK-06: Nimodipine Treatment Administered

CSTK-08: Thrombolysis in cerebral Infarction (TICI Post-Treatment Reperfusion Grade)

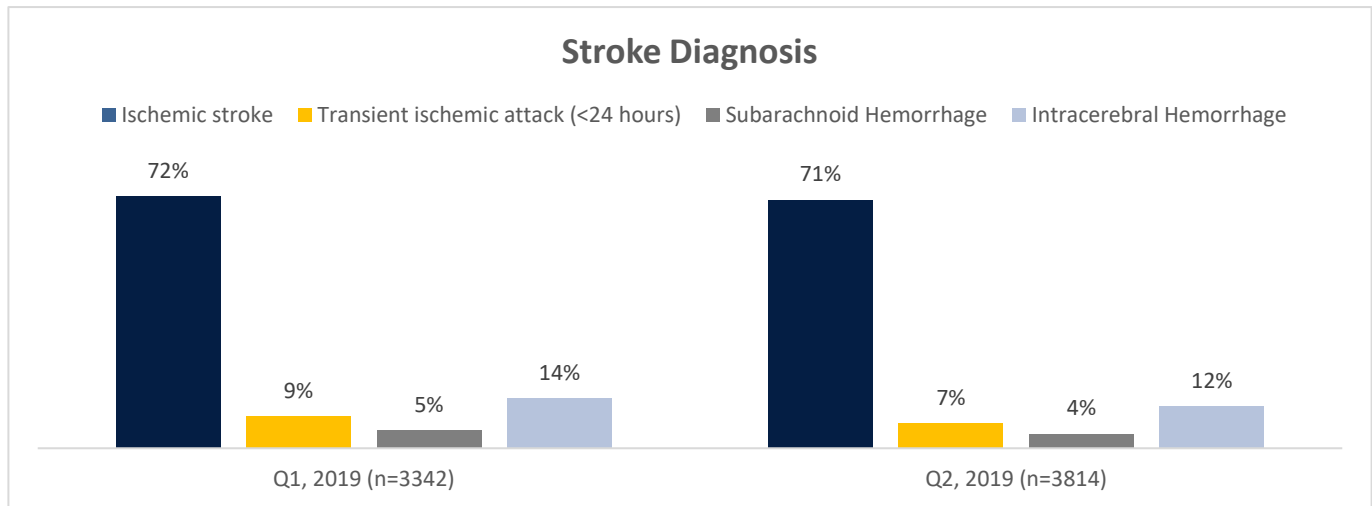
CSTK-09: Arrival Time to Skin Puncture

CSTK-10: Modified Rankin Score (mRS) at 90 Days: Favorable Outcome

CSTK-11: Timeliness of Reperfusion: Arrival Time to TICI 2B or Higher

CSTK-12: Timeliness of Reperfusion: Skin Puncture to TICI 2B or Higher

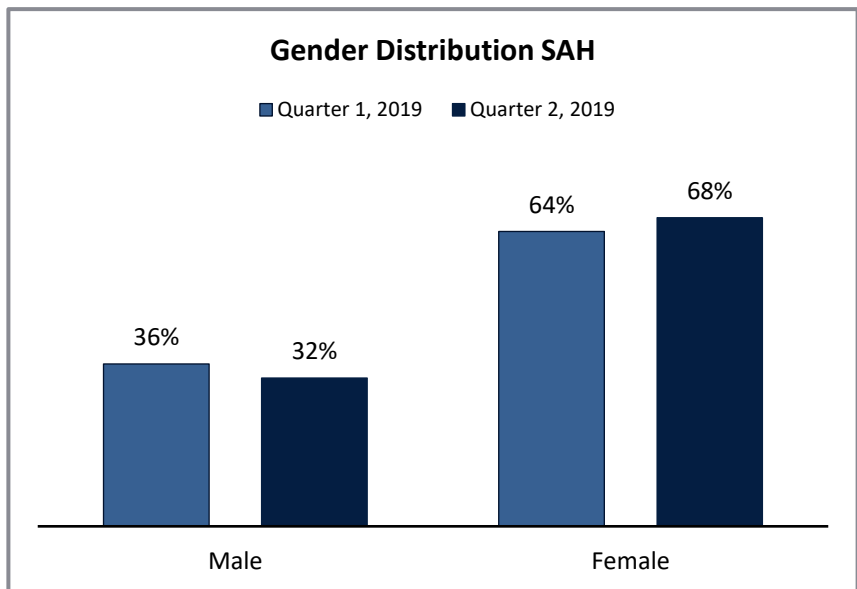
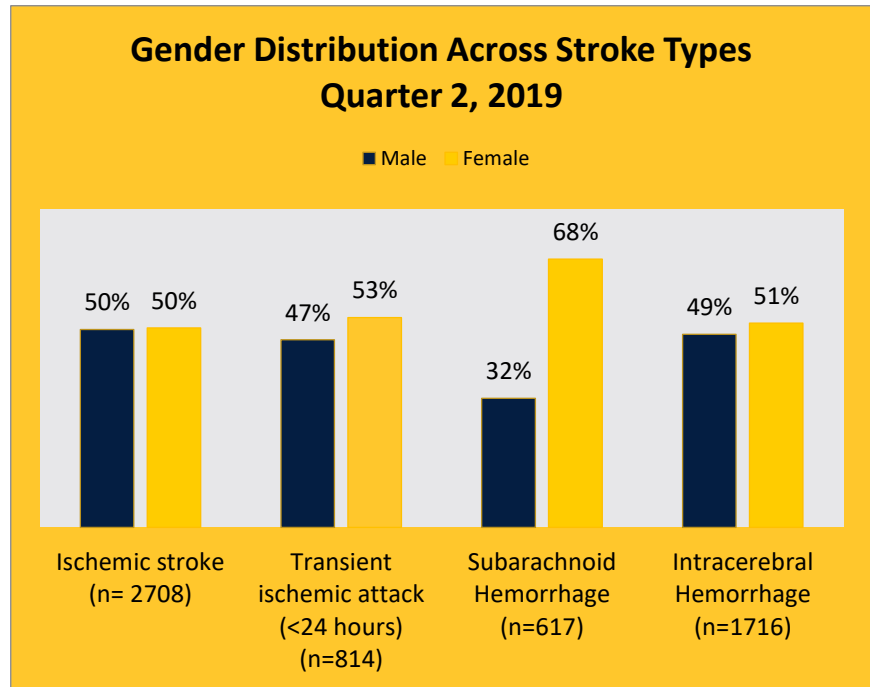
## Diagnosis



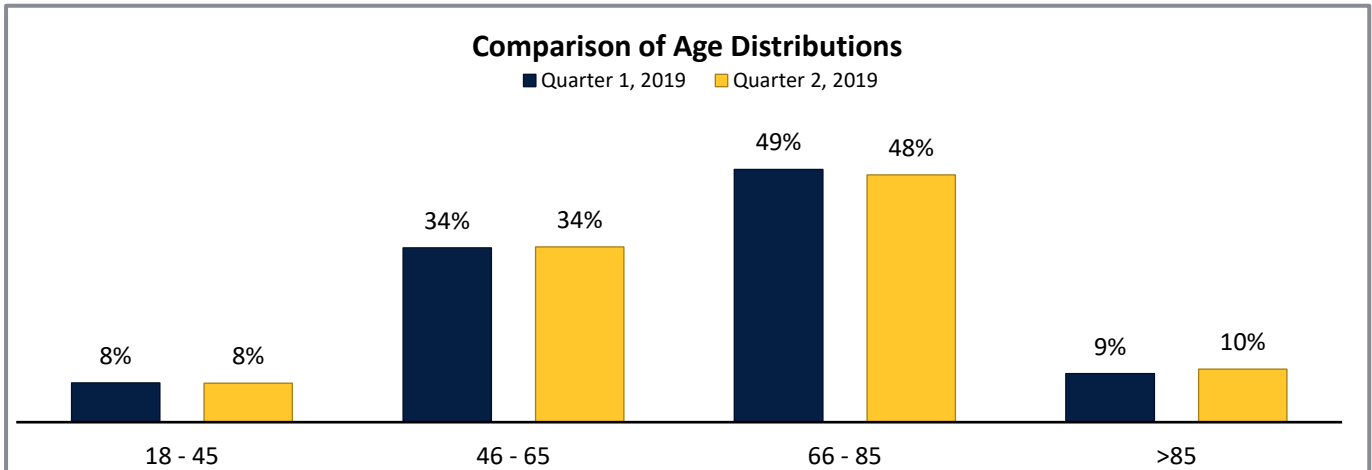
Overall, the patterns and distributions for the second quarter of 2019 are similar to what was shown in the first quarter of 2019. SR quarterly reports. There were 2,708 ischemic strokes, 267 transient ischemic attacks (TIA), 153 subarachnoid hemorrhages (SAH), and 458 intracerebral hemorrhages (ICH). The most common cases were ischemic strokes at 71% of strokes reported to the registry. There are several risk factors for Ischemic strokes: High blood pressure (this is the leading cause), diabetes, atherosclerosis or carotid artery disease, being over the age of 55, a sedentary lifestyle, etc.<sup>1</sup> The data seems to suggest that in July, August, and September, there may be a tendency towards higher numbers of ischemic strokes. One study indicated that levels of air pollution may be linked to higher rates of stroke, this may be a potential area to look into to explain why we see higher levels of ischemic stroke in the summer.<sup>2</sup>

### Gender Distributions

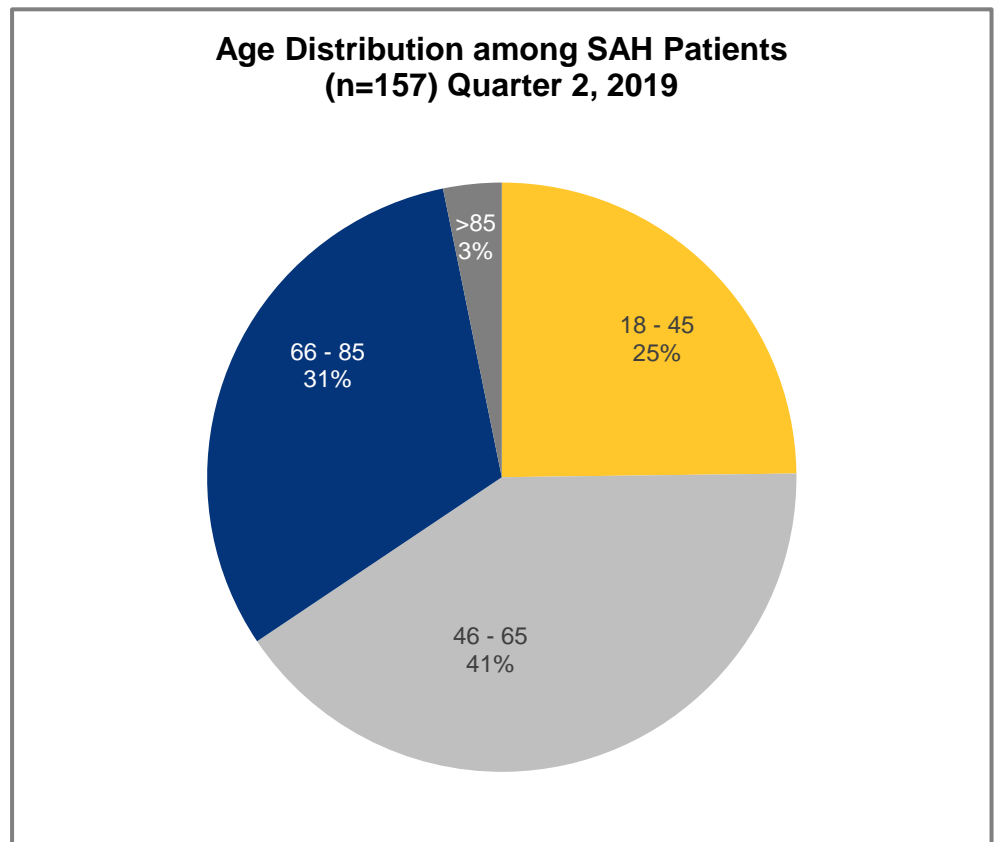
There were the same percentages of male and female cases for ischemic strokes. In past quarters, the trend of female transient ischemic attacks (TIA) being higher than male cases has been observed. From Quarter 1 of 2019 to Quarter 2 of 2019, gender differences in strokes have become more pronounced for females as opposed to less pronounced for males for subarachnoid hemorrhage (SAH). The percentage of female cases in Quarter 2 of 2019 was greater than the percentage of Quarter 1 of 2019 cases after a decrease from previous quarters in Quarter 1 of 2019. The difference between Quarter 1 of 2019 and Quarter 2 of 2019 was 4%.



### Age distributions

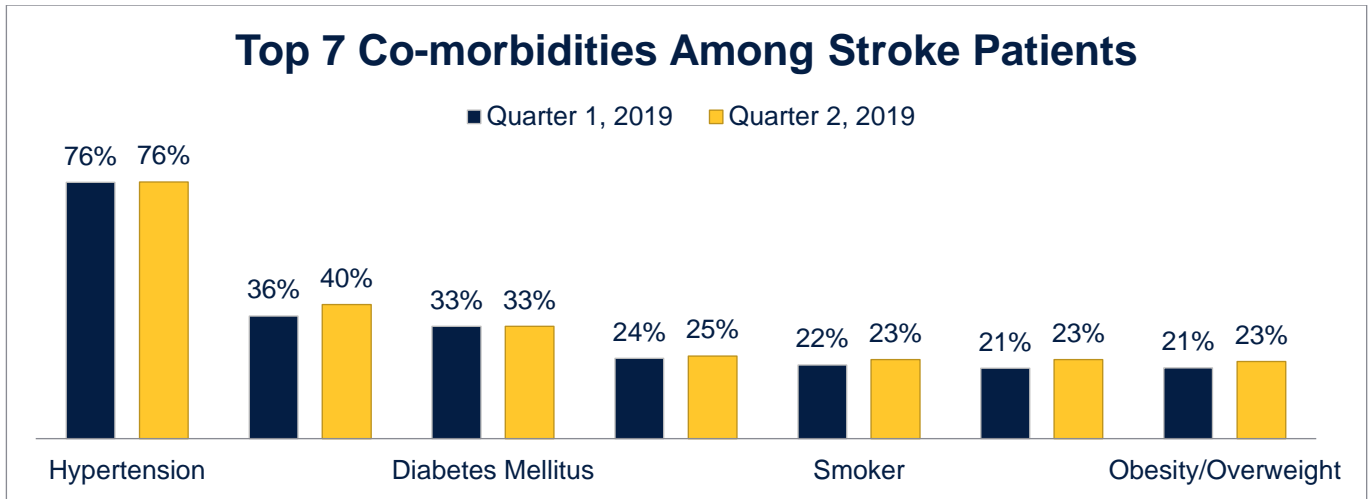


The most common age group experiencing strokes were those from ages 66-85, with 48% of all cases in this bracket. The prevalence of stroke overall decreased by age, with only 8% of cases occurring in those aged 18-45. In the 46-65 age group, there was no difference in Quarter 1 of 2019 than compared to Quarter 2, 2019. The difference between Quarter 2 of 2019 and Quarter 1 of 2019 decreased by two percent. SAH differed from other stroke types in age distributions, where 41% of cases occurred in those ages 46-65 (this is down 4% from Quarter 1, 2019).



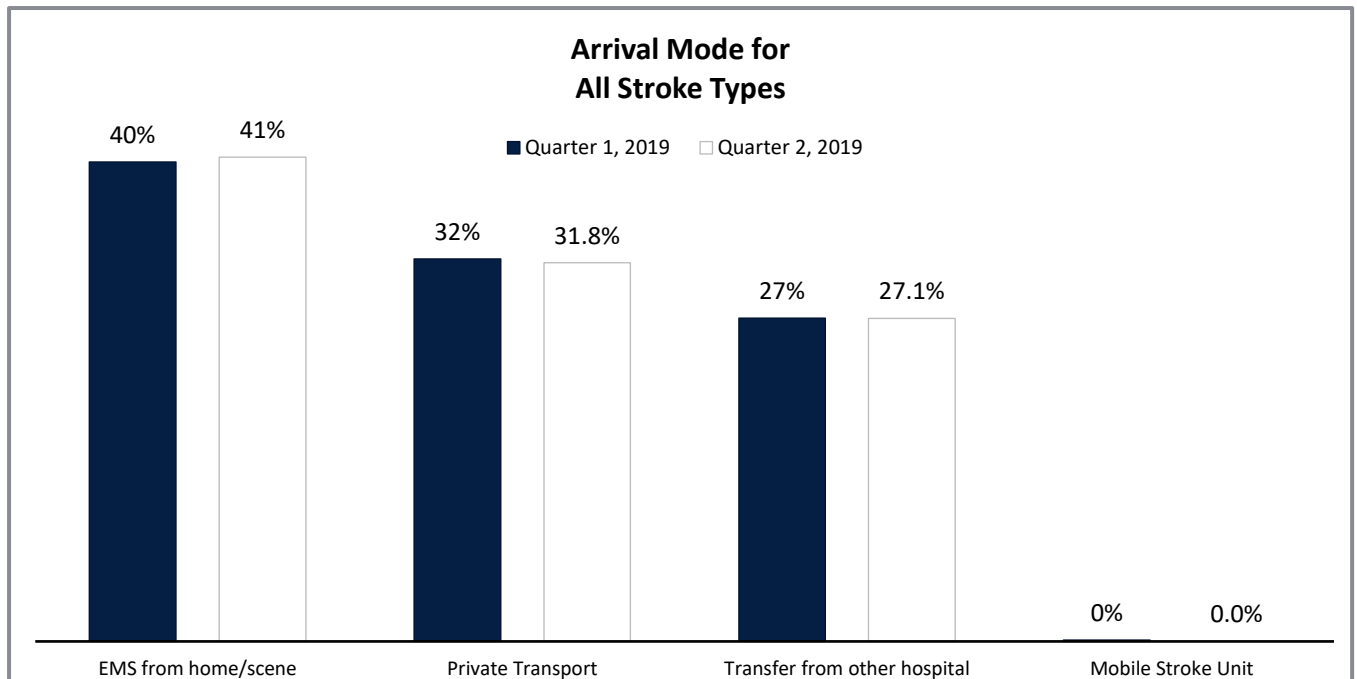


Co-morbidities

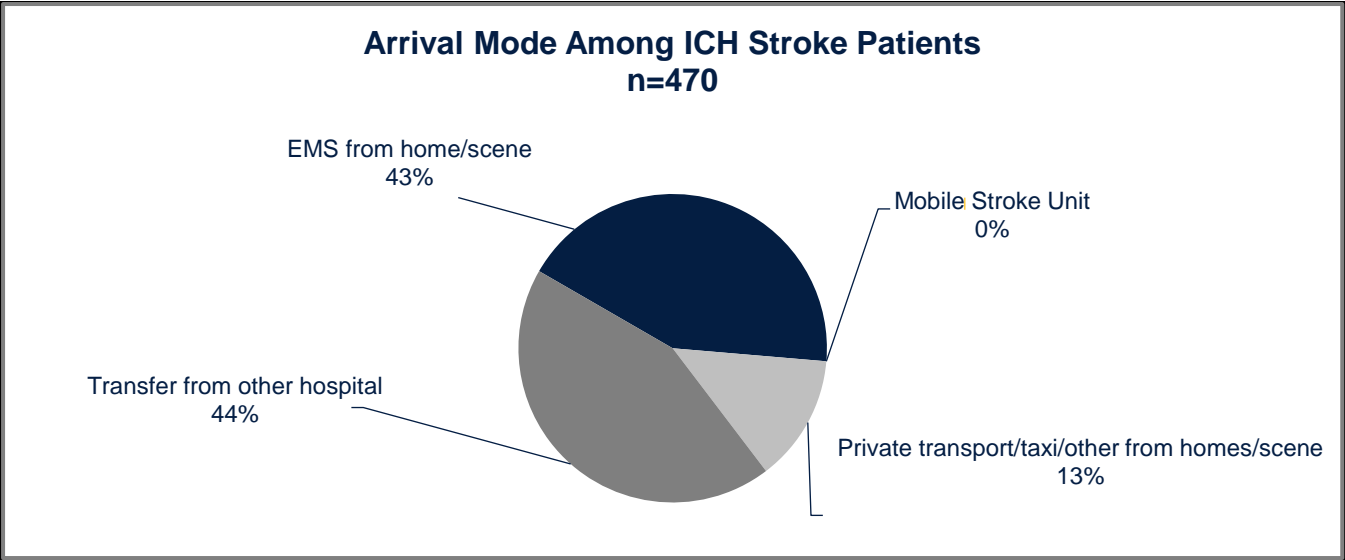
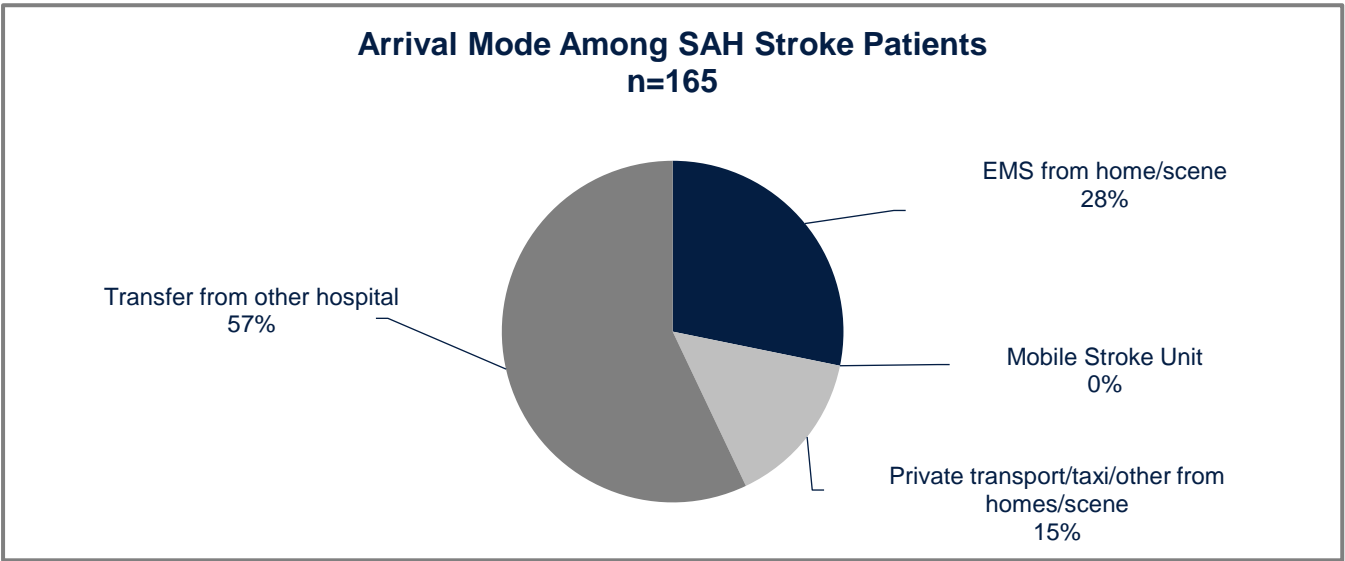


The top three co-morbidities among stroke patients in Quarter 2 of 2019, as seen in past quarters data, were hypertension with 76% of cases, dyslipidemia at 40% (this number is up 4% from Quarter 1), and diabetes mellitus at 33%.

Arrival mode

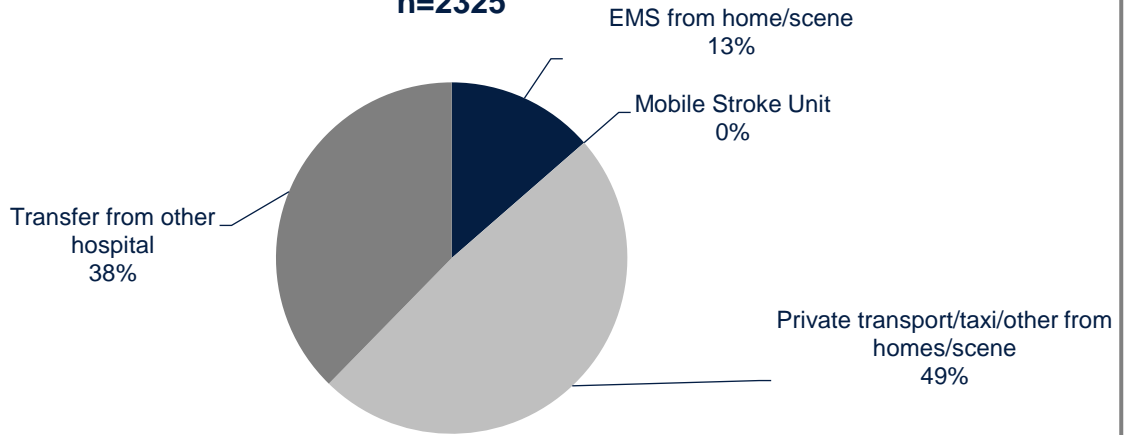


For all stroke types, most patients arrived via EMS services, with 41% of patients in the first quarter of 2019 using this method of transportation. The same percentage of patients seemed to arrive via EMS in the second quarter of 2019 as the second quarter of 2018, with the difference between proportions of the first quarter of 2019 and the third quarter of 2018 EMS arrivals being significant. Most TIA patients arrived via private transport (68%). Most ICH (44%) and SAH (57%) patients predominantly arrived via transfer from another hospital.



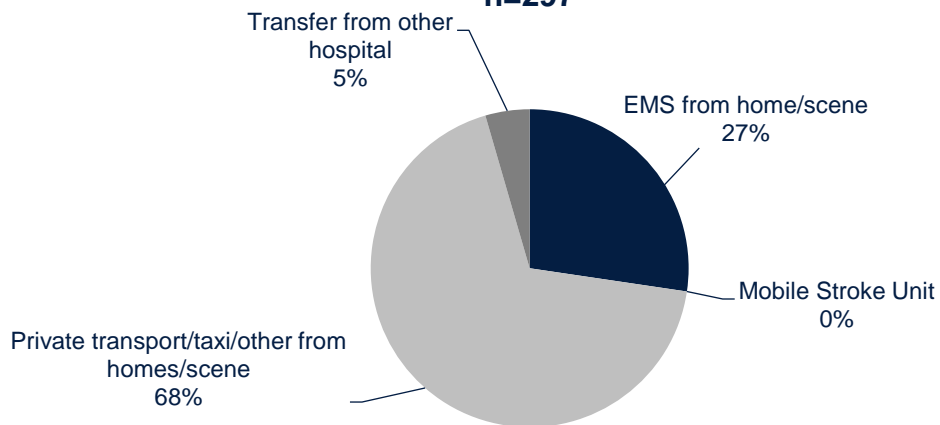
### Arrival Mode Among Ischemic Stroke Patients

n=2325



### Arrival Mode Among TIA Patients

n=297



*Transportation times*

Similar transport times for the various types of transportation were reported in the second quarter of 2019 in comparison to previous quarters, with private transport experiencing longer transportation times on average from home/scene in comparison to Emergency Medical

Services (EMS) transport.

Most patients arrived at the hospital in over 300 minutes

via private transportation

(26%) while only 23% of

patients via EMS services

arrived in that time frame.

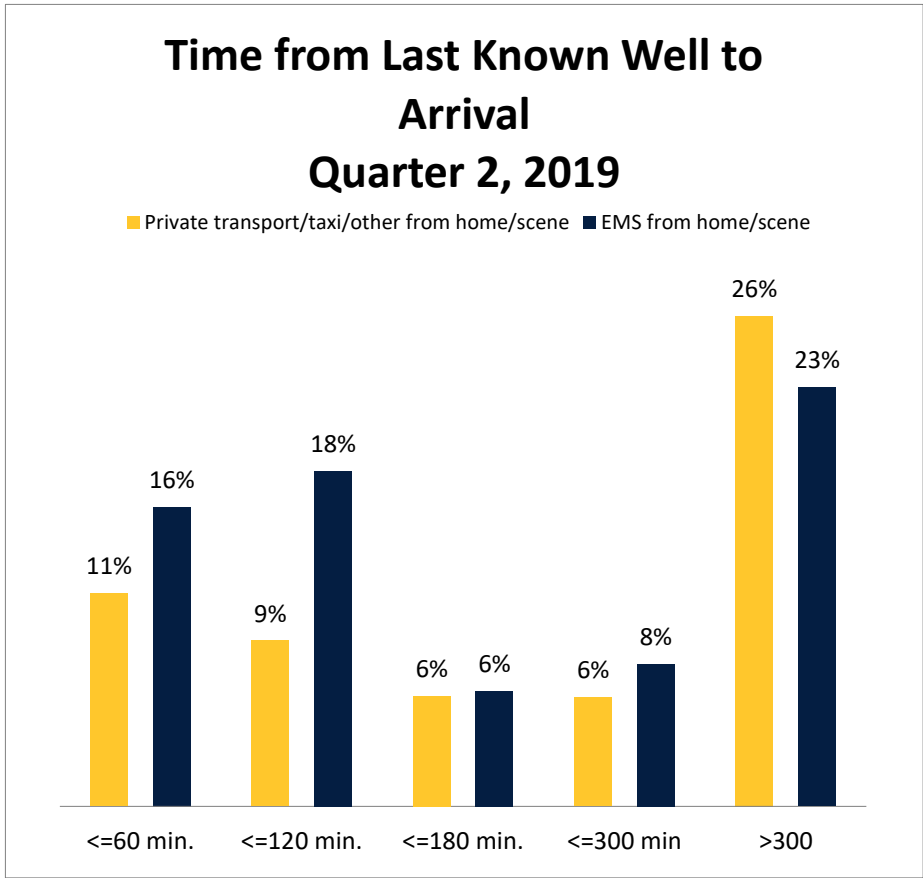
Meanwhile, 16% of patients

arrived at the hospital via

EMS services in less than 60

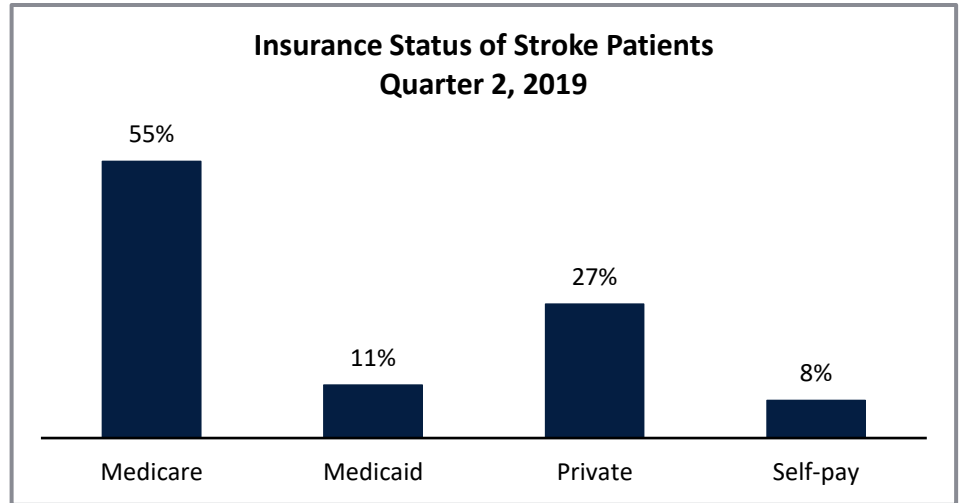
minutes, compared to 11% in

private transport.



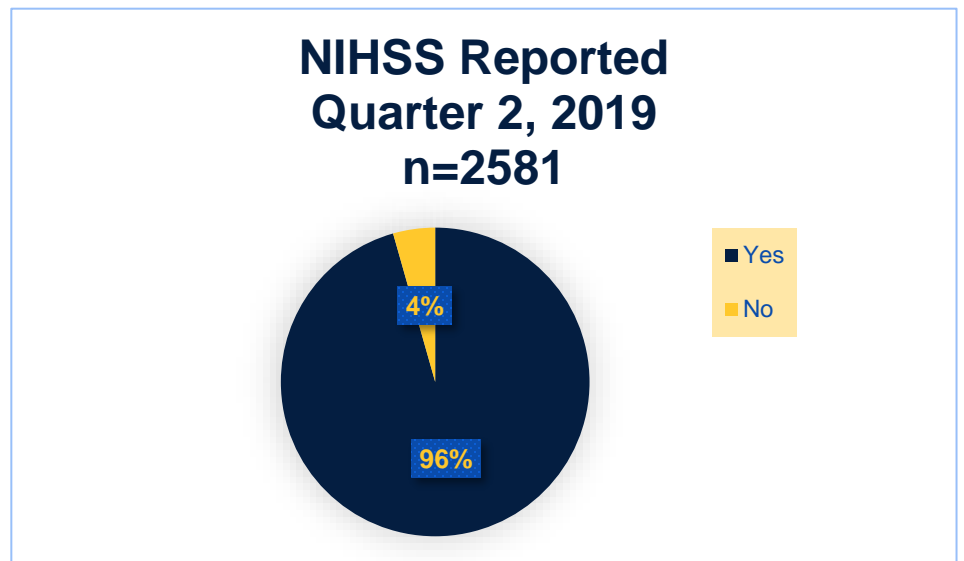
*Insurance status*

The majority of stroke patients had Medicare (55%). This reflects that the most common age group experiencing strokes are those from ages 66-85.



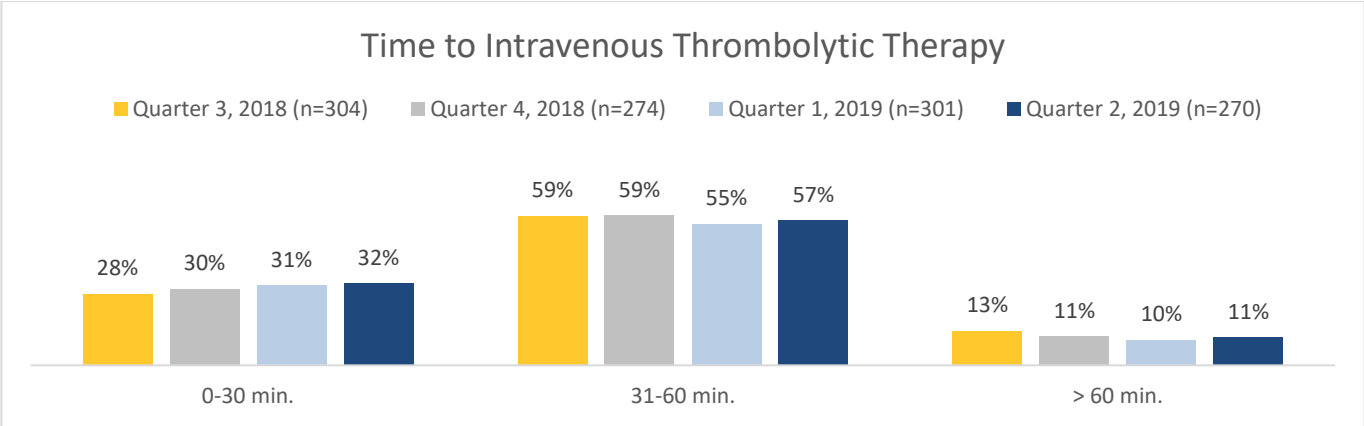
*NIHSS Reported*

The majority of patients with a diagnosis of ischemic stroke or stroke not otherwise specified, 96%, had a score reported for the National Institute of Health Stroke Scale (NIHSS). The NIHSS is a 15-item

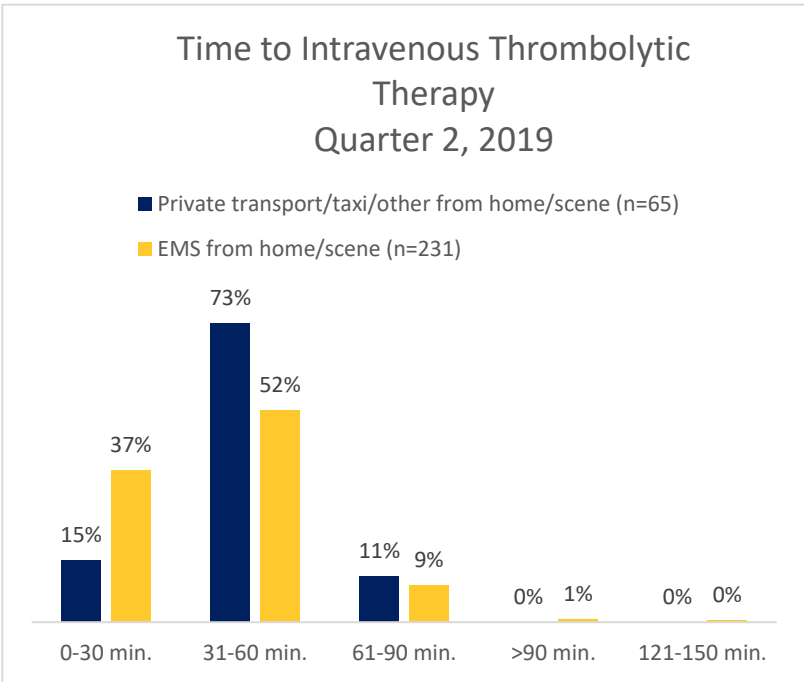


examination used to evaluate the effect of acute cerebral infarction on the levels of consciousness, language, neglect, visual-field loss, extraocular movement, motor strength, ataxia, dysarthria, and sensory loss.

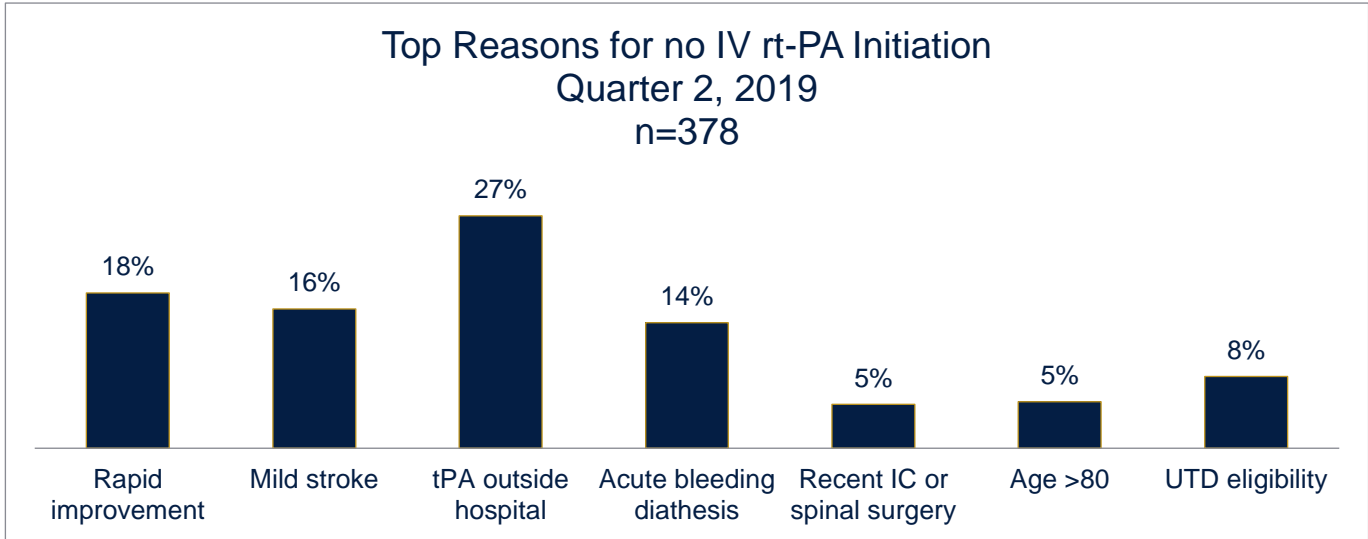
*Time to Intravenous Thrombolytic Therapy*



IV t-PA was initiated within 60 minutes for most patients in Quarter 2 of 2019. Compared to transport via EMS services, patients arriving via private transport experience slightly slower times with 73% of patients receiving treatment in an hour versus 52% who arrived via EMS.



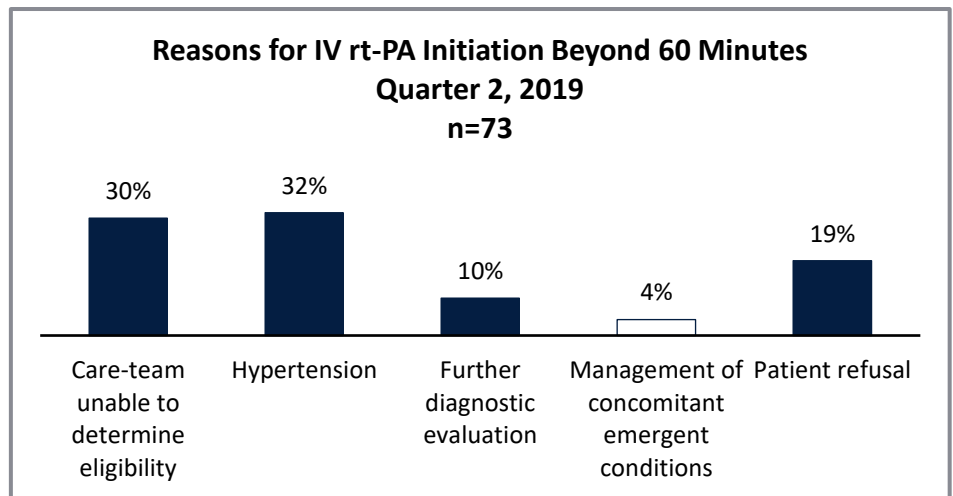
*Reasons for no IV rt-P*



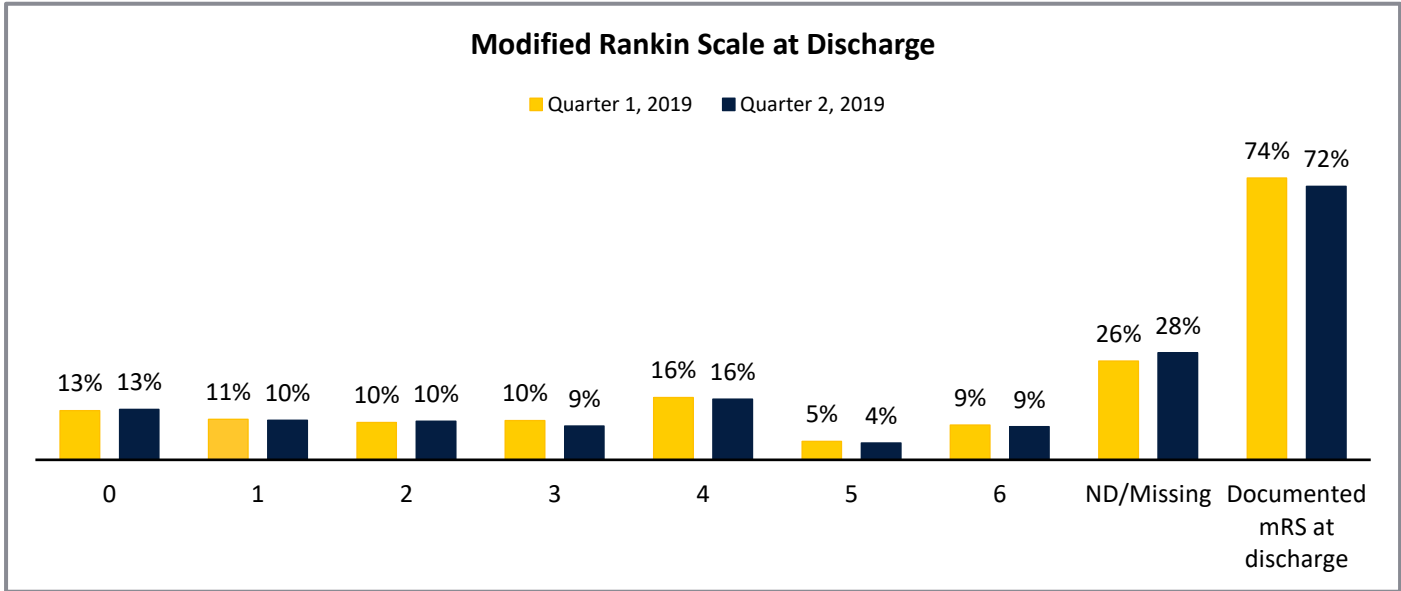
The percentages in the chart above represent the number of times the reason was listed as to why IV rt-PA was not initiated. The top five reasons for no IV rt-PA initiation in Quarter 2 of 2019, in order of highest proportion of patients to lowest, were because IV or IA tPA was given outside the hospital, the patient showed rapid improvement, mild stroke, acute bleeding diathesis, or UTD eligibility.

*Reasons for delay, IV rt-PA beyond 60 minutes*

The most common reason for delay in IV rt-PA beyond 60 minutes was Hypertension, composing 32% of cases in Quarter 2 of 2019. This number was down 4% from Quarter 1, 2019.



*Modified Rankin Scale at discharge*



72% of patients had their Modified Rankin Scale at discharge documented in Quarter 2 of 2019.

The Modified Rankin Scale ranges from 0-6, with the following designations for values:

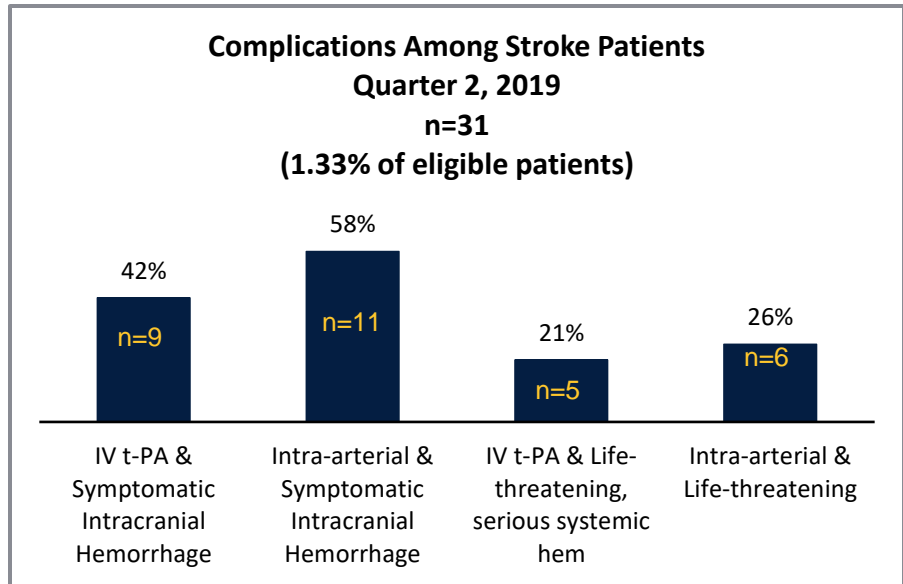
- 0 - No symptoms at all
- 1 - No significant disability despite symptoms: Able to carry out all usual activities
- 2 - Slight disability
- 3 - Moderate disability: Requiring some help but able to walk without assistance
- 4 - Moderate to severe disability: Unable to walk without assistance and unable to attend to own bodily needs without assistance
- 5 - Severe disability: Bedridden, incontinent and requiring constant nursing care and attention
- 6 - Death

There was a decrease in patients who were discharged with no symptoms from Quarter 1 of 2019 to Quarter 2 of 2019 by 2%.



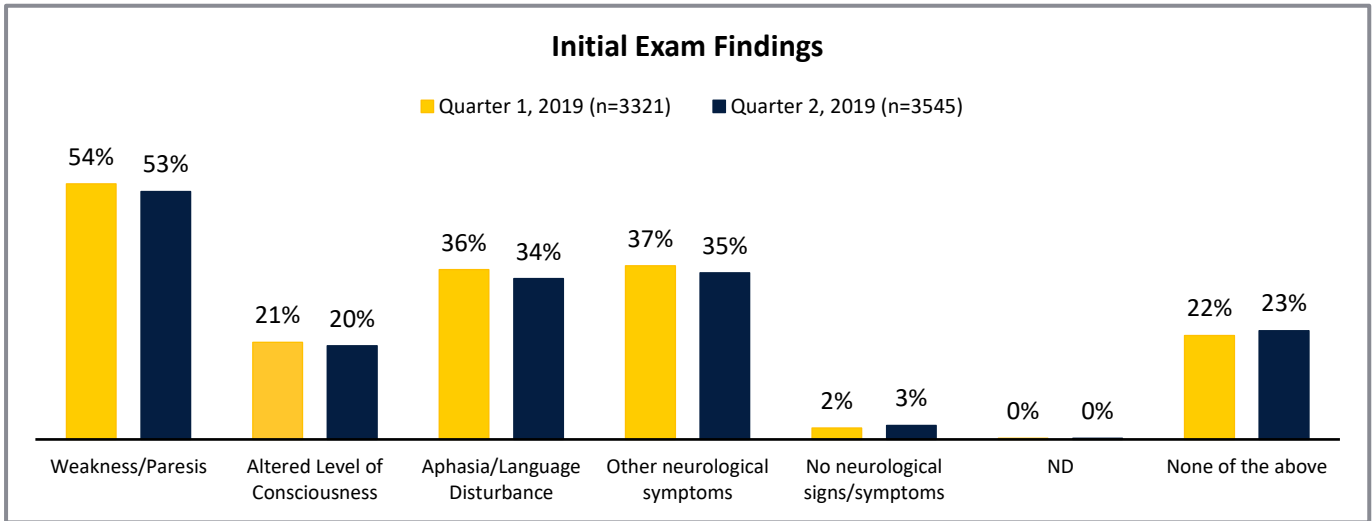
*Complication types for IV=tPA*

A total of 2,708 ischemic strokes occurred in Quarter 2 and only 378 patients did not receive IV-tPA, resulting in 2,330 patients who were eligible and potentially



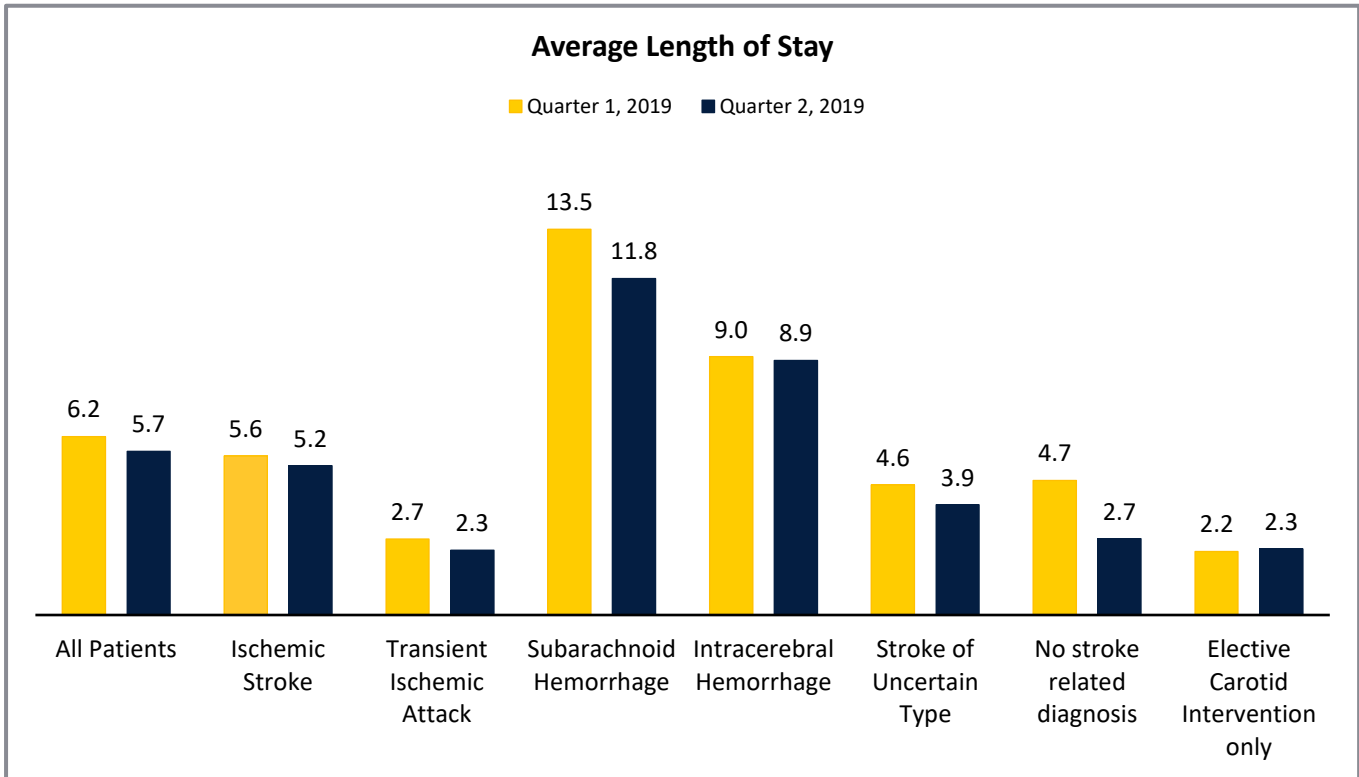
received IV-tPA. Only 31 patients (1.33%) of patients had a complication. The most common type of complication for IV-tPA in Quarter 2 of 2019 was Intra-arterial and Symptomatic Intracranial Hemorrhage at 58%. This means that 11 people had complications with Intra-arterial & Symptomatic Intracranial Hemorrhage, nine people had complications with IV t-PA & Symptomatic Intracranial Hemorrhage, six people with Intra-arterial & Life-threatening had complications, and five people IV t-PA & Life threatening serious systemic Hemorrhage had complications. Intra-arterial & Symptomatic Intracranial Hemorrhage at 58% is actually up 4% from Quarter 1, 2019. This means that out of the 2,208 ischemic strokes 1% had complications. This means that out of all patients with a primary stroke diagnosis of ischemic stroke who received IV t-PA or intra-arterial thrombolytic therapy, most complications were an Intra-arterial and Symptomatic Intracranial Hemorrhage.

### Initial exam findings



The two most common findings in initial exam of patients in Quarter 2 of 2019 were weakness/paresis (53%) and neurological other than altered level of consciousness (35%).

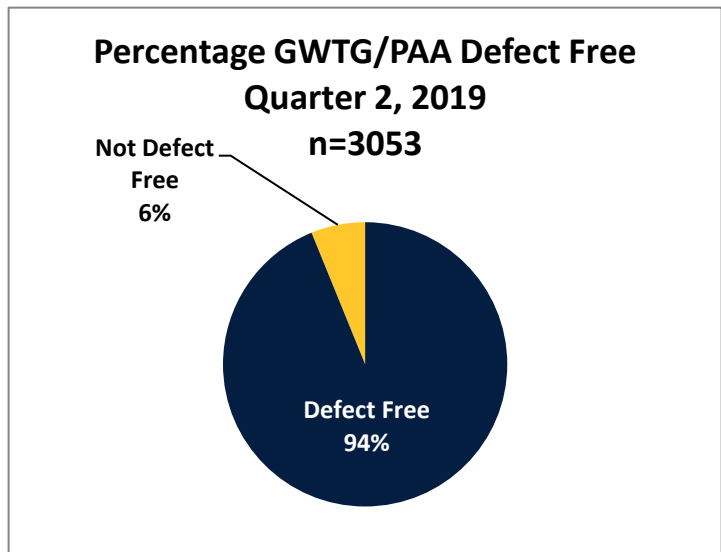
*Length of Stay*



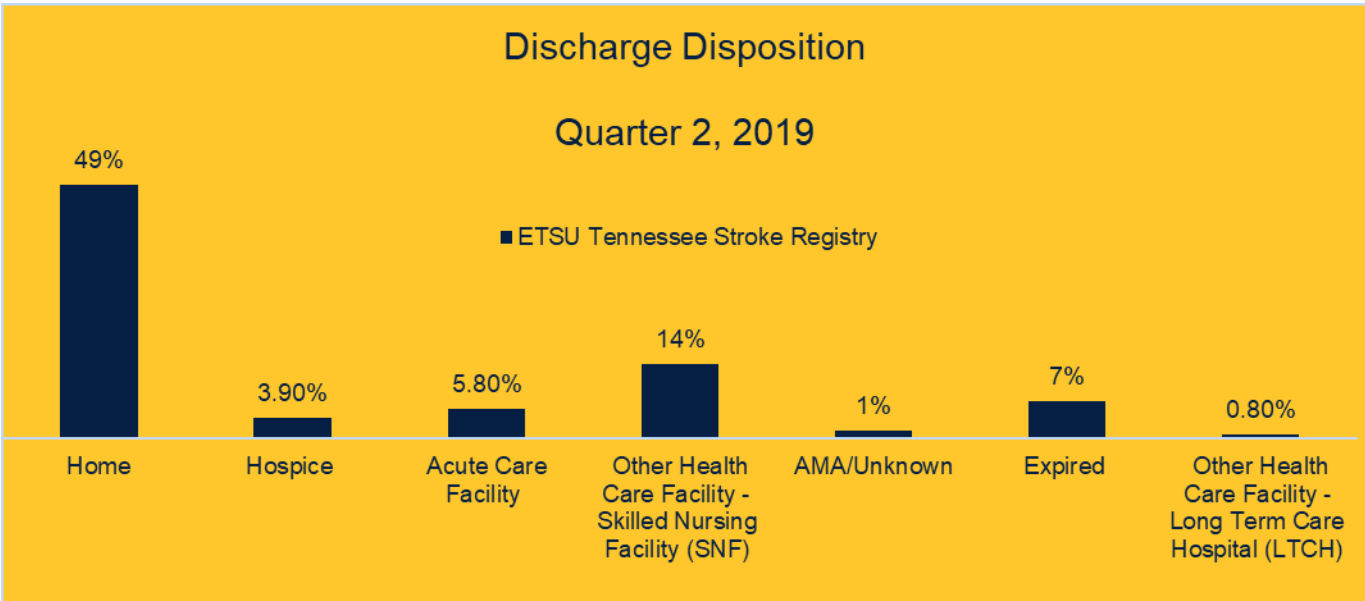
The type of stroke with the longest length of hospital stay (LOS) was SAH at about 14 days, and the shortest LOS was ECI and TIA at about 2 days.

*GWTG/PAA Defect Free*

94% of patients received defect free care according to GWTG standards. This was actually up one percent compared to Quarter 1, 2019, where 93% of patients received Defect-Free Care.



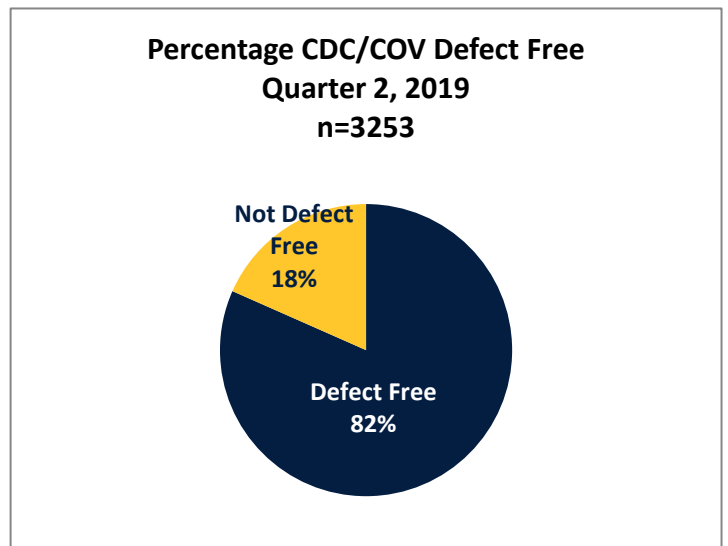
Discharge Disposition



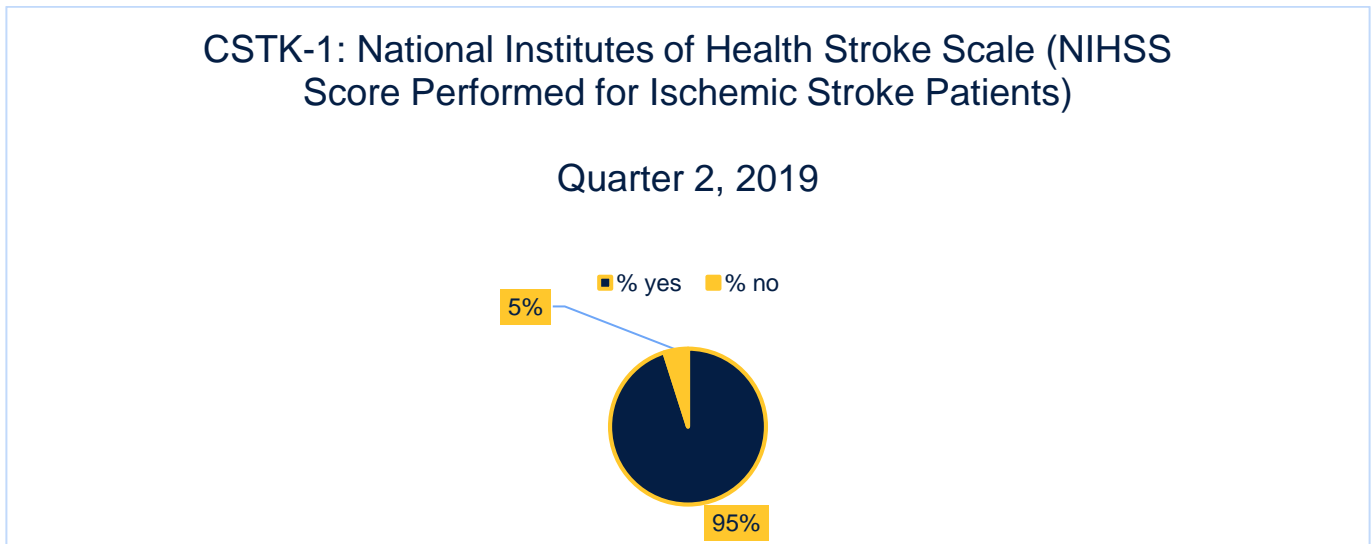
The type of discharge with the percentage of how patients are cared for after they leave the hospital is shown above. Hospice includes hospice at home and hospice in a facility. Other health care facility long term care hospital includes long term care hospitals, intermediate care facilities, and other healthcare facilities. Almost half (49%) of patients go home after they get discharged from the hospital. The next closest percentage is Skilled Nursing Facility at 14%.

*CDC/COV Defect Free*

82% of patients received defect free care according to the Center for Disease Control (CDC) standards.



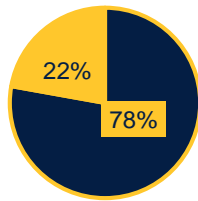
*Comprehensive Stroke Measures – Advanced Stroke Care*



### CSTK-03 Severity Measurement Performed for SAH and ICH Patients (Overall Rate)

Quarter 2, 2019

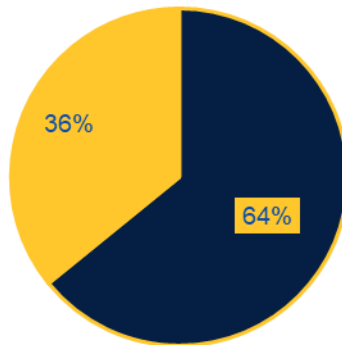
■ % yes ■ % no



### CSTK-03a - Compatibility Mode

Quarter 2, 2019

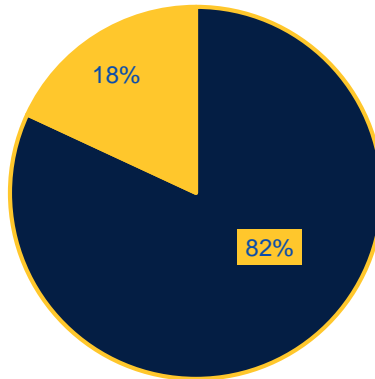
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### CSTK-03b - Compatibility Mode 2

Quarter 2, 2019

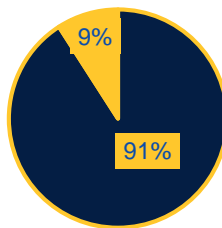
■ % yes ■ % no



### CSTK-04: Procoagulant Reversal Agent Initiation for Intracerebral Hemorrhage (ICH)

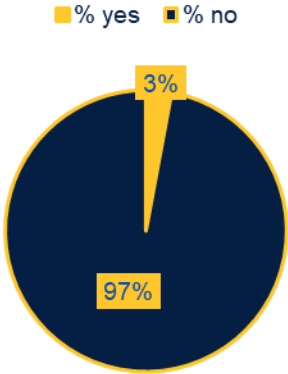
Quarter 2, 2019

■ % yes ■ % no



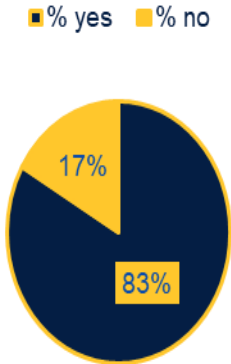
CSTK-05: Hemorrhagic Transformation  
(Overall Rate)

Quarter 2, 2019



CSTK-06: Nimodipine Treatment Administered

Quarter 2, 2019

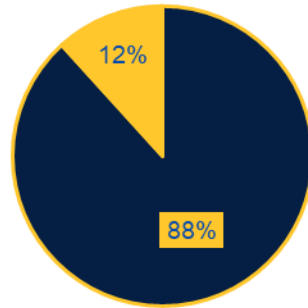




### CSTK-08: Thrombolysis in Cerebral Infraction (TICI Post-Treatment Reperfusion Grade)

Quarter 2, 2019

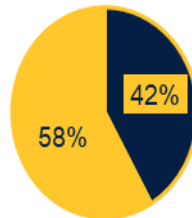
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### CSTK 10: Modified Rankin Score (mRS) at 90 Days: Favorable Outcome

Quarter 2, 2019

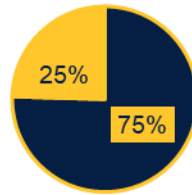
■ % yes ■ % no



### CSTK-11: Timeliness Of Reperfusion: Arrival Time to TICI 2B or Higher

Quarter 2, 2019

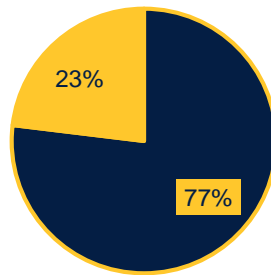
■ % of Patients received within 120 mins    ■ % of Patients received not within 120 mins



### CSTK-12: Timeliness of Reperfusion: Skin Puncture to TICI 2B or Higher

Quarter 2, 2019

■ % yes    ■ % no



## Contact Information

For more information about the Tennessee Stroke Registry and how to participate, contact:

Megan Quinn, TSR manager, or Kelsi McKamey, TSR graduate assistant.  
Email (preferred): [strokeregistry@etsu.edu](mailto:strokeregistry@etsu.edu) or [mckameykr@etsu.edu](mailto:mckameykr@etsu.edu)  
Phone: (423) 707-4890.

Local American Heart Association Representative:  
Kaley Pelton, MPH, RT(R)  
Quality & Systems Improvement Director  
Southeast Tennessee  
[Kaley.Pelton@heart.org](mailto:Kaley.Pelton@heart.org)

*We look forward to working with you to improve stroke care in Tennessee.*

## References

1. Berry, J. and Seunggu Han, M. (2019). *Ischemic stroke: Causes, symptoms, and risk factors*. [online] Medical News Today. Available at: <https://www.medicalnewstoday.com/articles/318098.php> [Accessed 22 Sep. 2019].
2. Ho AF, Zheng H, De Silva, DA, Wah W, et al. The relationship between ambient air pollution and acute ischemic stroke: A time-stratified case-crossover study in a city-state with seasonal exposure to the Southeast Asian Haze Problem. *Annals of Emergency Medicine*. 2018;72(5): 591-601. <https://www.sciencedirect.com/science/article/pii/S0196064418305687>. Accessed January 21, 2019.