

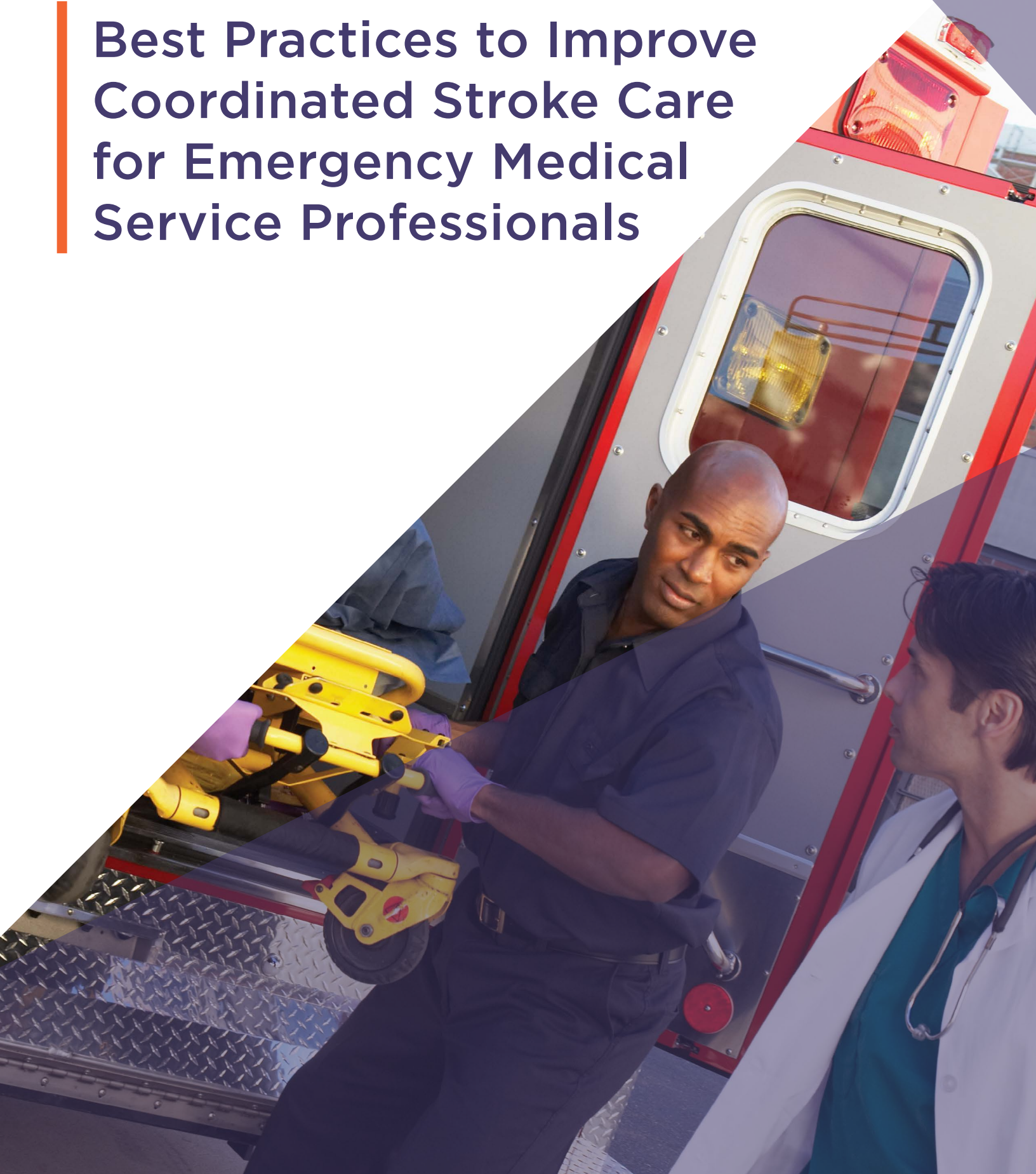


WISCONSIN COVERDELL  
STROKE PROGRAM

MINNESOTA  
**STROKE**  
REGISTRY



# Best Practices to Improve Coordinated Stroke Care for Emergency Medical Service Professionals



## ACKNOWLEDGMENTS

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The authors of this toolkit wish to thank the many EMS professionals who have provided input for this document and for their commitment to improve stroke care coordination in their local areas. Your dedication to quality patient care and application of EMS best practices are transforming patient outcomes and stroke systems of care each day.

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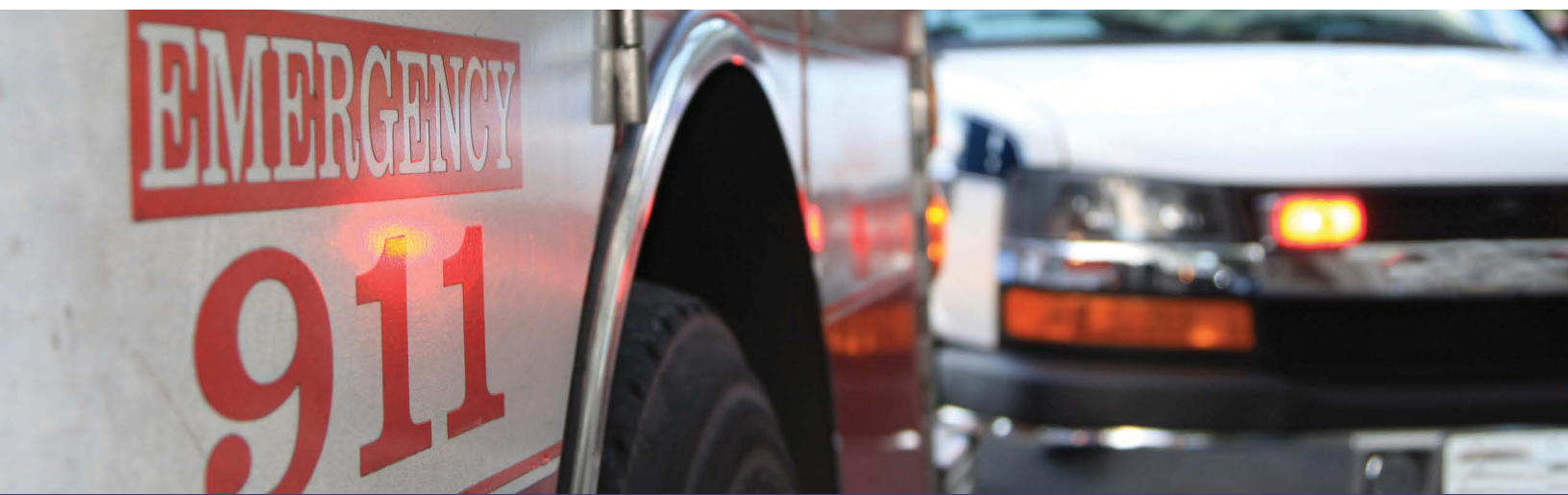
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For more information about the national and statewide stroke programs, see:

- Paul Coverdell National Acute Stroke Registry: [www.cdc.gov/dhdsp/programs/stroke\\_registry.htm](http://www.cdc.gov/dhdsp/programs/stroke_registry.htm)
- Wisconsin Coverdell Stroke Program: <https://www.dhs.wisconsin.gov/cardiovascular/index.htm>
- Minnesota Stroke Registry Program: <http://www.mnstrokeregistry.org/>



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## PRE-HOSPITAL STROKE CARE PRE-TEST

1. What acronym is commonly used for assessing a suspected stroke patient?
  - a. AVPU
  - b. AEIOU-TIPS
  - c. FAST
  - d. ALOC
  
2. Which statement about ischemic stroke is incorrect?
  - a. It accounts for about 80%–87% of all strokes.
  - b. It occurs when a blood vessel ruptures and blood leaks into the brain structures.
  - c. One subtype results from atrial fibrillation, valve disease, or ventricular thrombi.
  - d. One subtype stems from plaque, diabetes mellitus, or hypertension.
  
3. You are caring for a patient who you believe is suffering from a stroke. You know that you should remain on scene no longer than \_\_\_\_\_?
  - a. 10 minutes
  - b. 25 minutes
  - c. 30 minutes
  - d. There is no recommended maximum on-scene time with a stroke patient.
  
4. TIAs (Transient Ischemic Attacks) are currently defined as the acute onset of any focal neurological deficit that spontaneously resolves in \_\_\_\_\_.
  - a. 1 hour
  - b. 2 hours
  - c. 6 hours
  - d. 24 hours
  
5. Determining appropriate hospital destination for a suspected stroke patient is critical for a patient's outcome. A hospital that has obtained a designation as a Primary Stroke Center has demonstrated proficiency in providing appropriate stroke care. Those hospitals:
  - a. Establish a coordinated response to a suspected stroke patient.
  - b. Have a stroke team available 24/7.
  - c. Educate EMS on caring for a stroke patient.
  - d. Educate the community on stroke.
  - e. All of the above.

# Introduction

**An acute stroke (or “brain attack”) is an EMERGENCY demanding immediate and prompt action.**

Emergency medical services (EMS) are often the first healthcare providers in contact with a suspected stroke patient, making them a critical link in a patient's survival and long-term functioning. Medical advances in the past 20 years have significantly changed stroke treatment and outcomes. In the past when a stroke patient showed up in the emergency room, they were given blood thinners and often nothing more. Staff comforted patients and waited to monitor the severity of the stroke's damage before recommending rehabilitation. Now, it is widely known that there is actually a “golden hour” of treatment for most stroke patients. According to a study reported in the American Stroke Association's Stroke Journal, every delay in delivering a clot-busting drug after an ischemic stroke reduces a survivor's chance of a disability-free life. Clearly, EMS professionals play a significant role in the care and long-term outcomes of suspected stroke patients.

The purpose of this toolkit is to assist EMS agencies in consistently providing optimal stroke care and to improve care coordination among EMS agencies and hospital emergency departments (ED). This resource was created by EMS and quality improvement professionals to provide a variety of tools that support continuing education, performance improvement efforts and community education. Some of these tools include:

- Educational handouts about stroke
- Opportunities for stroke education
- Stroke treatment guidelines
- Sample EMS protocols
- A stroke checklist for emergency medical technicians (EMTs)
- Ideas for stroke treatment quality improvement metrics and projects
- Information on where to learn about hospitals' level of stroke care (e.g., state-designated stroke centers in Minnesota)
- Community education information and resources

Put these resources to good use! Consider the critical role EMS plays in stroke outcomes and look at how your agency can enhance training and processes to improve timely, evidence-based stroke care. To start:

1. Examine your agency's stroke protocol to make sure it meets current guidelines for EMS stroke care.
2. Ensure that all EMS crew members understand and apply best practices in caring for suspected stroke patients.
3. Collect data to track your agency's performance on stroke care metrics.
4. Work with your hospitals to coordinate communication protocols and hand-off procedures.

Through these efforts, you and your colleagues can help make stroke treatable and beatable for the individuals and communities you serve.



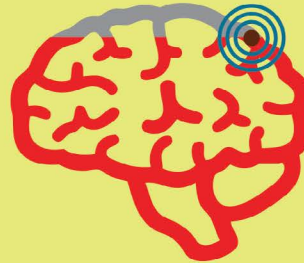
# ADVANCED STROKE TREATMENT

## Attacking Brain Clots to Save Lives

Nearly

# 800,000

people in the United States have a stroke every year.



More than

# 690,000

PER YEAR

U.S. strokes are caused when a clot cuts off blood flow to a part of the brain.

Stroke is the No. 5 cause of death in the United States, killing nearly 130,000 Americans a year.

## 1 in 20 DEATHS



## QUICK TREATMENT= LESS BRAIN DAMAGE!

Importance of Getting to the Hospital Quickly



Get to the hospital at the first sign of stroke so you can be evaluated and receive treatment in time.

Within  
**4.5**  
Hours

Clot-busting  
drug tPA

Within  
**6**  
Hours

Clot-removing  
endovascular  
treatment

Clot busters and clot-removal procedures must be administered within a few hours of stroke symptoms to lessen the chance of being disabled after a stroke.

Endovascular treatment is a surgical technique that can physically remove a large blood clot from a blocked artery in the brain.

# 911

**Call 9-1-1 at the first sign of stroke.**

## LEARN AND SHARE THE WARNING SIGNS OF STROKE

Spot a Stroke F.A.S.T.

# F

### FACE DROOPING

Does one side of the face droop or is it numb?

# A

### ARM WEAKNESS

Is one arm weak or numb?

# S

### SPEECH DIFFICULTY

Is speech slurred, are they unable to speak, or are they hard to understand?

# T

### TIME TO CALL 9-1-1

If the person shows any of these symptoms, even if the symptoms go away, call 9-1-1 and get to the hospital immediately.

Source:  
<http://circ.ahajournals.org/content/early/2014/12/18/CIR.0000000000000152.full.pdf+html>  
[http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64\\_02.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_02.pdf)  
<http://stroke.ahajournals.org/content/45/10/3019.short>

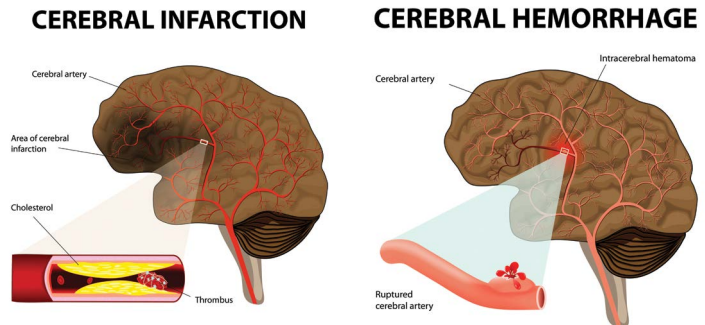
[StrokeAssociation.org](http://StrokeAssociation.org)



**Together  
to End Stroke™**

# Stroke Facts and Figures

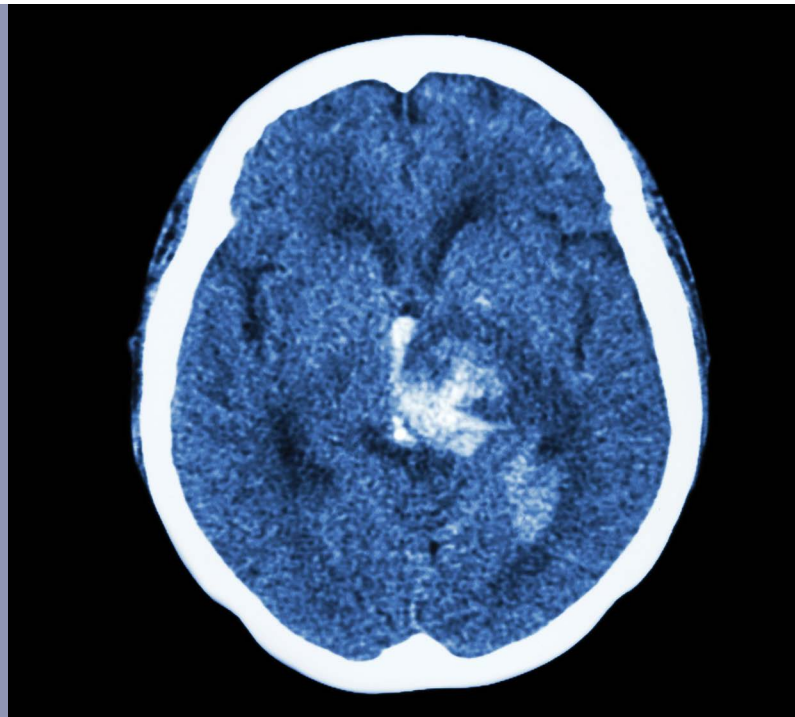
Each year, nearly 800,000 Americans experience a stroke — that is equivalent to about one stroke every 40 seconds. An ischemic stroke, sometimes called a “brain attack,” is similar to a heart attack except that it happens in the brain. Clots can form in the blood vessels that lead to or are in the brain. Sometimes clots can form in other areas of the body and travel to the brain. Ischemic strokes can also be caused by too much plaque (fatty deposits and cholesterol) that can clog vessels. When a blockage occurs, it robs brain cells of the oxygen and glucose they need to survive. About 87% of all strokes are ischemic.<sup>2</sup>



Another type of stroke, known as hemorrhagic (heh-more-raj-ik) stroke, is caused when a blood vessel in the brain ruptures or tears. When this happens, blood from the vessel seeps into the brain tissues and damages the brain cells. The most common causes of this type of stroke are high blood pressure and brain aneurysms (an-yur-isms) which can cause weakened blood vessels to burst. Patients experiencing hemorrhagic stroke are likely to complain of the worst headache of their life or they may become unconscious.<sup>3</sup>

## Time is Brain

This phrase refers to the rapid damage of brain cells when a stroke occurs and emphasizes the importance of recognizing and responding to stroke quickly. Researchers estimate that the average brain has between 86 and 100 billion neurons, cells that transmit information throughout the nervous system.<sup>4</sup> When a stroke occurs, the lack of oxygen to these cells can kill millions of neurons — about 1.9 million neurons for every minute without oxygen. For ischemic stroke, the brain ages 3.6 years each hour without treatment. Because of delays in getting treatment, about 15%–30% of stroke survivors experience some form of long-term disability.<sup>2</sup>



<sup>2</sup><http://strokeinfo.org/signsandsymptoms/stroke-facts>

<sup>3</sup>Adapted from [www.webmd.com/heart-disease/stroke#3](http://www.webmd.com/heart-disease/stroke#3)

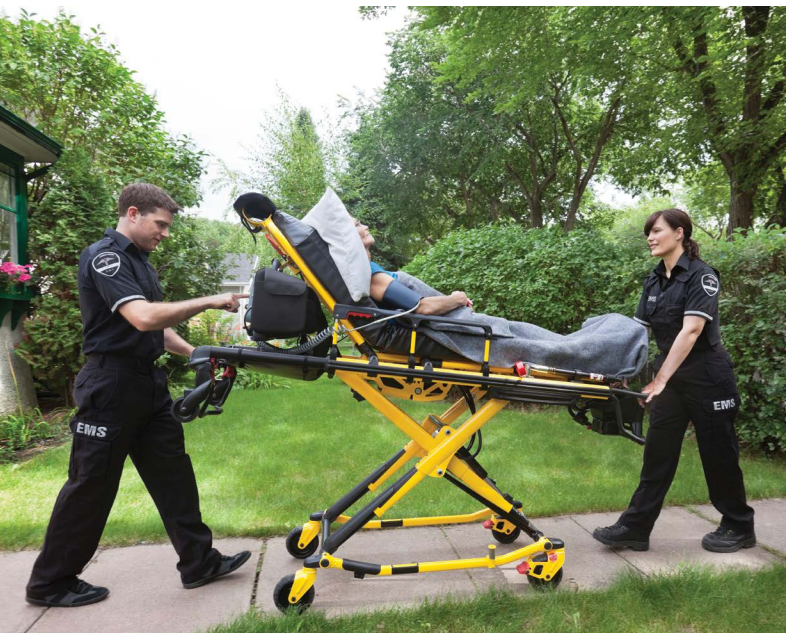
<sup>4</sup><http://www.disabled-world.com/artman/publish/brain-facts.shtml>



# Stroke Systems of Care

A stroke system of care refers to the several links or partners in the stroke chain of survival. These include: 1) community awareness; 2) dispatch and EMS; 3) acute stroke care provided by a small hospital or certified stroke center; and 4) post-stroke care including rehabilitation services and primary care. A well-functioning stroke system requires seamless coordination among EMS, hospitals and certified stroke centers. Coordinating smooth transitions of care — from dispatch to EMS to hospital — is essential to interrupt a stroke and prevent additional brain damage. The use of clot-busting medication known as tissue plasminogen activator (tPA)

can restore blood flow for ischemic strokes, but the drug needs to be delivered within 4.5 hours of when a patient first experienced symptoms. Ischemic stroke patients who experienced symptom onset greater than 4.5 hours ago may require interventional methods to remove the clot. Hemorrhagic stroke patients are not eligible to receive tPA and may require other interventional therapy. EMS is often the first link in this time-critical chain of survival. How quickly EMS recognizes stroke symptoms and determines the last time the patient was known to be well will have a significant impact on patient survival and disability.



National recommendations from the Brain Attack Coalition (a group of national leaders in stroke care) state that EMS should transport suspected stroke patients to the nearest stroke-certified facility. Certified stroke centers are hospitals that have met rigorous criteria to demonstrate that they apply national guidelines in providing advanced stroke treatment. Similar to the different levels of trauma care that hospitals provide, there are three levels of national stroke care certification that hospitals can achieve. These include Acute Stroke Ready Hospitals (ASRH), Primary Stroke Centers (PSC) and Comprehensive Stroke Centers (CSC). Table 1 highlights some of the differences between hospitals designated as ASRH and PSC.



## TABLE 1: COMPARISON OF ELEMENTS IN AN ACUTE STROKE-READY HOSPITAL AND PRIMARY STROKE CENTERS

Element	ASRH	PSC	Comment
Acute stroke team	15-minute response time	15-minute response time	Minimum of 2 members
Stroke protocols	Revise annually	Revise annually	Applies to all types of strokes
Emergency medical services	Training in field assessment tools for stroke	Training in field assessment tools for stroke	At least 2 hours of stroke-related education annually
Emergency department	Written protocols for treatment and stabilization; 4 annual hours of stroke education	Written protocols for treatment and stabilization; 8 annual hours of stroke education	Physician and nurse education for key staff
Laboratory testing, echocardiogram (ECG)/ chest radiograph	Test results available within 45 minutes of ordering	Test results available within 45 minutes of ordering	Testing available 24 hours, 7 days a week (24/7)
Brain imaging*	Test completed and read within 45 minutes; 60 minutes for magnetic resonance imaging (MRI)	Test completed and read within 45 minutes; 60 minutes for magnetic resonance imaging (MRI)	Head CT or MRI acceptable; service available 24/7
Stroke unit	Not required unless patients are admitted	Required for admitted patients; should include protocols and telemetry	Specific monitoring protocols even if not admitted
IV tPA <sup>†</sup>	Door-to-needle time of ≤60 minutes	Door-to-needle time of ≤60 minutes	IV tPA available 24/7
Neurosurgical services‡	Available within 3 hours	Available within 2 hours	Can be onsite or by transfer of patient
Initiation of telemedicine link	Within 20 minutes of when it is deemed medically necessary	Respond within 20 minutes of link request if serving as a hub	Type of link will vary by service vendor; same response times for receiving hub CSC
Telemedicine/ teleradiology equipment	Onsite to transmit	Onsite and offsite to receive	Applies to a CSC if they will be a hub site
Transfer of patients to PSC or CSC	Patient leaves within 2 hours of ED arrival (or once medically stable)§	Not applicable in most cases unless transferred to a CSC	Mode of transportation will vary

From: Higashida, R, et al. (2013). Interactions Within Stroke Systems of Care: A Policy Statement From the American Heart Association/American Stroke Association. Stroke. Retrieved from <http://stroke.ahajournals.org/content/44/10/2961.full.pdf+html>

ASRH indicates Acute Stroke-Ready Hospital; CSC, Comprehensive Stroke Center; CT computed tomography; ED, emergency department; IV tPA, intravenous tissue plasminogen activator; and PSC, Primary Stroke Center.

\*Comments apply to the ASRH recommendations unless otherwise noted.

†See Performance Metrics section for further details.

‡Neurosurgical coverage might include having a neurosurgeon at the hospital or transfer of the patient to another facility where a neurosurgeon is available and can be onsite.

§Exceptions include factors beyond the control of the ASRH, such as weather delays, mechanical issues, etc.

# STROKE CERTIFIED AND STROKE DESIGNATED HOSPITALS

While most hospitals can provide a basic level of stroke care, stroke *certified* and stroke *designated* hospitals are organizations that provide stroke care according to national recommendations. Three main national organizations *certify* hospitals as stroke centers. However, in several states, like Minnesota and Iowa, the state health department *designates* the level of stroke care hospitals provide based on specific criteria. More and more hospitals are becoming certified and/or designated stroke centers each year. Talk with hospitals in your region to confirm their capabilities in treating stroke.

For a current list of hospitals with national stroke certification, visit these websites:

[The Joint Commission](http://www.qualitycheck.org/consumer/searchQCR.aspx) [www.qualitycheck.org/consumer/searchQCR.aspx](http://www.qualitycheck.org/consumer/searchQCR.aspx)

[DNV-GL](http://dnvglhealthcare.com/hospitals) <http://dnvglhealthcare.com/hospitals>

[Healthcare Facilities Accreditation Program \(HFAP\)](http://www.hfap.org/about/overview.aspx) <http://www.hfap.org/about/overview.aspx>

For a current list of nationally certified stroke centers in Wisconsin, see

[Wisconsin Coverdell Stroke Program](https://www.dhs.wisconsin.gov/cardiovascular/index.htm) (at the Wisconsin Department of Health Services website)  
<https://www.dhs.wisconsin.gov/cardiovascular/index.htm>

For a current list of state designated stroke centers in Minnesota, see

[Minnesota Stroke System](http://www.health.state.mn.us/divs/healthimprovement/programs-initiatives/in-healthcare/ssdesignatedhospitals.html) <http://www.health.state.mn.us/divs/healthimprovement/programs-initiatives/in-healthcare/ssdesignatedhospitals.html>

## Certified Stroke Care At a Glance

### Acute Stroke Ready Hospital (ASRH)

An Acute Stroke Ready Hospital (ASRH) has the infrastructure and capability to care for acute stroke, including administration of intravenous tPA. The ASRH has fewer capabilities than a PSC but is able to diagnose, stabilize, treat, and transfer most patients with stroke. Most acute stroke patients are transferred to a CSC or PSC post-treatment.

### Primary Stroke Center (PSC)

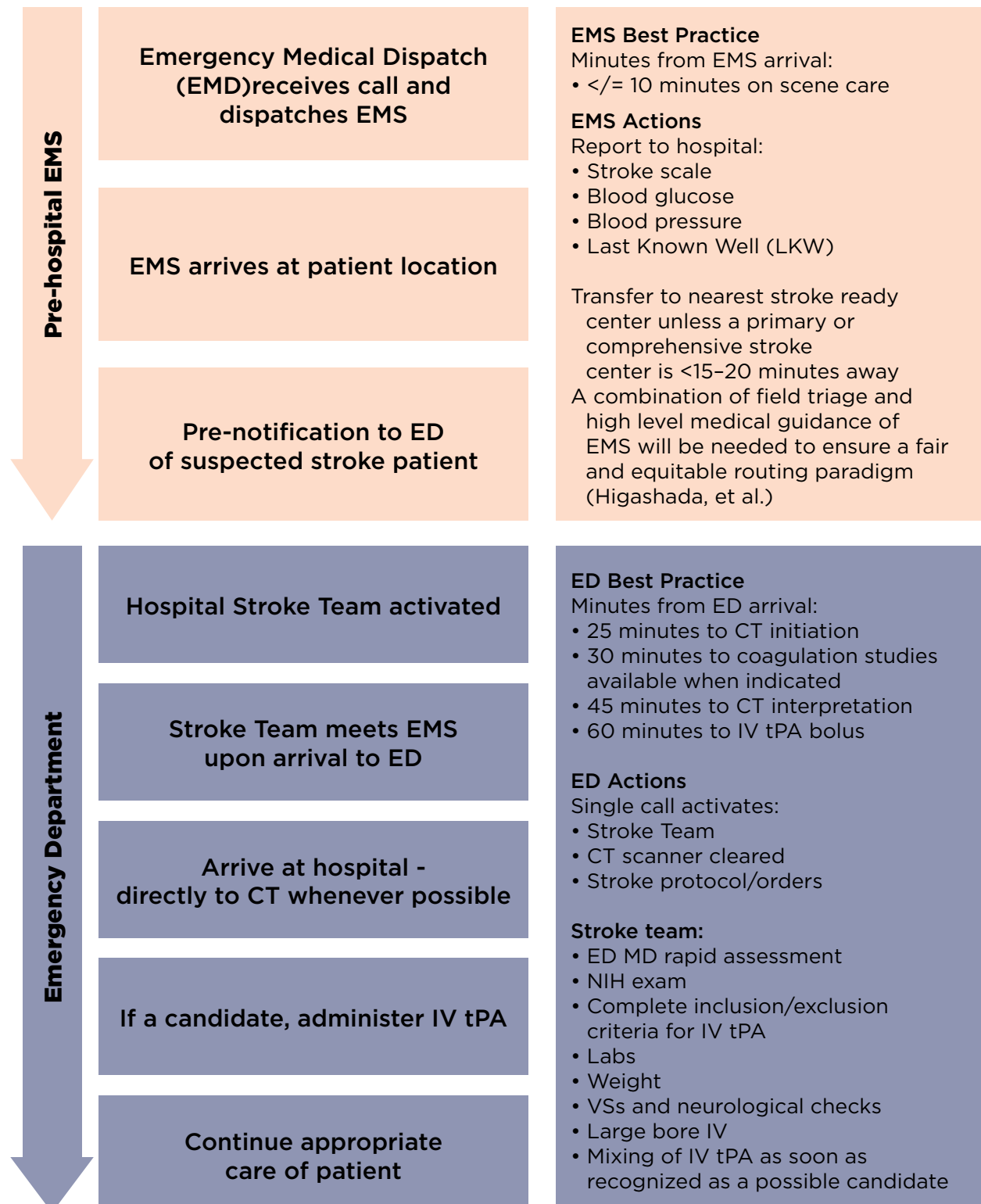
A Primary Stroke Center (PSC) has the necessary staffing, infrastructure, and programs to stabilize and treat most acute stroke patients. A PSC provides acute treatment to most patients with stroke and can admit the patient to a stroke unit. (Alberts MJ, 2011)

### Comprehensive Stroke Center (CSC)

A Comprehensive Stroke Center (CSC) has the personnel, infrastructure, and expertise to diagnose and treat stroke patients who require intensive medical and surgical care, specialized tests, or interventional therapies. The types of patients who might use and benefit from a CSC include, but are not limited to, patients with large ischemic strokes or hemorrhagic strokes, those with strokes from unusual causes or requiring specialized testing or therapies (e.g., endovascular, surgery), and/or those requiring multispecialty management. A CSC acts as a resource center for other facilities in their region. (Alberts MJ, 2005)

## TABLE 2: IDEAL PRACTICES FROM 9-1-1 TO STROKE TREATMENT

This visual highlights national recommendations for steps and timing in delivering optimal pre-hospital and acute care.



# Emergency Dispatch Guidelines

## Best Practices for Emergency Medical Dispatch

With a few key questions, local emergency medical dispatchers (EMDs) can alert an EMS squad of a suspected stroke and help shorten time-critical response. The Medical Priority Dispatch System™ (MPDS®) Stroke Diagnostic Tool (SDxT) includes a three-item diagnostic test based on the FAST acronym. The National Stroke Association introduced FAST as an easy way to remember the warning signs of stroke.

### Stroke Warning Signs

- F** Face and facial droop
- A** Arms and arm drift
- S** Speech: (slurred speech, inappropriate words or the inability to speak)
- T** Time: if any of the first three signs are observed, a person should call 9-1-1 immediately

Using the SDxT, an EMD will ask over the phone for the patient to smile and check for facial drooping. They will also ask the patient to raise both arms to check for weakness or paralysis on either side. Finally, they ask the patient to repeat a simple phrase such as “the early bird catches the worm” to hear if their speech is unusual. Patients are scored based on their response to each question. If a patient has a high score, it is more likely that he/she is having a stroke, and it is critical that EMS is deployed immediately.

EMDs select MPDS Protocol 28: Stroke/Transient Ischemic Attack (TIA) when a caller mentions stroke (or one or more other symptoms on the stroke symptoms list) for a conscious and breathing patient. Since it is impossible to know

whether a patient is having a TIA or a stroke, all patients with stroke-like symptoms should trigger the need for immediate evaluation. Other chief complaints that could be stroke-related include Falls (Protocol 17), Headache (Protocol 18) and Sick Person (Protocol 26). Incorporating the SDxT into those protocols could give EMDs a faster way to identify possible stroke patients. In turn, more rapid deployment of EMS could result.<sup>5</sup>

Another helpful resource for EMDs is the following tool from the Association of Public-Safety Communications Officials (APCO). Asking these questions can help detect possible stroke and the need for priority response from EMS. Review these with your agency's dispatcher to explore how current practices can be improved.

<sup>5</sup>Barron T, Make It FAST: Speed is key for assisting stroke victims. The Journal of Emergency Dispatch. July/Aug 2013.



# EMERGENCY DISPATCH FOR STROKE TOOL

## Questions About Vital Points

- What does the patient look like?
- Can the patient respond to you and follow simple commands?
- Can the patient answer your questions? Is the patient acting different from usual? Is the patient short of breath?
- Is the patient able to speak in full sentences?
- Is the patient complaining of any pain? Where is the pain located?
- Is the patient a diabetic?
- Has the patient had a seizure recently?
- Has the patient had a severe headache recently?
- Does the patient have any other medical or surgical history? What?
- Has the patient had a stroke before?
- Has the patient had any recent trauma/injury?

## Local Rescue Squad and Advanced Life Support (ALS) Priority Response

- Decreased or altered level of consciousness
- Difficult/noisy breathing
- Chest pain/diaphoresis
- Seizure
- Severe headache with any visual changes or loss of vision and no history of migraines
- Diabetic
- Difficulty speaking
- Confused
- Unilateral (one-sided) paralysis
- Weakness, numbness that is not focal to any one part of the body
- No breathing difficulty

## Pre-arrival Instructions

- If unconscious, go to Airway Control (Non-trauma).
- Keep the patient calm.
- Do not allow the patient to move around.
- If having difficulty breathing, keep neck straight and remove pillows.
- Do not give the patient anything by mouth (to eat or drink). Gather patient medications, if any.
- If anything changes or the patient's condition worsens, call back immediately.

## Short Report

- Age
- Sex
- Chief complaint
- Dispatch criteria used to determine response
- Pertinent related symptoms
- Medical/surgical history, if any
- Other agencies responding

# EMS Guidelines

## Best Practices for EMS Response to Stroke

How EMS responds to stroke patients in the first few minutes can have a profound impact on treatment options and long-term outcomes for those patients. Rapid assessment is the key in identifying suspected stroke. The following pages present evidence-based stroke care guidelines for EMS and sample protocols to use in your agency. Please compare these guidelines with the ones currently being utilized by your EMS. Discuss any differences identified throughout this process with the Service Director and/or your EMS Medical Director.

Through its Target: Stroke™ initiative, the American Heart Association/American Stroke Association (AHA/ASA) presents three easy reminders for EMS in responding to stroke. In the case of Code Stroke, EMS should: 1) Assess, 2) Alert and 3) Arrive. See the Resources section for more information.

### 1) Assess Stroke Patient

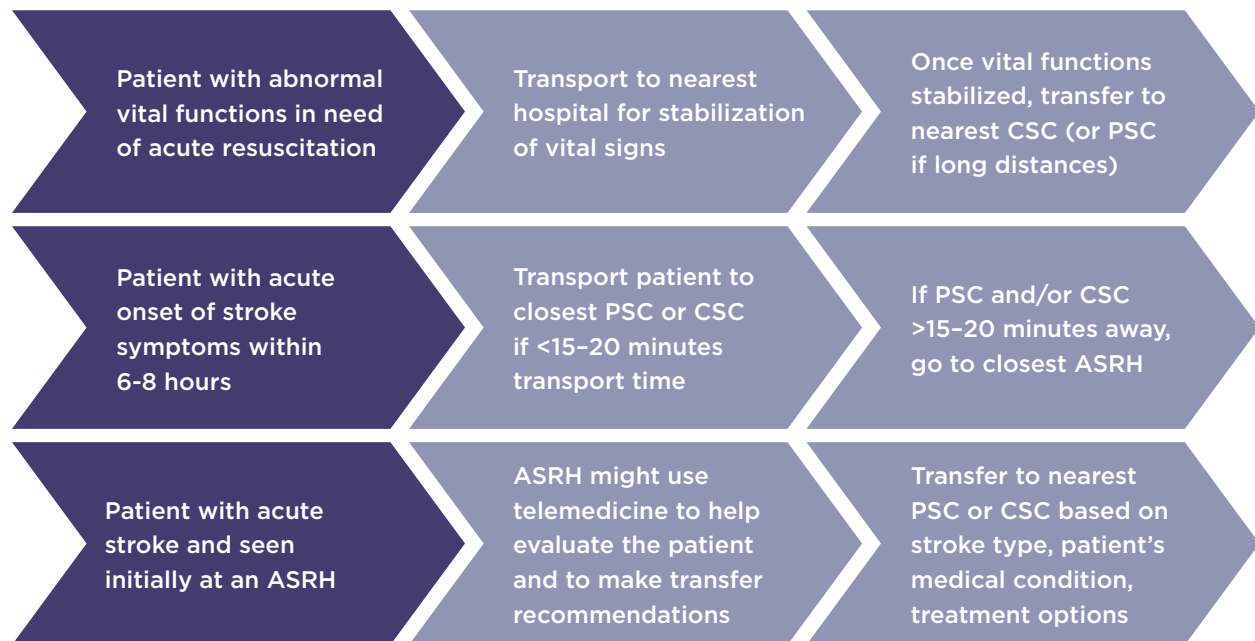
- **Use stroke scale:** After supporting the ABCs — airway, breathing and circulation — and giving oxygen as needed, EMS should perform a pre-hospital stroke assessment. The most common are the Cincinnati Pre-hospital Stroke Scale and the Los Angeles Pre-hospital Stroke Screen (LAPSS). These tools are effective in helping to detect the probability of stroke. The Cincinnati Pre-hospital Stroke Scale assesses facial droop, arm drift and speech. If just one of these components is abnormal, the patient has a 72% probability of having a stroke. If all three findings are present, the probability of an acute stroke is more than 85%.<sup>6</sup>
- **Establish time when patient was Last Known Well (LKW).** Therapies and interventions available to stroke patients depend on when the stroke occurred and how long the patient has been experiencing their current stroke symptoms (e.g., facial droop, slurred speech, arm drift, paresthesia, vision disturbances, balance issues, unsteady gait, etc.). It is critical to establish when the patient was last known to be well or normal. Last Known Well (LKW) time is the exact time when the patient was observed or known to be normal and without stroke symptoms. Identifying LKW aids in determining what therapies the patient may be eligible to receive. Determining this time may be as simple as asking a single question: “When did you last observe the patient acting normal?” or “When did you first notice a change?” The question may be posed to the patient, a family member, or anyone else who is/was with the patient. In the case of a patient who woke up with these symptoms, determining that LKW time is still a priority.
- **Check Blood Glucose:** There are various conditions that can mimic stroke symptoms. One condition is hypoglycemia. Always remember to obtain a blood glucose reading on a patient to rule this out.

<sup>6</sup>American Heart Association (2011). Advanced Cardiovascular Life Support Provider Manual. USA: First American Heart Association Printing. p. 137.

## 2) Alert the Receiving Hospital

National recommendations state that EMS should transport suspected stroke patients to the nearest certified stroke center. Guidelines support bypassing hospitals without stroke resources (e.g., the ability to perform CT scans 24/7, administer tPA and receive neurosurgical consult within 15 minutes). Be sure your agency is familiar with the capabilities of the hospitals it transports to and that this is reflected in destination determination procedures.

**Table 3: National Recommendations for Stroke Destination Planning**



From: Higashida, R, et al. (2013). Interactions Within Stroke Systems of Care: A Policy Statement From the American Heart Association/American Stroke Association. Stroke. Retrieved from <http://stroke.ahajournals.org/content/44/10/2961.full.pdf+html>

**Call receiving stroke center.** When stroke is suspected, EMS should alert the ED team at the certified stroke center as soon as possible. Depending on the facility, this may be referred to as calling “Code Stroke,” “Stroke Alert,” or “Neuro Alert.” Doing this will help save time in stroke triage and treatment.



## 3) Arrive at a Certified or Designated Stroke Center

**Rapid transport.** Rapid intervention is critical to optimal patient outcomes. It is recommended that EMS spend less than 10 minutes on scene and head to the nearest appropriate facility based on the guidelines above. In some cases, EMS will transport the patient directly to the CT scanner upon arrival at the hospital. Whatever the procedure at the hospitals you serve, it is important to leave a completed run sheet with the ED team.

# TARGET: STROKE<sup>SM</sup>

## STROKE IS AN EMERGENCY!

**CODE STROKE: ASSESS, ALERT, ARRIVE**

### Stroke is prevalent and life-threatening

Rapid intervention is crucial in the treatment of stroke

### Time equals brain

**AHA/ASA recommendations stress urgency of response**

- Call 9-1-1 for rapid emergency response and timely treatment of stroke
- Dispatchers should make stroke a priority dispatch
- Alert receiving hospital of potential stroke patient "CODE STROKE"
- Rapid transport of patients to the nearest stroke center

### EMS management of suspected stroke

#### Clinical assessments and actions

- Support ABCs: airway, breathing, circulation – give oxygen if needed
- Perform prehospital stroke assessment
  - Cincinnati Prehospital Stroke Scale
  - Los Angeles Prehospital Stroke Screen (LAPSS)
- Establish time when patient last known normal
- Rapid transport (consider triage to a center with a stroke unit if appropriate; consider bringing a witness, family member, or caregiver)
- Alert receiving hospital stroke center "CODE STROKE"
- Check glucose level if possible

### Take the patient to the nearest Primary Stroke Center/GWTG-Stroke Hospital

To find certified primary stroke centers in your area, go to [www.jointcommission.org/CertificationPrograms/PrimaryStrokeCenters](http://www.jointcommission.org/CertificationPrograms/PrimaryStrokeCenters)

EMS bypass of hospital without stroke resources supported by guidelines if stroke center within reasonable transport range

### Pre-notify receiving hospital of potential stroke patient

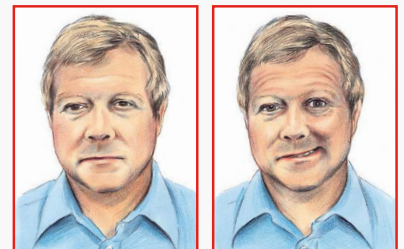
Alert receiving hospital as soon as possible of potential stroke patient "CODE STROKE"

## Stroke Assessment

### The Cincinnati Prehospital Stroke Scale

**Facial Droop** (have patient show teeth or smile):

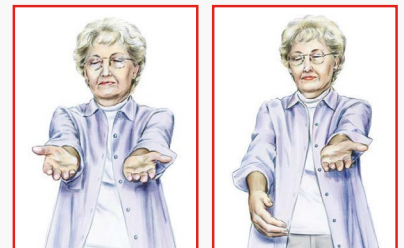
- Normal—both sides of face move equally
- Abnormal—one side of face does not move as well as the other side



Left: Normal. Right: Stroke patient with facial droop (right side of face).

**Arm Drift** (patient closes eyes and extends both arms straight out, with palms up, for 10 seconds):

- Normal—both arms move the same *or* both arms do not move at all (other findings, such as pronator drift, may be helpful)
- Abnormal—one arm does not move *or* one arm drifts down compared with the other



Left: Normal. Right: One-sided motor weakness (right arm).

**Abnormal Speech** (have the patient say "you can't teach an old dog new tricks"):

- Normal—patient uses correct words with no slurring
- Abnormal—patient slurs words, uses the wrong words, or is unable to speak

**Interpretation:** If any 1 of these 3 signs is abnormal, the probability of a stroke is 72%.

Modified from Kothari RU, Pancioli A, Liu T, Brott T, Broderick J. Cincinnati Prehospital Stroke Scale: reproducibility and validity. *Ann Emerg Med.* 1999;33:373-378. With permission from Elsevier.

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## Sample Medical Guidelines for Stroke from Aurora Lakeland Hospital, Elkhorn, Wisconsin

The following pages provide examples of how EMS best practices are reflected in agency guidelines. Discuss your agency's preferred stroke protocols with your EMS Medical Director.

Level	Suspected Stroke/ Cerebrovascular Accident (CVA)
FR B A I P	<p>Initial Medical Care — Special Considerations:</p> <ul style="list-style-type: none"> <li>• Titrate oxygen to bring oxygen saturations to 94% or greater.</li> <li>• Assist with BVM if patient is not breathing adequately.</li> <li>• Protect airway and provide suction as needed.</li> <li>• Elevate head of bed 15–30 degrees if BP is greater than 90 mmHg.</li> <li>• Protect paralyzed limbs from injury.</li> <li>• Keep head, neck and spine in neutral alignment. Do not flex neck.</li> <li>• Complete Neuro/Stroke Alert checklist enroute to hospital.</li> </ul>
A I P	<ul style="list-style-type: none"> <li>• Provide IV access.</li> </ul>
B A I P	<ul style="list-style-type: none"> <li>• Obtain and record blood glucose levels (if less than 60, treat per appropriate protocol).</li> <li>• Adult diabetic/glucose emergencies.</li> <li>• Pediatric diabetic/glucose emergencies.</li> <li>• Length of time of symptoms and Last Known Well TIME (if less than 4.5 hours, patient is a candidate for intervention).</li> <li>• Obtain Glasgow Coma Scale and Cincinnati Pre-hospital Stroke Scale. Note any changes from known baseline.</li> <li>• If seizures occur, treat per seizure protocol.</li> </ul> <p>Note: Bradycardia may be present in these patients due to increased intracranial pressure. Atropine IS NOT to be given if the BP is elevated.</p>

### Glasgow Coma Scale

Eye Opening:		Best Verbal Response:		Best Motor Response:	
Spontaneous	4	Oriented conversation	5	Obeys	6
In response to speech	3	Confused conversation	4	Localizes	5
In response to pain	2	Inappropriate words	3	Withdraws	4
None	1	Incomprehensible sounds	2	Abnormal flexion	3
		None	1	Abnormal extension	2
				None	1

### Cincinnati Pre-hospital Stroke Scale

**Facial Droop:** have patient show teeth or smile:

- Normal — Both sides of face move equally well.
- Abnormal — One side of face does not move as well as the other side.

**Arm Drift:** have patient close eyes and hold both arms out:

- Normal — both arms move the same or both arms do not move at all (other findings such as pronator grip may be helpful).

- Abnormal — one arm does not move or one arm drifts down compared to the other.

**Speech:** have patient say “you can’t teach an old dog new tricks”:

- Normal — patient uses correct words with no slurring.
- Abnormal — patient slurs words, uses inappropriate words or is unable to speak.

# STROKE PROTOCOL FROM WISCONSIN DEPARTMENT OF HEALTH SERVICES EMS UNIT

Stroke	
Priorities	Assessment Findings
Chief Complaint	"Weakness," "Confusion," "Slurred Speech," "Unresponsive"
OPQRST	When did it start? Was it witnessed? What is normal baseline?
Associated Symptoms/Pertinent Negatives	Headache, weakness, pupil dilation, slurred speech, aphasia, incontinence
SAMPLE	Medication or history consistent with stroke or TIA
Initial Exam	ABCs and correct any immediate life threats
Detailed Focused Exam	<b>Vital signs:</b> <b>General Appearance:</b> Unresponsive, noticeable facial droop, drooling, slouched posture <b>Neuro:</b> Cincinnati Pre-hospital Stroke Scale (speech, facial symmetry, motor)
Goals of Therapy	Maintain ABCs and adequate vital signs
Monitoring	BP, HR, RR, EKG, SpO <sub>2</sub> .

## Emergency Medical Responder (EMR)

- Routine medical care
- Oxygen
- Support airway as needed
- Ascertain time of onset or Last Known Well (LKW)
- Obtain cell phone number from witness and/or next-of-kin

## Emergency Medical Technician (EMT)

- Obtain blood glucose, if approved. If <60 mg/dl refer, to Hypoglycemic Guidelines.
- Do not delay transport to the closest facility with 24/7 CT and tPA availability (if known).
- Rapid transport is indicated if signs and symptoms the onset of is less than 24 hours.

## Advanced EMT (AEMT) / Intermediate / Paramedic

- Consider IV/IO NS @ TKO, if approved.
- Contact Medical Control for additional orders.

# TPA INTERFACILITY TRANSPORT PROTOCOL FROM WISCONSIN DEPARTMENT OF HEALTH SERVICES EMS UNIT

Priorities	Assessment Findings
Chief Complaint	Diagnosis of ischemic stroke; tPA infused or infusing; transporting to definitive care facility
OPQRST	When did it start? Was it witnessed? What is normal baseline?
Associated Symptoms/Pertinent Negatives	Headache, weakness, pupil dilation, slurred speech, aphasia, incontinent
SAMPLE	Medications; history consistent with stroke or TIA
Initial Exam	ABCs and correct any immediate life threats
Detailed Focused Exam	<b>Vital signs:</b> Initial blood glucose, blood pressure (BP) q 15 minutes and adjust to maintain within parameters <180/105 <b>General Appearance:</b> LOC, noticeable facial droop, drooling, arm drift <b>Neuro:</b> Cincinnati Pre-hospital Stroke Scale (speech, facial symmetry, motor)
Goals of Therapy	Maintain ABCs and adequate vital signs; maintain BP within parameters
Monitoring	Neuro exam, blood pressure, heart rate, respiration rate, EKG, SpO <sub>2</sub> q 15 minutes, initial blood glucose noted

## Paramedic

- Document current vital signs to ensure that blood pressure parameters are stabilized prior to transport.
- Verify total dose of IV tPA given or to be infused.
- Document total tPA dose to be administered, including start and stop times
- Assure correct dose of tPA is included if tubing change is required for EMS IV pump.
- Begin 0.9% NS infusion at existing rate following tPA administration — no other medications may be administered through tPA infusion line.
- Maintain oxygen of SpO<sub>2</sub>>94%
- Demand strict NPO, including oral medications.
- Perform and document pre-hospital stroke scale (Cincinnati Pre-hospital Stroke Scale recommended) q 15 minutes or anytime a change in mentation is noted.
- Document GCS and pupil exam.
- Position head of bed at 30 degrees.

- **BP Guidelines - if SBP>180 or DBP>105, or BP management medications started at sending facility:**  
(Examples)

- **Labetalol drip:** May increase 1-2mg/min q 10 minutes to maximum dose of 8mg/min, with a maximum total dose of 300 mg, until SBP<180 and/or DBP<105. If SBP<140 or DBP<80 or HR<60, discontinue infusion and contact medical control for further orders.
- **Nicardipine drip:** May increase dose by 2.5mg/hour q 5 minutes to maximum dose of 15mg/hour until SBP<180 and DBP<105. If SBP<140 or DBP<80 or HR<60, discontinue infusion and contact medical control for further orders.
- **Other:** Discuss with Medical Control and sending facility to assure understanding of all medications to be infused enroute.

- **BP Guidelines - if SBP>180 or DBP>105, BP management medications not started at sending facility:**  
(Examples)

- **Metoprolol Bolus:** 5mg IV bolus, repeat q 5 minutes to maximum of 20mg. Hold if SBP<140 or DBP<80 HR<60.
- **Hydralazine Bolus:** 10mg IV bolus over 2 minutes; may repeat in 10 minutes if no response; maximum dose 20 mg.
- **Labetalol 10 mg** IV x1 over 2 minutes; if no response after 10 minutes, may repeat x1.

- **Changes in neurological condition** - if the patient develops severe headache, acute hypertension and/or bradycardia, nausea, or vomiting:

- Discontinue tPA.
- Contact Medical Control for further orders; adjustment in BP medications, antiemetics, or including diversion to closest facility.
- Monitor VS and perform pre-hospital stroke scale neuro exam q 15 minutes

- **Oropharyngeal edema** - if signs of angioedema are present (note - this occurs more commonly in patients taking ACE Inhibitors):

- Stop tPA.
- Treat according to appropriate protocol for allergic reaction/anaphylaxis.
- Monitor airway and consider intubation if persistent swelling occurs.
- Notify Medical Control and receiving facility of changes.

### **Contact receiving facility with updates, changes, concerns and ETA**

### **Contact Medical Control for the following:**

- Additional orders
- Acute changes in condition

**Note:** \*For interfacility transport only. Requires approval from DHS; knowledge of tPA administration required; use and understanding of IV pump operations required; Critical Care level preferred. The transferring hospital may choose to transport the patient using a lower-level EMS service if the wait for a Critical Care ambulance service is excessive, provided that they send a Critical Care nurse to accompany the patient. Timely, rapid transport is essential to a definitive level of care for stroke patients.



# Quality Improvement Tools

EMS can face a variety of barriers in delivering ideal care. Consider whether some of these typical barriers affect your agency. Then, consider implementing one or more of the Quality Improvement (QI) activities to address those barriers.

## Barriers to Ideal Practices

## Sample QI Activity

Working with dispatch to identify suspected stroke

Work with dispatchers on sample screening questions that can be asked in the event of a suspected stroke

Stroke symptoms that mimic other conditions

Review the use of the Cincinnati Pre-hospital Stroke Scale and do mock patient assessments

Too much time spent on the scene

Mock stroke code

Lack of destination protocols (Wisconsin requires a destination determination policy for each licensed EMS Service)

Identify hospitals' level of stroke care

Identifying time patient was Last Known Well (LKW)

Work with EMS providers on sample questions to determine the LKW

Pre-notifying hospital with "Stroke Alert"

Coordinate with the receiving hospital on a pre-notification process

Lack training on stroke guidelines

Online courses, refresher courses, and stroke education with local hospitals, Coverdell EMS QI toolkit

Communicating critical patient data and coordination of handoff

Develop a communication tool to support the patient handoff between EMS and hospitals

Documenting run data accurately

Perform a quarterly audit of stroke run sheets to verify adherence to stroke protocol and documentation of stroke performance metrics on the run sheet

Lack of feedback from hospitals

Coordinate with the stroke coordinator, EMS coordinator or ED team to get feedback on defect-free care; ask to attend QI meetings to discuss cases

Implementing and monitoring stroke performance improvement

Use Quality Improvement (QI) tools to support your work around improving stroke care in your community and in the pre-hospital setting

## BARRIER: WORKING WITH DISPATCH TO IDENTIFY A SUSPECTED STROKE

**Sample QI Activity:** Work with dispatchers on sample screening questions that can be asked in the event of a suspected stroke ([See Best Practices for Emergency Medical Dispatch](#)).

**Put it to Action:** 9-1-1 received a phone call from a patient's wife who says he is very confused. The wife reports that they were eating breakfast and he spilled coffee all over his shirt, then he started talking funny. Some screening questions for dispatch to determine if this is a possible stroke include:

1. Was the change in your husband's behavior sudden? Did this just happen at the breakfast table, or did you notice anything odd earlier in the morning?
2. Spilling his coffee may be a sign of arm weakness. Ask the wife to check if he can raise his arms. Are both arms the same?
3. Does your husband take any medications for blood sugar, blood pressure or cholesterol?

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## BARRIER: STROKE SYMPTOMS THAT MIMIC OTHER CONDITIONS

**Sample QI Activity:** Review the cerebrovascular accident (CVA)/stroke protocol for your agency and make sure that a neuro assessment is included. Perform mock patient assessments to better understand stroke symptoms and common mimics.

**Put it to Action:** The Cincinnati Pre-hospital Stroke Scale predicts the likelihood that a patient's symptoms are related to stroke. Here are some common signs and symptoms of stroke:

- Facial drooping
- One-sided weakness or numbness, in the arms or legs or face
- Trouble walking, dizziness, loss of balance
- Speech that is slurred or garbled, or not making sense
- Visual disturbances, such as blurry vision or double vision in one or both eyes
- Severe headache

Your agency can do mock patient assessments to practice identifying stroke and stroke mimics. Common stroke mimics include:

- Low blood sugar (hypoglycemia)
- Vertigo
- Migraine headache
- Bell's Palsy
- Residual symptoms left over from a previous stroke

But what if you're still not sure? You can only gather so much information in the pre-hospital setting. If you are unsure, it is appropriate to notify the hospital with a "stroke alert," "neuro alert," "code stroke," or "suspected stroke."

## BARRIER: TOO MUCH TIME SPENT ON SCENE

**Sample QI Activity:** Include an “on-scene time limit” on your CVA/stroke protocol and perform a mock stroke code.

**Put it to Action:** Add an on-scene time goal to your stroke protocol, such as “limit scene time to 10 minutes.” Research shows that EMS stroke protocols that include specific guidelines for on-scene time are more likely to reduce on-scene times than those with no or general timing instructions. Here are some ideas to minimize scene time:

- Know what questions to ask the patient/family to determine Last Known Well (LKW). [Practice determining LKW here.](#)
- Ask the family member to ride along in the back of the rig to answer questions on the way to the hospital. If no family member is available, get a cell phone number.
- Grab the patient’s medications and bring them along to the hospital.
- Complete patient assessment and treatment in the moving ambulance. This includes assessment to include CPSS, blood glucose, 12-lead and IV.
- If the patient is capable and willing, consider having the patient walk to the ambulance. This gives the EMT additional opportunity to assess the patient’s gait, arm movements, etc.
- Know your hospital destination so that family members or others can be advised without delay.

**Put it to Action:** Get a team of people together to perform a mock stroke code. A simple mock code can be done in a short period of time with everyone in the same room:

1. Assign one person to be in charge of running the mock code.
2. Give people name tags so their role in the code is clear: dispatch, first responder 1, first responder 2 (driver), patient, patient’s daughter.
3. Have the leader read a description of the dispatch call.

**Example:** The patient’s daughter drove over to her father’s house after receiving a strange phone call from him. She called 9-1-1 after finding him slumped over on his chair. He appears to be very confused and doesn’t know what is going on.

4. Ask the “dispatcher” to practice assessment questions in order to get more information about the patient’s condition and the possible reason for the 9-1-1 call.
5. Instruct “first responder 1” and “first responder 2” to walk through the steps of arriving at the patient’s home, doing a quick assessment and loading the patient. Talk through steps that you will take to minimize on-scene times.

## BARRIER: LACK OF DESTINATION PROTOCOLS

**Sample QI Activity:** Identify hospitals' level of stroke care.

**Put it to Action:** Review and display a list and/or map of stroke certified or stroke designated hospitals in your area. EMS should deliver patients to the most appropriate stroke certified or designated hospital. Occasionally, the most appropriate stroke designated hospital may not be able to accept stroke patients. It is important to pre-notify the hospital that you are on your way so they can be prepared. Reasons a hospital may be unable to accept stroke patients include: scheduled or unscheduled maintenance on their CT scanner, a CT scanner that is already in use or unavailable hospital staff.

**Note:** In Minnesota, the Minnesota Department of Health designates hospitals that meet the minimum requirements for treating acute stroke patients based on national recommendations. A list of designated hospitals is updated each quarter at: <http://www.health.state.mn.us/divs/healthimprovement/programs-initiatives/in-healthcare/ssdesignatedhospitals.html>.

The locations of nationally certified stroke centers in Wisconsin are displayed on the Coverdell Stroke Program webpage <https://www.dhs.wisconsin.gov/cardiovascular/index.htm>.

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## BARRIER: IDENTIFYING TIME PATIENT WAS LAST KNOWN WELL (LKW)

**Sample QI Activity:** Work with EMS providers on sample scenarios and questions to determine the LKW clock time.

**Put it to Action:** Identifying the time the patient was LKW (or at baseline), is essential to determine if emergent treatment can safely be used. Here are some tips to help you accurately document a patient's LKW clock time:

- If the patient or family reports that the patient was last normal “\_\_\_\_\_ minutes ago,” convert that to a clock time and verify that with the patient/family, for example, “so that would be about 2:15 this afternoon?” and then record as 14:15.
- Stroke patients are not always the best historians or may not be able to communicate clearly so getting any information you can from the family or bystanders is important.
- Having a specific time documented using the 24-hour clock avoids any miscommunication as the patient is seen by various providers in the ED.
- If symptoms resolved and returned, determine the LKW time before the first episode as well as the most recent episode. Make sure to determine if all symptoms completely resolved between episodes or if any symptoms remained.



**Put it to Action:** If asked when symptoms started, people often identify the time symptoms were first noticed. It is important to clarify:

- Is that when you first noticed the symptoms or when you last remember being normal?
- What were you doing when you noticed the symptoms? What were you doing before that? Was everything normal?
- What is your normal routine? Did you have problems with that today?
- If symptoms were present upon waking, what time did you go to bed last night? Did you get up during the night? Did you have any problems then?

If you are unsure when the patient was Last Known Well, try to help the patient identify a timeframe:

- What was on TV when you last remember being normal?
- What time did you get home? What did you do after that?
- What time did you talk to your daughter? Can we get her phone number to call her and see if she remembers what time it was?
- What time did you get up? Talk me through your morning routine and when you first noticed something was different.

**Put it to Action:** Case study to determine the patient's Last Known Well (LKW) time:

- 9-1-1 was called at 10:05AM — “I think my dad is having a stroke.”
- EMS arrived to the scene at 10:18AM.
- The son, John, said, “I arrived about 20 minutes ago and noticed that the right side of my dad’s face wasn’t moving normally and he was having a hard time using his right arm, especially the hand. I think his speech sounds slurred too.”
- The patient, Paul, was asked when the symptoms started. “I was fine until about five minutes before John arrived. I couldn’t keep hold of the starter handle on the mower. Every time I tried to pull the starter, my hand slipped off.”

Do you have enough information to determine Paul’s LKW time? What else do you need to know? We know what time John and Paul noticed the symptoms, but that doesn’t tell us when Paul was last normal.

- Paul was asked to talk through his morning routine to determine if he was truly normal at any time after waking.
- Paul got up at 7:30AM, used the bathroom and made coffee. He ate breakfast and took a shower without any difficulty.
- John called about 45 minutes before he arrived to say he was running some errands and would stop by. Neither John nor Paul noted any slurred speech during the conversation.
- About 5-10 minutes after John called, Paul went to get more coffee. He remembers it seemed very heavy and he ended up spilling coffee all over his shirt. He cleaned up the coffee on the floor, but had to use his left arm because he kept dropping the sponge with his right arm.

Given this sequence, the last time Paul was known to be normal was when he spoke to John on the phone. What time was it?

- John arrived about 20 minutes before EMS arrived at the scene, approximately 9:58AM. He spoke to his father on the phone about 45 minutes before then, approximately 9:13AM.
- When asked if 9:13AM sounded right, John said, “I would say 9:15. Dad asked what time I would be there and I had to look at my watch to estimate when I would arrive.”
- LKW well time is 09:15 (make sure you’re using a 24-hour clock).

## BARRIER: LACK TRAINING ON STROKE GUIDELINES

**Sample QI Activity:** Have EMS staff take online courses for stroke and an annual refresher course. A list of Stroke Education Resources can be found below. When possible, have EMS personnel participate in stroke protocol and educational opportunities that are offered in your region, especially by your local hospitals.

**Put it to Action:** New employees should review the CVA/Stroke protocol upon hire and receive an orientation on the protocols for patient handoff and process for filling out and leaving a run sheet. Coordinate with area hospitals to involve/invite EMS to stroke education opportunities. Make sure that EMS is involved with any mock stroke codes that are put on by the hospitals. Contact your EMS Medical Director and discuss the need for stroke education.

Specific resources to support stroke refresher training are listed in the back of this toolkit.



## BARRIER: COMMUNICATING CRITICAL PATIENT DATA / COORDINATION OF HANDOFF

**Sample QI Activity:** Work with your local hospitals to define what information, in what order and to whom it should be communicated during the patient handoff. Develop a tool to support the communication process of critical patient information.

**Put it to Action:** Use an SBAR Communication tool to support the handoff between EMS and hospitals. Situation Background Assessment and Recommendation (SBAR) is an evidence-based communication tool used to make sure that the right information gets to the right people in the shortest timeframe:

- **Situation:** Urgent Concerns, age, sex, chief complaint
- **Background:** History of present illness, high-risk medications
- **Assessment:** General impressions, pertinent findings, vital signs, pain level
- **Recommendations/Recap:** Treatment provided, response to interventions

### Let's give it a try for a stroke patient:

- **Situation:** Our patient is a 68-year-old male with an altered state of consciousness and right-sided weakness. His wife reports that he started acting funny around dinner time (about 45 minutes ago, around 6PM). I called the hospital with a stroke alert.
- **Background:** Mr. Johnson does have a history of atrial fibrillation, but he does not take medicine because he had an ablation for it 5 years ago. He takes aspirin twice per day and took his dose this morning.
- **Assessment:** The patient has a blood pressure of 165/106, pulse of 102, oxygen at 98 and appears to be in no pain. He has a facial droop, weakness in his right arm and can follow some commands; he does appear to be a bit confused.
- **Recommendations/Recap:** Mr. Johnson is exhibiting stroke-like symptoms. His Last Known Well time is around 6PM this evening. His wife is on her way to the hospital and will be there in approximately 10 minutes.

**Put it to Action:** Use an EMS communication board in the patient's room to document critical information during the verbal report. This ensures that the same information is provided to the various providers involved in the patient's care.

**Put it to Action:** Meet with the hospital EMS coordinator, stroke coordinator and/or ED staff to develop a written protocol for the patient handoff process. The protocol should address the following elements at a minimum:

- Where should the stroke patient should be taken?
- What information should be given to the ED staff (written or verbal)?
- In what form should the information be delivered (run sheet, paper form, piece of paper, verbal report)?
- Which ED staff should receive the information?
- Where and when should the EMS run sheet be left or transmitted?

Once a protocol is established, work with your EMS staff to make sure they are aware of this process. It is also advisable to pull area EMS agencies and hospitals together to ensure as much consistency as possible.

## BARRIER: COMPLETE DOCUMENTATION OF RUN DATA

**Sample QI Activity:** Perform a quarterly audit of stroke run sheets to verify adherence to stroke protocol and documentation of stroke performance metrics on the run sheet.

**Put it to Action:** Every quarter pick five (or up to 10%) stroke run sheets to audit. This can be done using paper run sheets or electronic records. Check each run sheet for this information:

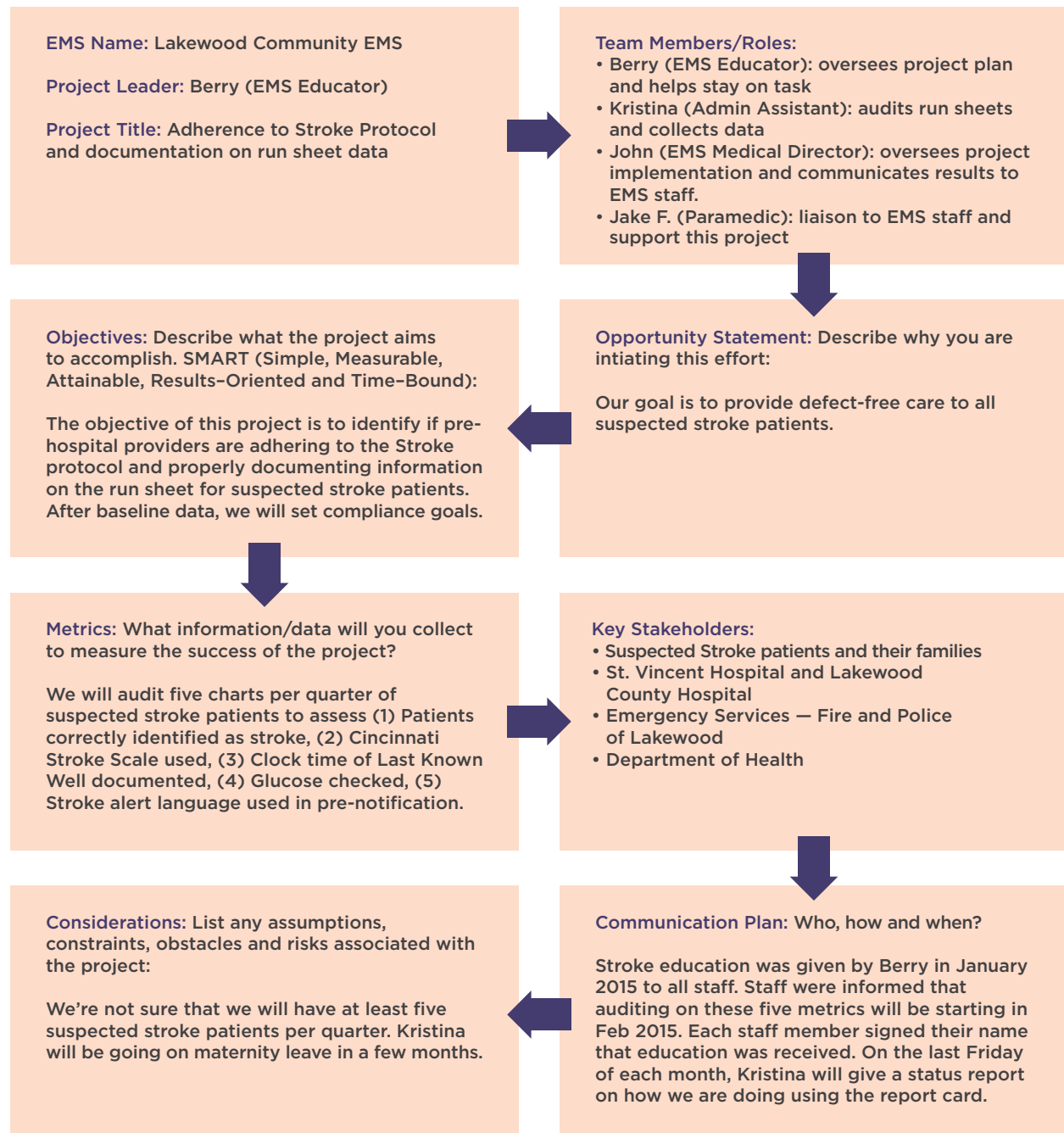
- Patients correctly identified as stroke (may require feedback from hospital)
- Patients for whom the Cincinnati Pre-hospital Stroke Scale (or other neurological assessment) was performed
- Patients for whom the Last Known Well (LKW) time is documented and recorded as a clock time
- Patients for whom glucose level was checked
- Patients for whom the hospital was notified en route of a suspected stroke
- Patients for whom scene time was kept to less than 10 minutes

After the audit is complete, compile and share the results with EMS staff on a report card. Set goals to increase adherence to the stroke protocol and run sheet documentation. Take this opportunity to educate and remind staff of the importance of data collection and how the care that is provided pre-hospital is instrumental to patient outcomes. Here is an example of a report card:

EMS Performance Metrics	Q1 2015	Q2 2015	Q3 2015	Q4 2015	Q1 2016	Q2 2016
1. Percentage of primary provider impression of CVA confirmed as stroke						
2. Percentage of stroke cases for whom the Cincinnati Pre-hospital Stroke Scale was performed and documented						
3. Percentage of patient cases for whom the Last Known Well was recorded as a clock time						
4. Percentage of stroke cases for whom the glucose level was checked						
5. Percentage of stroke cases for whom the hospital was notified en route of a suspected stroke						
6. Percentage of potential stroke patients whose scene time was kept to less than 10 minutes						

**Put it to Action:** Develop a Stroke Quality Improvement Initiative Project Plan. This project plan is used to plan and coordinate the work of a specific quality improvement project. It defines the scope, resources, objectives and execution of a project. You may choose to take a key activity from your Stroke Quality Improvement Plan and develop it further by putting it into a project plan to guide the project.

## STROKE QUALITY IMPROVEMENT INITIATIVE PROJECT PLAN





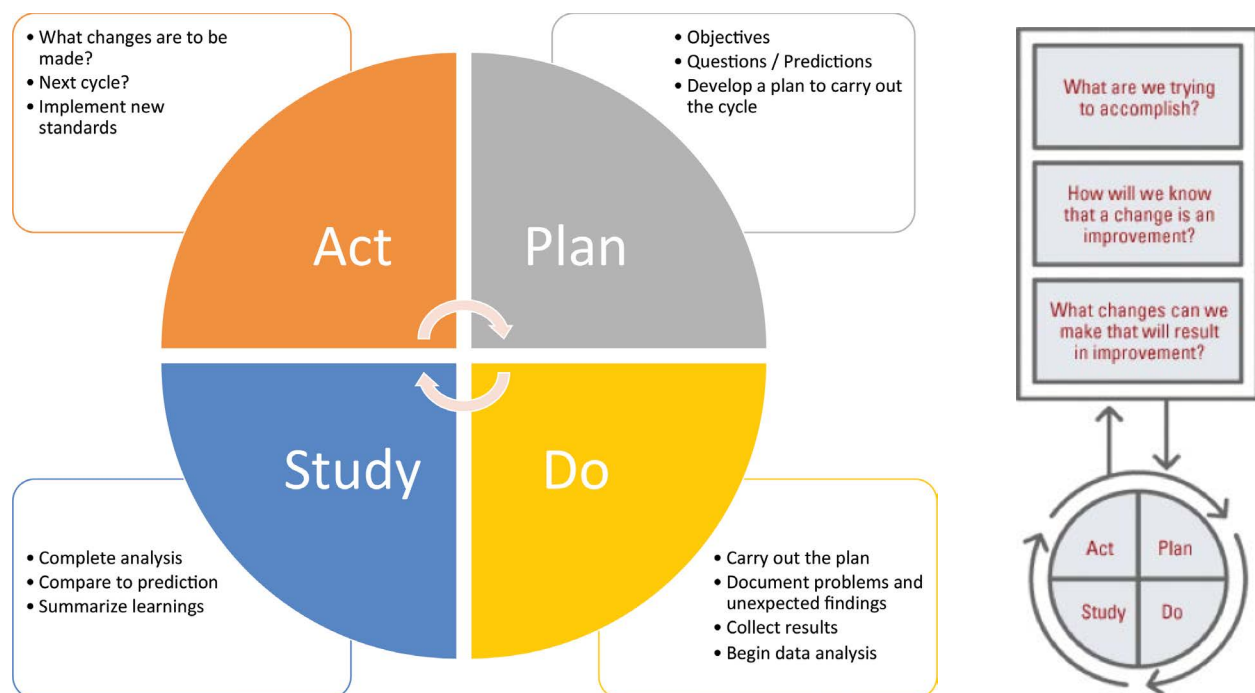
# STROKE QUALITY IMPROVEMENT INITIATIVE PROJECT PLAN

<p>EMS Name:</p> <p>Project Leader:</p> <p>Project Title:</p>	Team Members/Roles:
Objectives: Describe what the project aims to accomplish. SMART (Simple, Measurable, Attainable, Results-Oriented and Time-Bound):	Opportunity Statement: Describe why you are initiating this effort:
Metrics: What information/data will you collect to measure the success of the project?	Key Stakeholders:
Considerations: List any assumptions, constraints, obstacles and risks associated with the project:	Communication Plan: Who, how and when?

**Put it to Action:** Use the Plan-Do-Study-Act (PDSA) worksheet to test a change in your process.

The PDSA cycle is an interactive, four-stage problem-solving model used for improving a process or carrying out a change. The four stages of the worksheet include:

- **Plan:** Recruit a team, draft an aim statement, describe current context and process, describe the problem, identify causes and alternatives
- **Do:** Implement action plan
- **Study:** Determine if plan resulted in an improvement
- **Act:** Standardize a positive change, or do another PDSA if negative change



# PDSA WORKSHEET FOR TESTING CHANGE

EMS Agency: \_\_\_\_\_ Prepared By: \_\_\_\_\_ Date: \_\_\_\_\_

## AIM

**Overall goal you wish to achieve; make sure it is time-specific, measureable, and defines the specific population of patients that will be affected**

By December 31, 2016, 10 consecutive suspected stroke patients will have documentation of the Cincinnati Pre-hospital Stroke Scale, 24-hour clock time of Last Known Well (LKW), and pre-notification to the receiving hospital on the run sheet. Run sheet will have been left with hospital to scan into patient chart.

### Describe your first (or next) test of change:

#### Person responsible

#### When to be done

#### Where to be done

Train EMS staff on the updated Stroke/CVA protocol.

EMS Educator

By June 30, 2016

EMS grounds

## PLAN

### List the tasks needed to set up this test of change

#### Person responsible

#### When to be done

#### Where to be done

1. EMS Educator to develop materials to teach pre-hospital providers appropriate care guidelines for suspected stroke patients. Develop materials for 45-minute training (e.g., pre-test and post-test, PowerPoint and quick guide handout).
2. EMS Educator and EMS Manager to train staff about protocol for suspected stroke patients.
3. EMS will demonstrate learning by using "teach back" method and self-graded post-test.

EMS Educator;  
EMS Manager

Three training dates by June 1st (attendance at one training session mandatory for all employees).

Main Conference room; order pizza

### Predict what will happen when the test is carried out

#### Measures to determine if prediction succeeds

Ten consecutive suspected stroke patients will have a documented Cincinnati Stroke Scale, LKW and pre-notification to receiving hospital on run sheet.

Abstract run sheet data by hospital to determine if Cincinnati Pre-hospital Stroke Scale, LKW and pre-notification are documented; reports available.

## DO

### Describe what actually happened when you ran the test

Trained EMS staff in June. Collected further data through August. July and August data indicates that Last Known Well (LKW) was being documented as “unknown” in at least 50% of the suspected stroke patients. Of suspected stroke patients, 100% had a documented neuro assessment of Cincinnati Pre-hospital Stroke Scale and 90% had documentation of pre-notification to the hospital.

## STUDY

### Describe the measured results and how they compared to the predictions

Case review plus informal interviews with staff found that if the patient/family could not identify when the patient was last normal (at their baseline), that the LKW was being documented as unknown. EMS staff was able to increase documentation of LKW, but it was unexpected for this documentation to be listed as “unknown” instead of a clock time. Adherence to the protocol for a neuro assessment of the Cincinnati Pre-hospital Stroke Scale and pre-notification to the hospital is as expected. One of the two cases where pre-notification was not documented noted that the patient refused to be brought to the hospital. An informal interview revealed that the second case that did not receive pre-notification was because they were only a few minutes away from the hospital.

## ACT

### Describe what modifications to the plan will be made for the next cycle from what you learned

EMS Educator will send out a memo and post reminders for EMS staff to document a clock time of LKW. EMS Educator will develop a short 20-minute follow-up training (to be tacked on to cardio training day) to provide education on how to determine LKW (specifically, what questions to ask the patient/family to drill down to an actual LKW time, including how to document and ask questions on possible wake-up stroke). This will also cover when it is appropriate to document “unknown” as the LKW. We will continue to review and track run sheet documentation to continuously evaluate and make appropriate changes to the PDSA cycle.

# PDSA WORKSHEET FOR TESTING CHANGE

EMS Agency: \_\_\_\_\_ Prepared By: \_\_\_\_\_ Date: \_\_\_\_\_

## AIM

Overall goal you wish to achieve; make sure it is time-specific, measureable, and defines the specific population of patients that will be affected

Describe your first (or next) test of change:

Person  
responsible

When to be done

Where to  
be done

## PLAN

List the tasks needed to set up  
this test of change

Person  
responsible

When to be done

Where to  
be done

Predict what will happen when the  
test is carried out

Measures to determine if prediction succeeds



## **DO**

**Describe what actually happened when you ran the test**

## **STUDY**

**Describe the measured results and how they compared to the predictions**

## **ACT**

**Describe what modifications to the plan will be made for the next cycle from what you learned**

# Community Outreach

Recognizing the signs and symptoms of stroke and calling 9-1-1 is one of the biggest gaps in treating stroke patients. We hear it over and over again: “if they would only get to the hospital sooner.” Many organizations are stepping up to the plate to make public awareness of stroke a priority. This includes hospitals, public health departments, the American Stroke Association, the Minnesota Stroke Association, the Wisconsin Stroke Coalition and many others. EMS too plays an important role in educating the public on the signs and symptoms of a stroke and the need to activate emergency services. This section of the toolkit provides resources for reaching out to your community by listing talking points and links to public service announcements (PSAs) and other materials.

In Minnesota, only 55.4% of adults report that they know the signs and symptoms of a stroke. This leaves over 2.3 million people who wouldn't know if they or their loved ones were having one. Furthermore, only 88% of adults report that they would call 9-1-1 as their first response if they thought someone was having a stroke. In Wisconsin, data from the Coverdell Stroke Registry in 2015 showed that approximately 40% of people admitted to the hospital for stroke treatment arrived by EMS. Studies clearly

demonstrate that a stroke patient who arrives in an ED by EMS is treated faster than a walk-in stroke patient. Clearly, there is a need to increase recognition of and response to stroke in our communities. This is our call for action!

There are many things that your EMS agency can do to provide important information about stroke to your community. You may consider several activities to reach people. And remember, you don't have to do it alone. Consider partnering with your community hospitals, government or local businesses to get the word out. Here are some suggestions:

- Stage an exhibit at the county fair
- Host an event for Stroke Month in May
- Hold town hall meetings
- Participate in summer parades
- Deliver presentations at schools
- Message using your website, Facebook or Twitter
- Print materials such as posters, flyers, bookmarks or wallet cards
- Show stroke PSA videos at events
- Host blood pressure screenings at your fire department
- Distribute stroke education materials at your fund-raising events



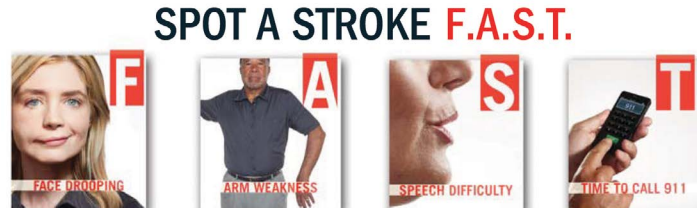
# STROKE TALKING POINTS

When you have a conversation with someone in your community, you'll want a few talking points to get things started. Here are the key messages you'll want to talk about:

## Know the signs and symptoms of a stroke

"How would I know if I'm having a stroke and what's happening inside my body?"

The acronym FAST is an easy way to remember the signs and symptoms of stroke.



StrokeAssociation.org/WarningSigns | 1-888-4-STROKE

**F**acial Drooping

**A**rm Weakness

**S**lurred Speech

**T**ime to call 9-1-1

A stroke happens when there is a blood clot in the brain (ischemic stroke) or a blood vessel in the brain that bursts (hemorrhagic stroke), causing blood flow to the brain to stop. This is sometimes called a brain attack. A person who has a stroke may lose function of their body parts and often spends time in rehabilitation to regain their strength. Some people may die from a stroke.

## Stroke is an emergency and the first step is to call 9-1-1

"I only live 10 minutes from the hospital; I'll just get a ride."

Someone may feel silly calling an ambulance when they live a short distance from the hospital, but calling 9-1-1 is more than a ride in an ambulance. A paramedic will ask the patient or their family important questions that the doctor will need to know, like what medications they are taking, or when their symptoms started. Emergency workers will also call the hospital ahead of time so they can have a team of people waiting for the patient at the door, with all the right equipment turned on and ready.

## A stroke doesn't hurt (most of the time)

"I have slurred speech and a weak arm, but it's not painful, so what's the emergency?"

Doctors have a short time window (4.5 hours) to give people a lifesaving drug for an ischemic stroke (the clot kind). Even if it does not hurt, stroke patients lose millions of brain cells every minute. If someone having a stroke does not get to the hospital in time to be treated, they may not regain certain functions and could even die.

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# Resources

## COMMUNITY EDUCATION

### Links to PSAs, Print Material and Web Material

- [FAST materials for print and web](http://www.strokeassociation.org/STROKEORG/Professionals/Ad-Council_UCM_451917_SubHomePage.jsp) from the American Stroke Association: magazine, newspaper, bus shelter, billboard, web banner and mobile app banner ([http://www.strokeassociation.org/STROKEORG/Professionals/Ad-Council\\_UCM\\_451917\\_SubHomePage.jsp](http://www.strokeassociation.org/STROKEORG/Professionals/Ad-Council_UCM_451917_SubHomePage.jsp))
- FAST and Stroke Awareness print materials from the Minnesota Stroke Partnership: tip cards, bookmarks and posters
- [Customizable print materials](http://www.strokeassociation.org/STROKEORG/Professionals/CommunityResourcesandPatientEd/Stroke-Community-Resources-and-Patient-Education_UCM_451855_SubHomePage.jsp) from the American Stroke Association (username and password; [http://www.strokeassociation.org/STROKEORG/Professionals/CommunityResourcesandPatientEd/Stroke-Community-Resources-and-Patient-Education\\_UCM\\_451855\\_SubHomePage.jsp](http://www.strokeassociation.org/STROKEORG/Professionals/CommunityResourcesandPatientEd/Stroke-Community-Resources-and-Patient-Education_UCM_451855_SubHomePage.jsp))
- [Stroke Awareness Body Language PSA video](https://www.youtube.com/watch?feature=player_embedded&v=wH7k5CFp4hl) from the American Stroke Association ([https://www.youtube.com/watch?feature=player\\_embedded&v=wH7k5CFp4hl](https://www.youtube.com/watch?feature=player_embedded&v=wH7k5CFp4hl))
- [12 Signs of Stroke PSA video](https://www.youtube.com/watch?v=evu_ZHKNPOc) from the Minnesota Department of Health ([https://www.youtube.com/watch?v=evu\\_ZHKNPOc](https://www.youtube.com/watch?v=evu_ZHKNPOc))
- [Rural EMTs speak out on stroke PSA video](https://www.youtube.com/watch?v=5APe_Na75m8) from the Minnesota Department of Health ([https://www.youtube.com/watch?v=5APe\\_Na75m8](https://www.youtube.com/watch?v=5APe_Na75m8))
- [Stroke Awareness and Education Resource Toolkit](http://www.mnstrokepartnership.org/documents/StrokeToolkitsV2.pdf) from the Minnesota Stroke Partnership (<http://www.mnstrokepartnership.org/documents/StrokeToolkitsV2.pdf>)
- [15 Things Caregivers Should Know After a Loved One Has Had a Stroke](http://www.strokeassociation.org/STROKEORG/LifeAfterStroke/ForFamilyCaregivers/CaringforYourLovedOne/15-Things-Caregivers-Should-Know-After-a-Loved-One-Has-Had-a-Stroke_UCM_310762_Article.jsp) — available from the American Heart Association ([http://www.strokeassociation.org/STROKEORG/LifeAfterStroke/ForFamilyCaregivers/CaringforYourLovedOne/15-Things-Caregivers-Should-Know-After-a-Loved-One-Has-Had-a-Stroke\\_UCM\\_310762\\_Article.jsp](http://www.strokeassociation.org/STROKEORG/LifeAfterStroke/ForFamilyCaregivers/CaringforYourLovedOne/15-Things-Caregivers-Should-Know-After-a-Loved-One-Has-Had-a-Stroke_UCM_310762_Article.jsp))
- [Resources from the National Stroke Association](http://www.stroke.org/site/PageServer?pagename=recov) (<http://www.stroke.org/site/PageServer?pagename=recov>)
- [For caregivers and families](http://www.stroke.org/site/PageServer?pagename=care) (<http://www.stroke.org/site/PageServer?pagename=care>)

## STROKE TRAINING AND EDUCATION

### EMS Stroke Education Resources from the American Stroke Association

- [Stroke Training for EMS Professionals PDF guide](http://www.strokeassociation.org/idc/groups/stroke-public/@wcm/@hcm/@sta/documents/downloadable/ucm_456069.pdf) ([http://www.strokeassociation.org/idc/groups/stroke-public/@wcm/@hcm/@sta/documents/downloadable/ucm\\_456069.pdf](http://www.strokeassociation.org/idc/groups/stroke-public/@wcm/@hcm/@sta/documents/downloadable/ucm_456069.pdf))
- [EMS Stroke Assessment Guide \(Target Stroke\)](http://www.strokeassociation.org/idc/groups/stroke-public/@wcm/@hcm/@sta/documents/downloadable/ucm_454087.pdf) ([http://www.strokeassociation.org/idc/groups/stroke-public/@wcm/@hcm/@sta/documents/downloadable/ucm\\_454087.pdf](http://www.strokeassociation.org/idc/groups/stroke-public/@wcm/@hcm/@sta/documents/downloadable/ucm_454087.pdf))
- [EMS Course Information Stroke Treatment Course PDF](http://www.strokeassociation.org/idc/groups/stroke-public/@wcm/@hcm/@sta/documents/downloadable/ucm_452372.pdf) ([http://www.strokeassociation.org/idc/groups/stroke-public/@wcm/@hcm/@sta/documents/downloadable/ucm\\_452372.pdf](http://www.strokeassociation.org/idc/groups/stroke-public/@wcm/@hcm/@sta/documents/downloadable/ucm_452372.pdf))
- [Get With The Guidelines Target Stroke Initiative](http://www.heart.org/HEARTORG/General/Get-With-The-Guidelines-StrokeTarget-Stroke-Webinars_UCM_446719_Widget.jsp) ([http://www.heart.org/HEARTORG/General/Get-With-The-Guidelines-StrokeTarget-Stroke-Webinars\\_UCM\\_446719\\_Widget.jsp](http://www.heart.org/HEARTORG/General/Get-With-The-Guidelines-StrokeTarget-Stroke-Webinars_UCM_446719_Widget.jsp))

### EMS4Stroke Resources from the National Stroke Association

- [EMS Stroke Training Program](http://www.strokeawareness.com/ems4stroke/stroke-training/) (login required; <http://www.strokeawareness.com/ems4stroke/stroke-training/>)
  - Understanding the types of stroke
  - Recognizing common stroke symptoms
  - The risk factors for stroke
  - Guidelines for EMS treatment of stroke
  - Goals for EMS response times
  - The three levels of hospitals that can treat stroke
  - In-depth case studies

- **Resources for EMS Trainers** (<http://www.strokeawareness.com/ems4stroke/ems-training-resources/#tab-for-trainers>):
  - EMS Trainer's Stroke Slide Kit
  - Video showing EMS protocol for patients with stroke
  - Pre-hospital Care Presentation
  - Community Presentation on Stroke

## Licensed Institution Refresher Courses

To obtain State of Minnesota EMT certification, applicants must take an Emergency Medical Technician—Basic course, and pass the written and practical state examinations. Current cardiopulmonary resuscitation (CPR) health care provider certification is a prerequisite for this course. Some schools and organizations that offer EMT courses in the Twin Cities Metro area are:

- **Century College** 651-773-1720 [www.century.cc.mn.us](http://www.century.cc.mn.us)
- **Hennepin Technical College** 952-995-1320 [www.hennepintech.edu](http://www.hennepintech.edu)
- **Anoka-Hennepin Technical College** 763-576-4700 [www.anokatech.edu](http://www.anokatech.edu)
- **Inver Hills Community College** 651-450-8500 [www.ehs.net](http://www.ehs.net)
- **American Red Cross of the Saint Paul Area** 612-871-7676 [www.redcrosstc.org](http://www.redcrosstc.org)
- **Hennepin County Medical Center** 612-873-5681 [www.hcmc.org](http://www.hcmc.org)
- **HealthEast Academy** 651-232-1743 <https://www.healtheast.org/health-east-medical-transportation/ems-academy.html>

To obtain State of Wisconsin EMS licensure at any level (EMR, EMT, AEMT or Paramedic), applicants must successfully complete that level course and pass the National Registry of Emergency Medical Technicians (NREMT) written and practical examinations. Wisconsin utilizes the NREMT testing standards for licensure requirements. All Wisconsin Technical Colleges offer some level of EMS training for licensure. Current BLS CPR for the Healthcare Provider is a requirement to obtain and maintain licensure. Licenses are good for two years and refresher training is required every two years.

### Wisconsin Technical Colleges:

[Blackhawk Technical College](http://www.blackhawk.edu/) (<http://www.blackhawk.edu/>)  
[Chippewa Valley Technical College](http://www.cvtc.edu/) (<http://www.cvtc.edu/>)  
[Fox Valley Technical College](http://www.fvtc.edu/) (<http://www.fvtc.edu/>)  
[Gateway Technical College](https://www.gtc.edu/) (<https://www.gtc.edu/>)  
[Lakeshore Technical College](http://www.gotoltc.edu/) (<http://www.gotoltc.edu/>)  
[Madison Area Technical College](http://madisoncollege.edu/) (<http://madisoncollege.edu/>)  
[Mid State Technical College](http://www.mstc.edu/) (<http://www.mstc.edu/>)  
[Milwaukee Area Technical College](http://www.matc.edu/) (<http://www.matc.edu/>)  
[Moraine Park Technical College](http://www.morainepark.edu/) (<http://www.morainepark.edu/>)  
[Nicolet Area Technical College](http://www.nicoletcollege.edu/) (<http://www.nicoletcollege.edu/>)  
[Northcentral Technical College](http://www.ntc.edu/) (<http://www.ntc.edu/>)  
[Northeast Wisconsin Technical College](http://www.nwtc.edu/Pages/home.aspx) (<http://www.nwtc.edu/Pages/home.aspx>)  
[Southwest Wisconsin Technical College](https://www.swtc.edu/) (<https://www.swtc.edu/>)  
[Waukesha County Technical College](http://www.wctc.edu/) (<http://www.wctc.edu/>)  
[Western Technical College](http://www.westernnc.edu/default.aspx) (<http://www.westernnc.edu/default.aspx>)  
[Wisconsin Indianhead Technical College](http://www.witc.edu/) (<http://www.witc.edu/>)

# Glossary

**Cincinnati Pre-hospital Stroke Scale:** The Cincinnati Pre-hospital Stroke Scale is an assessment tool used to diagnose a potential stroke in a pre-hospital setting.<sup>7</sup> It tests three signs for abnormal findings which may indicate that the patient is having a stroke — facial droop, arm drift or speech problems. Patients with 1 of these 3 findings as a new or acute event have a 72% probability of an ischemic stroke. If all 3 findings are present, the probability of an acute stroke is more than 85%.<sup>8</sup>

**Computed tomography (CT):** CT technology combines computer-processed x-ray images from different angles to produce a cross-sectional image of specific areas scanned. A CT scan allows clinicians to see the inside of an object without cutting it open.

**Drip and Ship:** “Drip and ship” refers to the practice of starting acute stroke therapy with intravenous (IV) tissue plasminogen activator (t-PA) and then transferring a patient to a regional hospital with advanced stroke care capabilities where additional therapies can be offered.

**FAST:** This mnemonic has become an easy way for the public to remember the urgency in recognizing and responding to stroke signs and symptoms. When a person exhibits Facial droop, Arm drift or Speech problems, it is Time to call 9-1-1.

**Glasgow Coma Scale:** This neurological scale is an objective way to record the conscious state of a person for initial assessment. The scale is scored from 3 (deep unconsciousness) to 15. This is often used by EMS for acute medical and trauma patients.

**Hemorrhagic stroke:** A hemorrhagic stroke is a kind of stroke caused when a blood vessel in the brain ruptures or tears and blood from the vessel seeps into the brain tissues and damages the brain cells. This type of stroke, most often caused by high blood pressure and brain aneurysms, accounts for approximately 13% of all strokes.

**Ischemic stroke:** An ischemic stroke, sometimes called a “brain attack,” is similar to a heart attack except that it happens in the brain. Clots can form in the blood vessels that lead to or are in the brain. Sometimes clots can form in other areas of the body and travel to the brain. Ischemic strokes can also be caused by too much plaque (fatty deposits and cholesterol) that can clog vessels. When a blockage occurs, it robs brain cells of the oxygen and glucose they need to survive. About 87% of all strokes are ischemic.<sup>9</sup>

**Last Known Well:** Last Known Well (LKW) time is the exact time when the patient was observed or known to be normal and without stroke symptoms.

**Los Angeles Pre-hospital Stroke Screen (LAPSS):** The LAPSS is a tool used by EMS to screen for the probability of stroke. It includes the Cincinnati Stroke Scale as well as additional information. Although the additional questions make it longer to administer, this scale can help detect posterior strokes and those that may benefit from endovascular care.

**National Institutes of Health Stroke Scale (NIHSS):** This tool is used in the acute care setting to assess the severity of stroke. The scale includes 11 items that each have a score between 0 and 4, where zero typically indicates normal function. The scores range from a minimum of 0 to a maximum of 42.

**Neuro/Stroke Alert or Code Stroke:** These terms are used to cue EMS, ED staff or a stroke team of a suspected stroke patient in need of immediate triage and treatment.

**Stroke Certification:** This is national recognition that an institution has achieved performance standards to demonstrate routine delivery of advanced stroke care according to national recommendations.

**Stroke Designation:** This state-level recognition identifies hospitals that provide a specific level of stroke care according to criteria specified by the state.

**Tissue plasminogen activator (tPA):** tPA is a protein used to break up blood clots. One of its uses is to treat ischemic stroke. It is contraindicated for hemorrhagic stroke.

<sup>7</sup>Hurwitz AS, Brice JH, Overby BA, Evenson KR (2005). “Directed use of the Cincinnati Prehospital Stroke Scale by laypersons”. *Prehosp Emerg Care* 9 (3): 292–6. doi:10.1080/10903120590962283. PMID 16147478.

<sup>8</sup>Stratford, Chris; American College of Surgeons; Pollak, Andrew N.; Benjamin Gulli; Chatelain, Les (2005). *Emergency care and transportation of the sick and injured*. Boston: Jones and Bartlett.

<sup>9</sup><http://strokeinfo.org/signsandsymptoms/stroke-facts>



## PRE-HOSPITAL STROKE CARE PRE-TEST ANSWERS

1. **C — FAST.**  
F — Facial droop or grimace. Have the patient smile and determine if the smile appears equal or unequal.  
A — Arm drift. Have the patient extend both arms straight out from the body and check for an inability to hold the arms in that position.  
S — Speech. Have the patient repeat a simple sentence. Does the patient slur their words, use wrong or unintelligible words or not able to speak?  
T — Time. If any of the above tests show an abnormal result (from what is normal for that patient), it is time to call 9-1-1.
2. **B** — A hemorrhagic stroke can occur when a blood vessel ruptures and allows blood to leak or spill into brain tissue.
3. **A — 10 minutes.** Evidence-based best practices encourage EMS on-scene times of no more than 10 minutes for suspected stroke patients. Time is brain!
4. **A — 1 hour.** Acute onset of focal neurological deficits is a warning sign of potential serious underlying issues that may result in an actual stroke. EMS should always encourage patients to seek medical attention even if their symptoms have resolved within 1 hour.
5. **E — All of the above.** EMS should always consider transporting a suspected stroke patient to a hospital that has been recognized or certified as having demonstrated proficiency in providing appropriate stroke care. EMS should learn what their local hospitals are capable of providing stroke patients. When uncertain, seek direction or assistance from your EMS Medical Director.

