

# **2022 Virginia EMS Stroke Inventory Survey**

## **Summary Report**

**A Collaboration between the Virginia Department of Health  
Office of Family Health Services and Office of EMS,  
Virginia Stroke Care Quality Improvement Advisory Group,  
and the CDC Paul Coverdell National Acute Stroke Program**

**January 2023**

For any questions, please contact: [stroke@vdh.virginia.gov](mailto:stroke@vdh.virginia.gov)

## Table of Contents

Executive Summary	3
Survey Methods (Distribution, Data Quality, Response)	5
Key Results	4
EMS Protocols (Responses, Recommendations)	6
Stroke Assessment Tools (Responses, Recommendations)	7
Hospital Feedback (Responses, Recommendations)	8
Hospital Transport (Responses, Recommendations)	10
Patient Education (Responses, Recommendations)	11
Recommendations for the 2023 Virginia EMS Stroke Inventory Survey	12
References	12
Appendix A – Abbreviations	13
Appendix B – Copy of Survey Questions	14

## **2022 Virginia EMS Stroke Inventory Survey Executive Summary**

**Background:** In support of the *Code of Virginia* §32.1-111.15:1, the Virginia Department of Health (VDH) collected data and information from hospitals and EMS agencies through a stroke inventory survey to facilitate the evaluation and improvement of stroke care in Virginia. The results of the survey will be used to inform quality improvement initiatives, identify interventions in specific geographic areas of the state, and support appropriate allocation of resources throughout the state. The EMS Stroke Survey Workgroup, a subgroup of the Virginia Stroke Care Quality Improvement Advisory Group, convened in 2019 to develop the EMS Stroke Inventory Survey. The plan to distribute the survey to EMS agencies in 2020 was postponed due to the COVID-19 pandemic.

In 2021, VDH's Office of Family Health Services (OFHS) was awarded the Centers for Disease Control and Prevention (CDC) Paul Coverdell National Acute Stroke Program funding. The additional support and collaboration from this funding initiative supported VDH's efforts to launch the Virginia EMS Stroke Inventory Survey in 2022. The completion and distribution of the 2022 Virginia EMS Stroke Inventory Survey was a collaborative effort between the OFHS and the Office of EMS (OEMS).

This report includes results and recommendations based solely on responses to the EMS Stroke Inventory Survey and were not compared to any statewide pre-hospital data.

## **2022 VIRGINIA EMS STROKE INVENTORY SURVEY METHODS**

**Survey Distribution:** On June 9, 2022, an online REDCap survey was distributed to 620 EMS agency superusers via contact information provided by OEMS. Over the course of four weeks, a weekly email was sent to remind participants to complete the survey. The survey initially closed on July 7, 2022. However, VDH reopened the survey on July 12 due to several EMS agencies indicating they did not have the opportunity to respond. The survey closed again on August 1, 2022.

**Response:** A total of 293 survey responses (complete, partial, and duplicates) were submitted in REDCap. A final count of 251 respondents provided complete or mostly complete answers used for analyses.

Survey respondents represented all 11 EMS council regions. The most responses were received from Southwest Virginia and Western Virginia, with 42 respondents per council region. The chart below reflects each region's response number and proportion of responding agencies per region. The total number of agencies in each region are displayed in parentheses after each region name.

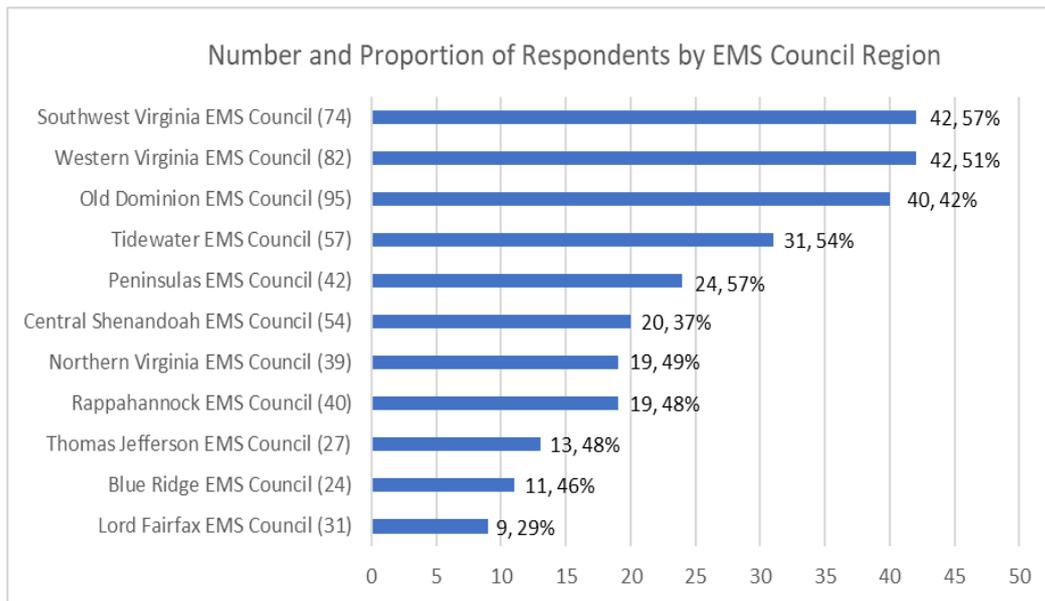


Chart 1. Note: Respondents had the ability to select more than one answer. Total responses = 270.

## Key Results and Recommendations

- **Key Result:** 251 out of 620 (40%) EMS agencies fully or partially completed the survey.
  - **Recommendation:** The VDH Stroke Team shall shorten and revise future versions of the survey with input from OEMS and OEMS-identified EMS representatives (e.g., EMS Medical Directors) with the goal of increasing response rates and completion of the survey.
  
- **Key Result:** All 11 EMS Council Regions were represented in the survey. The most responses were received from Southwest Virginia and Western Virginia, with 42 respondents per council region.
  - **Recommendation:** The VDH Stroke Team will continue to collaborate with the EMS Regional Councils to increase participation in the EMS Stroke Inventory Survey.
  
- **Key Result:** A total of 167 (70%) EMS agencies reported providing stroke pre-alert notifications to hospitals within 24 hours of the patient’s last known well (LKW) time.
  - **Recommendation:** The current 2017 Virginia OEMS Division of Trauma/Critical Care Prehospital and Inter-hospital State Stroke Triage Plan<sup>1</sup> does not address time parameters for EMS providers to pre-alert the receiving hospital. If a suspected stroke patient is within 24 hours of LKW time upon presentation to EMS, a pre-alert for stroke should be sent to the receiving hospital. The VDH Stroke Team recommends adding time parameters to EMS protocols, per guidance from the 2019 American Heart Association (AHA)/American Stroke Association (ASA) Stroke Guidelines<sup>2</sup>.

- **Key Result:** Survey respondents reported the most popular stroke assessment scale used is the Cincinnati Pre-hospital Stroke Scale.
  - **Recommendation:** The VDH Stroke Team recommends the creation of a statewide list of recommended stroke recognition primary and secondary scales. This document should contain information on the sensitivity and specificity of each scale, as well as benefits and challenges.
  
- **Key Result:** Most survey respondents (164, 65%) were unaware of their stroke assessment completion percentage.
  - **Recommendation:** The VDH Stroke Team, in partnership with OEMS, shall identify any resources available to EMS agencies to evaluate stroke quality metrics for suspected stroke patients.
  
- **Key Result:** A total of 124 (49%) respondents indicated they received stroke refresher trainings once per year. When asked about agencies need regarding provider stroke education, most answers referenced the desire to learn more about stroke assessment techniques, to stay up to date on stroke education, and to have training delivered in a variety of ways (e.g., in-person, sim lab training, PowerPoint presentations, brochures).
  - **Recommendation:** The VDH Stroke Team, in partnership with OEMS, shall raise awareness about the availability of statewide and local resources for EMS agency stroke education.
  
- **Key Result:** A total of 94 (38%) survey respondents reported not receiving feedback on stroke patient outcomes from receiving hospitals.
  - **Recommendation:** The development of the Virginia Stroke Registry and the adoption of the Health Data Exchange (HDE)\* offered through ESO, a pre-hospital data management vendor, will allow linking of the patient hospital records with EMS pre-hospital records to allow bidirectional feedback. However, feedback tools should be developed and used by both EMS agencies and hospitals to better facilitate communication regarding stroke patient outcomes.
  
- **Key Result:** Most respondents reported taking suspected stroke patients to certified stroke centers (72%) over non-certified stroke centers (20%). Distance is the primary driver as to where to take a suspected stroke patient.
  - **Recommendation:** The VDH Stroke Team, in partnership with OEMS, shall investigate the reasons agencies transport suspected stroke patients to Virginia hospitals that are not stroke certified, or to out-of-state stroke certified facilities.

\*The Health Data Exchange (HDE) refers to an interoperability platform connecting EMS agencies and hospitals to allow a seamless exchange of EMS pre-hospital data and hospital medical record data.

## 2022 VIRGINIA EMS STROKE INVENTORY SURVEY RESULTS

### EMS PROTOCOLS

Regarding EMS protocols, 246 (98%) of respondents replied that they have a written protocol for stroke patients, with 84% using the regional stroke protocol and 14% using an agency-specific stroke protocol. For those who indicated using their own stroke protocol, the ability to upload a copy of their protocol was provided. A total of 16 agencies completed this upload.

When asked if the agency had a process and guidance document that requires a pre-hospital stroke assessment and documentation, 232 (93%) of the 250 respondents who answered this question responded that they do have a stroke process or protocol. Of these, 207 (89%) EMS agencies reported they have stroke protocols that require documenting all pre-hospital stroke assessments conducted, while 25 (11%) reported that pre-hospital stroke assessments are routinely conducted, without a requirement to document the assessments. Eighteen respondents (7%) responded having no process or guidance document that requires a pre-hospital stroke assessment and documentation, two of which are non-emergency transporting agencies.

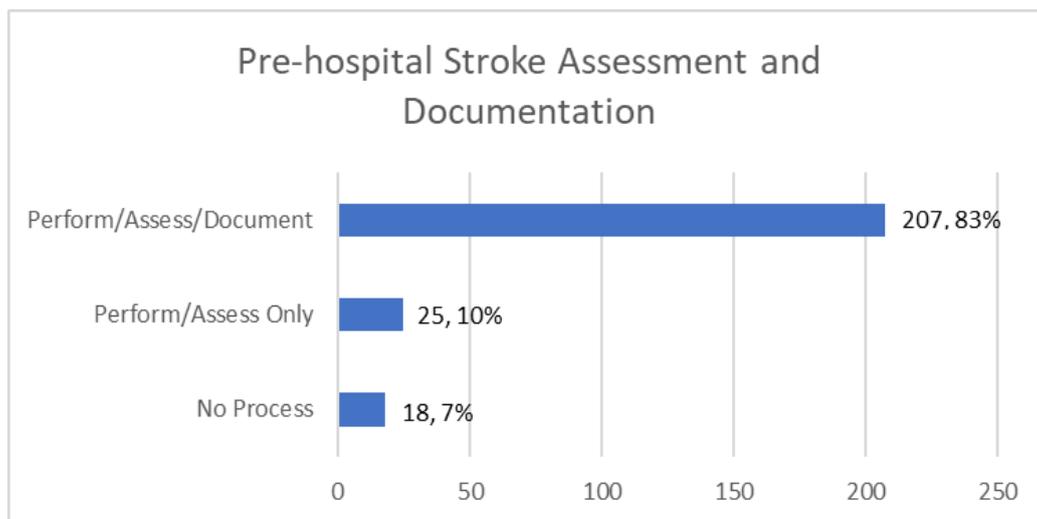


Chart 2. Note: This question was answered by 250 respondents.

When asked if the 2017 Virginia Office of Emergency Medical Services Division of Trauma/Critical Care Prehospital and Inter-hospital State Stroke Triage Plan<sup>1</sup>, herein referred to as '2017 Stroke Triage Plan', influenced any changes in stroke care practices, the majority of survey respondents (56%) reported no stroke care changes were implemented as a result of the 2017 Stroke Triage Plan<sup>1</sup>. Respondents were then asked if the agency had a "Stroke Alert" policy to pre-alert acute care facilities that EMS is transporting a suspected stroke patient to the facility; 219 (88%, n=248) responded yes, and 29 (12%, n=248) responded no.

Next, EMS agencies were asked approximately how many hours after the patient's last known well (LKW) time they called a stroke alert. Please note, there may be reasons outside of an EMS agency's control that cause a late stroke alert (e.g., a patient's delay in seeking care).

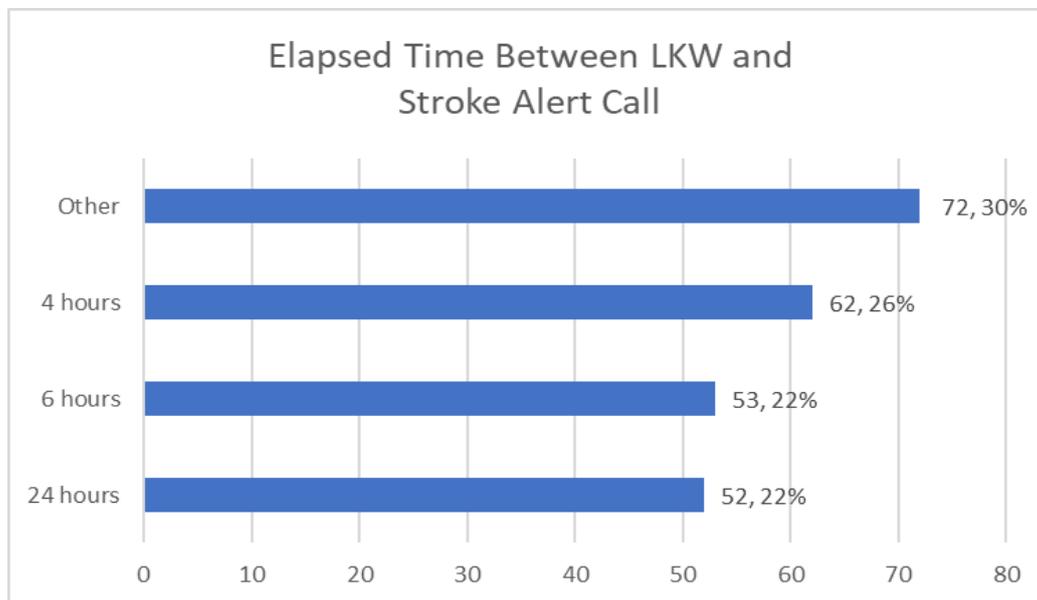


Chart 3. Note: This question was answered by 239 respondents.

### Recommendation

A recommendation would be to update the 2017 Stroke Triage Plan<sup>1</sup> guidelines to include time parameters for sending stroke pre-alerts to receiving hospitals for stroke patients with an LKW time of 24 hours or less, per guidance from the 2019 AHA/ASA Stroke Guidelines<sup>2</sup>. Additionally, the VDH stroke team would like to work with the agencies who use an agency-specific stroke protocol to better understand how protocols differ across agencies.

## STROKE ASSESSMENT TOOLS

Regarding whether EMS providers in the agency routinely perform pre-hospital stroke assessments on patients suspected of stroke, there were 250 respondents and 98% (245) responded yes. Of the five agencies that do not routinely perform a pre-hospital stroke assessment, four agencies wrote that they are primarily interfacility transport, and one indicated that they had not cared for a potential stroke patient.

Respondents were asked what Primary Stroke Assessment tool was used and were provided the following choices: CPSS (Cincinnati Prehospital Stroke Scale), FAST (Face, Arm, Speech, Time) Exam, BEFAST (Balance, Eyes, Face, Speech, Time) Exam, RACE (Rapid Arterial occlusion Evaluation) Stroke Scale, LA (Los Angeles) Motor Scale, MEND (Miami Emergency Neurological Deficit) Scale or Other Scale. A total of 260 respondents reported using the primary stroke assessments listed in the table below. No respondents reported using the LA Motor scale or MEND scale. One agency chose the "Other" stroke scale and sent an email stating that they use the acronym ACT-FAST as their primary stroke scale as of 2021, replacing the VAN scale.

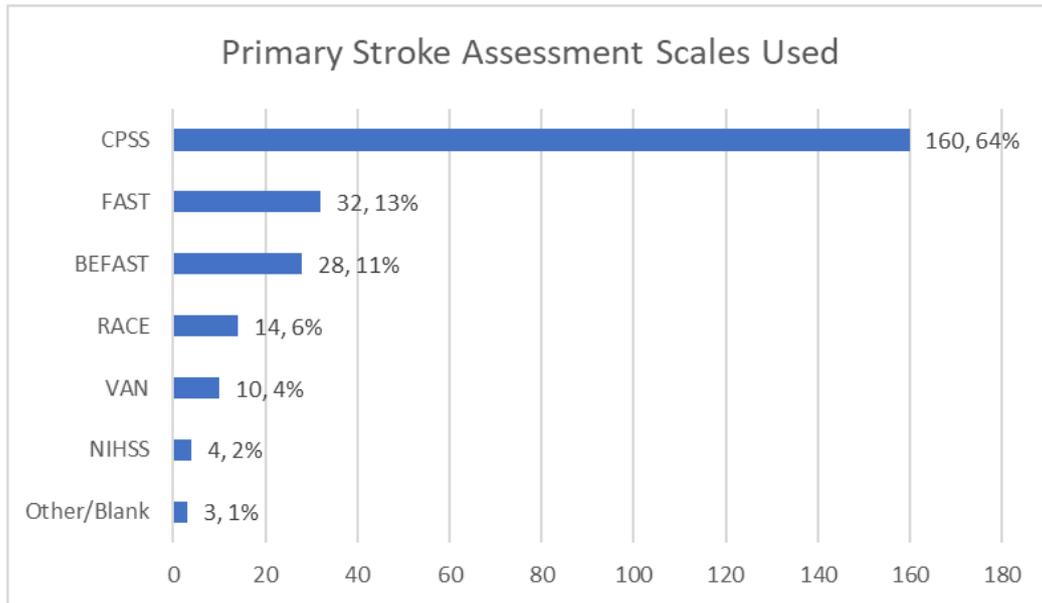


Chart 4. Note: Respondents had the ability to select more than one answer. Total responses = 251.

### Recommendation

As there are multiple stroke scales in use across the 11 EMS council regions, potentially leading to confusion among providers and receiving hospitals, it would be reasonable to develop a statewide list of recommended stroke recognition primary and secondary scales with the benefits and challenges of each scale. It may be valuable to also distinguish the differences between “primary” and “secondary” stroke scales.

## HOSPITAL FEEDBACK

When asked if EMS personnel/agencies received feedback from hospital personnel concerning patient care outcomes for suspected stroke patients, 94 (38%) respondents indicated that they did not receive feedback and 11 (4%) were unsure if their agency received feedback from hospitals. Of the 143 EMS agencies that reported receiving hospital feedback, 112 (45% of all respondents) received it from some hospitals and 31 (13% of all respondents) received it from all hospitals.

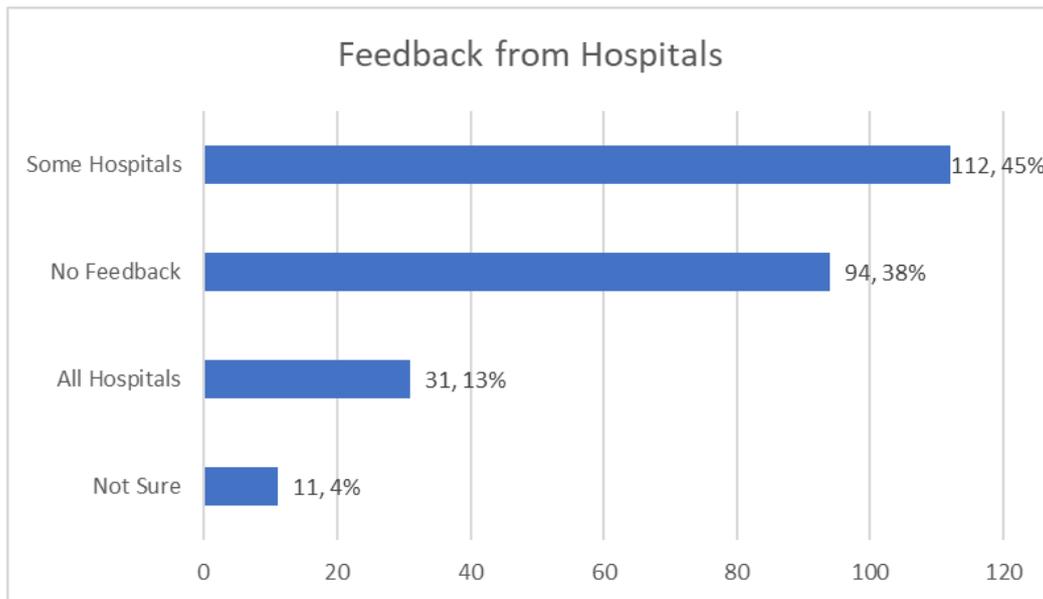


Chart 5. Note: This question was answered by 248 respondents.

Below are counts of the hospital feedback methods.

Note: respondents could select more than one answer.

- Initiated by EMS personnel to hospital personnel – 74 (30%)
- Initiated by hospital personnel to EMS personnel – 52 (21%)
- Regularly held in-person meetings – 22 (9%)
- Hospital EMS Feedback form – 22 (9%)
- Other feedback, undefined – 20 (8%)
  - Respondents were allowed to write in answers and responses included: families relaying patient outcome information, asking on-duty hospital personnel, and verbal updates from hospital personnel.

Agencies were then asked the helpfulness of feedback received from hospitals. The majority (163, 65%) responded the feedback was helpful (combining 'Extremely Helpful' and 'Very Helpful' responses). There were 44 (20%) respondents who answered the hospital feedback was somewhat helpful, 15 (6%) responded the feedback was not helpful at all, and 21 (9%) respondents did not answer.

The most helpful patient outcome information provided from hospital feedback are listed below.

Note: respondents could select more than one answer. There were 610 total selections.

- Patient Diagnosis – 192 (31%)
- Outcome at Hospital Discharge – 149 (24%)
- Emergency Department Disposition – 143 (23%)

### Recommendation

The development of the Virginia Stroke Registry and adoption of the HDE through ESO, a pre-hospital data management vendor, will allow linking of the patient hospital records with EMS pre-hospital records to allow bidirectional feedback. However, feedback tools should be developed and

used by both EMS agencies and hospitals to better facilitate communication regarding stroke patient outcomes.

## HOSPITAL TRANSPORT

Each respondent was asked to list the top three hospitals to which they transported stroke patients. This question was asked to help the VDH Stroke Team and OEMS better understand which hospitals are receiving stroke patients.

Table 1.

Hospital Choices	Number of Respondents	Certified Stroke Center n (%)	Non-Certified Stroke Center n (%)	Out-of-State Hospital n (%)
First Choice	234	169 (72%)	48 (21%)	17 (7%)
Second Choice	201	133 (66%)	38 (19%)	30 (15%)
Third Choice	139	100 (72%)	21 (15%)	18 (13%)

When looking at transporting patients to out-of-state facilities, 6 (3%) agencies listed out-of-state facilities as their only destination choices over in-state facilities. This could be due to the out-of-state facility being the closest hospital to the respective region. Agencies reported transporting stroke patients to out-of-state hospitals located in Tennessee, North Carolina, Maryland, and District of Columbia. Out-of-state facility names are available upon request.

Agencies were asked what percentage of stroke patients are transported to stroke centers. Responses are displayed below.

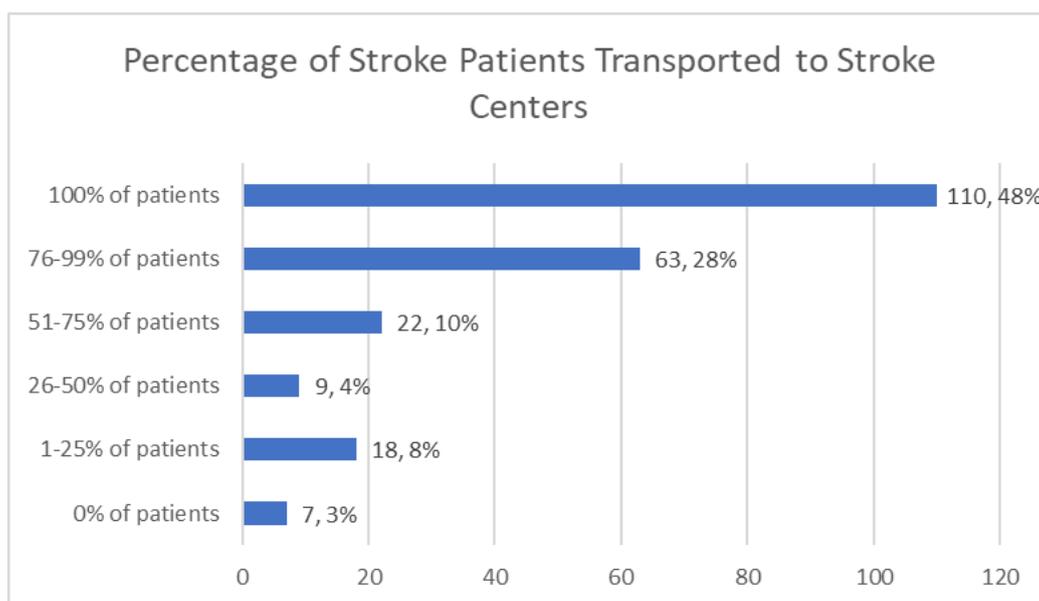


Chart 6. Note: This question was answered by 229 respondents.

Respondents were then asked what factors influence the choice of hospital to which they transport patients for stroke care. The results are displayed below.

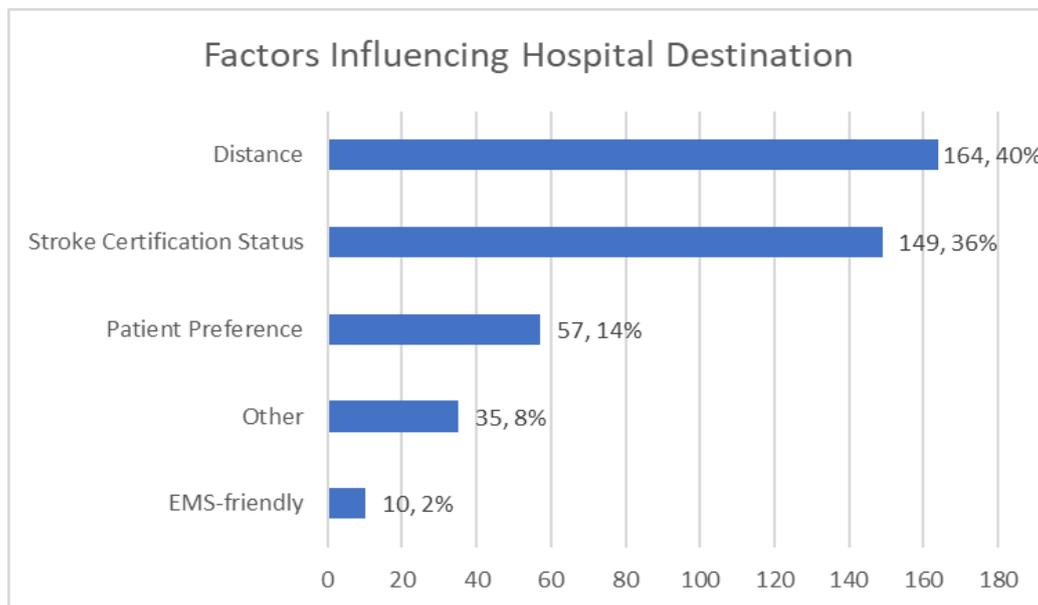


Chart 7. Note: Respondents had the ability to select more than one answer. Total responses = 415.

### Recommendation

The VDH Stroke Team shall investigate the location of hospitals to which EMS agencies are transporting suspected stroke patients to explore the main barriers agencies face and address those barriers, if possible.

## **PATIENT EDUCATION ON STROKE**

Respondents were asked, "If available, what type of stroke education materials would be helpful for your patients?". The most common answers are listed below.

- Recognition and signs/symptoms
  - Early recognition
  - General stroke assessments (e.g., FAST, BEFAST)
  - Conducting trainings/presentations on recognizing stroke signs and symptoms in schools
  - Atypical signs/symptoms, posterior strokes, Transient Ischemic Attacks (TIAs)
- Multimedia materials
  - Brochures, flyers, wallet-sized assessment cards
  - Magnets
  - Videos for presentations and to present online
  - Messages/materials to post on agency social media accounts

### Recommendation

The VDH Stroke Team shall work with OEMS to develop a process to allow providers access to educational materials, such as magnets or brochures, for stroke patients and their families. In

addition, EMS agencies can offer more opportunities for EMS providers to participate in community outreach and education on stroke.

## RECOMMENDATIONS FOR THE 2023 VIRGINIA EMS STROKE INVENTORY SURVEY

### Next Steps

It would be beneficial to compare the Hospital Stroke Inventory Survey and EMS responses to look for feedback and explore methods to continue or expand positive patient outcomes.

### Future Survey Recommendations

1. Capture data in response to the following required CDC Paul Coverdell National Acute Stroke Program metrics:
  - a. Did your EMS agency implement protocol changes through systematic quality improvement methods and interventions to improve stroke care practices and patient care?
  - b. What are the number and percentage of EMS agencies reporting an improvement in a selected care performance measure based on identified performance gaps and quality improvement activities?
2. Clarify language of questions to improve response rate.
3. Ensure that the survey is sent to the appropriate recipients for the survey.
4. When “other” is offered as an option, allow a write-in box for explanation.
5. Provide for a more focused survey based upon the data gathered in the 2022 EMS survey and data collected through the EMS ESO portal.

## REFERENCES

1. Virginia Office of Emergency Medical Services. (2017, November 30). *Virginia Office of Emergency Medical Services Division of Trauma/Critical Care Prehospital and Inter-hospital State Stroke Triage Plan*. Retrieved from VDH.Virginia.gov: <https://www.vdh.virginia.gov/content/uploads/sites/23/2018/08/Virginia-Stroke-Triage-Plan-July-2018.pdf>
2. Powers, W. J., Rabinstein, A. A., Ackerson, T., Adeoye, O. M., Bambakidis, N. C., Becker, K., & Tirschwell, D. L. (2019, October). Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke. *Stroke*, e344–e418. Retrieved from <https://www.ahajournals.org/doi/10.1161/STR.000000000000211?cookieSet=1>

## Appendix A: Abbreviations

AHA	American Heart Association
ASA	American Stroke Association
BEFAST	Balance, Eyes, Face, Arm, Speech, Time
CDC	Centers for Disease Control and Prevention
CEUs	Continuing Education Units
CPSS	Cincinnati Prehospital Stroke Scale
EMS	Emergency Medical Services
EMTs	Emergency Medical Technicians
ESO	Emergency Services Organization
FAST	Face, Arm, Speech, Time
HDE	Health Data Exchange
L.A.	Los Angeles
LKW	Last Known Well
LVO	Large Vessel Occlusion
MEND	Miami Emergency Neurological Deficit
OEMS	Office of Emergency Medical Services
OFHS	Office of Family Health Services
NIHSS	National Institute of Health Stroke Scale
PCNASP	Paul Coverdell National Acute Stroke Program
RACE	Rapid Arterial Occlusion Evaluation
TNK	Tenecteplase
tPA	tissue plasminogen activator
VAN	Vision, Aphasia, Neglect
VDH	Virginia Department of Health

## Appendix B: Copy of Survey Questions

### Virginia EMS Stroke Inventory Survey 2022

Thank you for taking the time to complete this survey. Results from this survey will enable the Virginia Stroke Care Quality Improvement Advisory Group to gain a better understanding of the needs of EMS agencies with regards to stroke treatment, triage, and transport. The information you provide is confidential and will only be reported as aggregated results.

For any questions or concerns, please contact Kathryn Funk at [Kathryn.Funk@vdh.virginia.gov](mailto:Kathryn.Funk@vdh.virginia.gov).

#### Contact Information

First Name

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Last Name

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Position Name/Title

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Email Address

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## Agency Information

EMS Agency Name \_\_\_\_\_

Within which EMS Regional Council area(s) do you primarily operate?

- Blue Ridge EMS Council
  - Central Shenandoah EMS Council
  - Lord Fairfax EMS Council
  - Northern Virginia EMS Council
  - Old Dominion EMS Alliance
  - Peninsulas EMS Council
  - Rappahannock EMS Council
  - Southwest Virginia EMS Council
  - Thomas Jefferson EMS Council
  - Tidewater EMS Council
  - Western Virginia EMS Council
- (select all that apply)

## Stroke Protocol

Does your agency have a written protocol for stroke [patients](#)?

- Yes, we have our own (you will be emailed a link after this survey to upload)
- Yes, we use the regional stroke protocol
- No

## Pre-Hospital Stroke Assessment

Does your agency have a process and guidance document requiring a pre-hospital stroke assessment and documentation?

- Yes, performed only  
 Yes, performed and documented  
 No

Do EMTs/Paramedics in your agency routinely perform a pre-hospital stroke assessment on patients suspected of a stroke?

- Yes  
 No

If no, please explain why not

(If you answered yes, skip this question)

What PRIMARY stroke assessment scale does your agency's EMT/Paramedics use most often?

- Cincinnati Pre-hospital Stroke Scale  
 Miami Emergency Neurologic Deficit Pre-hospital Checklist (MEND)  
 NIH Stroke Scale (NIHSS)  
 L.A. Motor Scale (LAMS)  
 Rapid Arterial Occlusion Evaluation (RACE) Scale  
 F.A.S.T. Exam  
 B.E.F.A.S.T. Exam  
 Vision, Aphasia, Neglect (VAN)  
 Other stroke scale type

What SECONDARY stroke assessment scale does your agency's EMT/Paramedics use most often?

- Cincinnati Pre-hospital Stroke Scale  
 Miami Emergency Neurologic Deficit Pre-hospital Checklist (MEND)  
 NIH Stroke Scale (NIHSS)  
 L.A. Motor Scale (LAMS)  
 Rapid Arterial Occlusion Evaluation (RACE) Scale  
 F.A.S.T. Exam  
 B.E.F.A.S.T. Exam  
 Vision, Aphasia, Neglect (VAN)  
 None

Approximately how often do the personnel at your agency receive stroke refresher training?

- Once a month or quarter  
 Once every six months  
 Once a year  
 Once every two years  
 Unscheduled trainings in the field  
 Never  
 Other  
(select all that apply)

Are you aware of your agency's current stroke assessment completion percentage?

- Yes  
 No

## Quality Improvement

If your agency has a Training Officer, please include their name here:

\_\_\_\_\_

(Please provide first and last name)

If your agency has a Quality Improvement Coordinator, please include their name here:

\_\_\_\_\_

(Please provide first and last name)

About what percentage of suspected stroke patient records does your agency perform process and quality improvements on?

- 0%
- 1 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 99%
- 100%

What are your current training or educational needs related to stroke patient care?

\_\_\_\_\_

If available, what type of stroke education materials would be helpful for your patients?

\_\_\_\_\_

Did the State Stroke Triage Plan released in 2018, influence any changes in stroke care practices?

- Yes
- No

What quality improvement projects or new innovations are priorities for your EMS agency (including, but not limited to stroke related care)?

\_\_\_\_\_

## EMS - Hospital Integration

Does your agency have a "Stroke Alert" policy to pre-alert facilities that you are transporting a suspected stroke patient to them?

- Yes  
 No

Approximately how many hours after the patient's last known well do you call a stroke alert?

- 4 hours  
 6 hours  
 24 hours  
 Other

Does your personnel/agency receive feedback from hospital personnel concerning patient care outcomes for suspected stroke patients?

- Yes, from all hospitals  
 Yes, from some hospitals  
 No  
 Not sure

How is feedback received from hospital personnel?

- Report initiated by EMS personnel to hospital personnel for patients selected by EMS personnel  
 Report initiated by hospital personnel to EMS for patients selected by the hospital personnel  
 Report initiated by hospital personnel to EMS for all transported patients  
 Regularly held in-person meetings  
 Hospital EMS Feedback Form  
 Hospital Hub Outcome Form  
 Other  
 Not Applicable  
(Select all that apply)

If other, please specify

\_\_\_\_\_  
(If not applicable, skip this question)

How would you characterize patient outcome feedback received from hospitals?

- Extremely Helpful  
 Very Helpful  
 Somewhat Helpful  
 Slightly Helpful  
 Not at all Helpful

What type of patient outcome information do you find useful?

- Patient Diagnosis  
 Emergency Department Disposition  
 Hospital Disposition  
 Outcome at Hospital Discharge (IT27.15)  
 Other  
(Select all that apply)

If other, please specify

\_\_\_\_\_  
(If not applicable, skip this question)

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**Hospital Relationships**

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Please list the top three hospitals your agency takes stroke patients for care:

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Name of Hospital 1

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Name of Hospital 2

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Name of Hospital 3

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What percentage of stroke patients are transported to a stroke center?

- 

0%

1 - 25%

26 - 50%

51 - 75%

76 - 99%

100

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What factors influence what hospital you take stroke patients to for care?

- Distance  
 Stroke Certification  
 EMS friendly  
 Patient preference  
 Other

(select all that apply)