

Urgent care for stroke patients: Timing is everything

Patients need to reach a certified stroke center before the thrombolytic “window” closes.

By Dorothy Moore, DNP, RN, CCRN

WHILE RELAXING at home at about 4 PM, Alan Sarangelo, a retired 62-year-old respiratory therapist, feels the left side of his face growing numb. His wife, a nurse, suspects he may be having a stroke and immediately calls 911.

At 4:25 PM, Mr. Sarangelo is emergently transported to the emergency department (ED) of a Joint Commission-accredited primary stroke center. There, clinicians note his slurred speech, left-sided facial drooping, and difficulty holding his left arm up for more than a few seconds. His vital signs are blood pressure (BP) 189/112 mm Hg; pulse, 112 beats/minute; respiratory rate (RR), 23 breaths/minute; and oxygen saturation 96% on room air. Mr. Sarangelo's wife tells them he has a history of type 2 diabetes, hypertension, and hyperlipidemia.

For stroke patients who meet certain criteria, thrombolytic therapy to break down blood clots is the primary treatment option. Tissue plasminogen activator (tPA), the most frequently used thrombolytic, is a protein that catalyzes the conversion of plasminogen to plasmin, the major enzyme that breaks down clots. To be eligible for tPA, the patient must reach a certified stroke center as soon as possible after symptom onset. By some estimates, only 3% to 5% of stroke patients get to the hospital in time to receive tPA.

Despite campaigns to educate the public to seek immediate help for symptoms of a suspected stroke, many people wait hours before doing so. Or instead of calling 911, they take the family car. Obviously, they don't realize that minutes lost mean brain tissue lost or that stroke is a life-threatening emergency that warrants an immediate 911 call. (See *How prevalent is stroke?*)

As a nurse, your assessment of the patient's signs and symptoms and your knowledge of stroke treatment are vital. All nurses should know the warning signs of stroke, teach patients and families about these key clues, and spread the word about the importance of getting immediate help. Early assessment and rapid treatment are critical to saving brain cells—and lives.

Stroke pathophysiology

Stroke occurs in two main types—ischemic (caused by a clot) and hemorrhagic (caused by bleeding in the brain). Both types deprive brain tissue of oxygen, leading to cell death and permanent brain injury.

Approximately 87% of strokes are ischemic. Hemorrhagic strokes account for only about 13% of strokes but are more lethal than ischemic strokes, causing roughly 40% of all stroke deaths. (See *Facts about hemorrhagic stroke.*)

An ischemic stroke can be thrombotic or embolic.

- A *thrombotic* stroke occurs when a thrombus (clot) forms in a cerebral artery.
- An *embolic* stroke occurs when a thrombus migrates to the brain from elsewhere in the body, typically the heart or a carotid artery. Ischemic stroke potentially can be treated with thrombolytic therapy if the patient meets strict administration criteria. Transient ischemic attacks (sometimes called ministrokes) are a type of ischemic stroke. (See *Spotlight on TIAs.*)

Stroke risk factors

Nearly half (49%) of Americans



LEARNING OBJECTIVES

1. Describe how to assess patients for stroke.
2. Discuss the use of thrombolytic therapy in patients with stroke.
3. State nursing care interventions related to stroke.

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How prevalent is stroke?

In the United States, stroke is the fifth leading cause of death and the leading cause of disability. Here are some key facts on stroke from the Centers for Disease Control and Prevention (CDC):

- On average, one American dies from stroke every 4 minutes.
- Every year, more than 795,000 people in the United States have a stroke. About 610,000 of these strokes are first or new strokes.

Facts about hemorrhagic stroke

Hemorrhagic stroke can be intracerebral or subarachnoid. Although signs and symptoms vary widely depending on severity and location of the brain bleed, these strokes share certain features—headache, nausea and vomiting, confusion, altered level of consciousness, and, in some cases, seizure. Neck stiffness and a “thunderclap” headache are the hallmarks of a subarachnoid stroke.

Nursing care for patients with hemorrhagic stroke focuses on reducing the risk of additional bleeding, including careful blood pressure management. These patients aren't eligible for thrombolytic therapy and typically require critical care or intensive care monitoring and, in many cases, rapid surgical intervention.

Spotlight on TIAs

A transient ischemic attack (TIA) is a short episode (usually less than 5 minutes) of neurologic dysfunction associated with stroke symptoms. It stems from an embolus that blocks blood flow to the brain. If the blockage is short-lived (because the clot is either dislodged or dissolved) and symptoms resolve, the event is labeled a TIA.

Most TIA symptoms resolve within 1 hour. A TIA should always be taken seriously: It's a warning of the high likelihood of a future stroke.

have at least one of the three major risk factors for stroke—high blood pressure, high cholesterol, or smoking. These risk factors can be modified by behavioral changes. Other modifiable risk factors include physical inactivity, obesity, and diabetes type 2.

Also, stroke is strongly linked to atrial fibrillation (AF): About 15% of persons who have strokes have AF, an arrhythmia in which blood may pool in the heart and form a clot that travels to the brain to cause a stroke. Proper AF management with anticoagulants can help prevent a stroke.

Nonmodifiable risk factors for stroke include the following:

- **Age:** For each decade after age 55, the odds of having a stroke approximately double.
- **Personal history of stroke, TIA, or myocardial infarction (MI):** Stroke risk increases greatly for

people who've already had a stroke or MI. TIAs are strong predictors of future stroke.

- **Family history:** Having a first-degree relative who has had a stroke increases your stroke risk.
- **Race:** African-Americans have almost double the risk of first-ever strokes compared to whites. They also have higher stroke death rates.
- **Gender:** Women have more strokes than men and are more likely to die from them. Their increased risk stems partly from use of oral contraceptives and postmenopausal hormone replacement therapy.

Assessing patients for stroke

Stroke or suspected stroke is an emergency that calls for an immediate response. If you suspect your patient is having a stroke, activate a stroke alert, notify the

physician, or call 911 (depending on your location).

To detect stroke quickly, first responders and other frontline providers use several well-known stroke scales, including the Cincinnati Stroke Scale and the Los Angeles Prehospital Stroke Scale. These scales share many similar elements, some of which are part of the FAST exam. (See *FAST and BEFAST*.)

The National Institute of Neurological Disorders and Stroke describes these major signs and symptoms of stroke:

- sudden numbness or weakness of the face, arms, or legs
- sudden confusion or trouble speaking or understanding others
- sudden trouble seeing in one or both eyes
- sudden trouble walking, dizziness, or loss of balance or coordination
- sudden severe headache with no known cause.

NIHSS and mNIHSS tools

Nurses who manage patients with acute stroke should develop expertise in administering the National Institutes of Health Stroke Scale (NIHSS), a tool that objectively quantifies a patient's stroke impairment. The NIHSS consists of 11 items that rate the patient's neurologic functioning, including level of consciousness, best gaze, visual fields, facial palsy, motor function, limb ataxia, sensory function, language, articulation, and inattention. The lower the score, the better the patient's prognosis. The modified NIHSS (mNIHSS), a short version of the NIHSS, is less widely used but has better inter-rater reliability than the older NIHSS.

Your role in thrombolytic therapy and stroke alert activation

Your initial evaluation of a patient with a suspected stroke should include airway, breathing, and circulation, followed by neurologic as-

assessment using either the NIHSS or the mNIHSS, per facility policy. If you suspect a stroke, immediately notify the attending physician, who will call for a stroke alert or code stroke.

A stroke alert or code stroke should run as efficiently as a code blue. Nurses should have preassigned roles that include drawing blood for lab work, maintaining communication with the patient's family, and communicating with physicians and computed tomography (CT) staff.

Connect the patient to the cardiac monitor to track heart rhythm and use an oximeter to monitor oxygenation status. Implement aspiration and seizure precautions. Be aware that controversy exists over whether to elevate the head of the bed because this can increase intracranial pressure; however, increased aspiration risk (from not elevating the head of the bed) must be considered. Be sure to follow facility policy and procedure.

Stroke alert team protocol

The following steps constitute a typical stroke alert team protocol with the goal of obtaining a CT scan within 25 minutes of the patient's hospital arrival.

Blood pressure monitoring

If the patient is a tPA candidate, maintain systolic BP below 185 mm Hg and diastolic BP below 110 mm Hg. Expect the physician to order labetalol or nicardipine to lower BP to goal pressures. If BP can't be maintained below these goals, the patient is not a tPA candidate. Caution: Rapidly lowering BP is contraindicated because it may reduce perfusion to ischemic brain tissue.

CT: The gold standard

A noncontrast CT scan of the brain is the diagnostic test of choice to rule out hemorrhagic stroke in an emergency. Time is critical, as studies show that delays in administer-

FAST and BEFAST

Widely taught to the general public, the FAST exam is a quick, focused assessment you can incorporate into your practice. FAST stands for:

- **Facial drooping.** Assess both sides of the patient's face. Does one side droop? Does the patient report that one side feels numb or tingly? Ask the patient to smile; watch for weakness on one side, closely comparing the nasolabial folds ("laugh lines") on either side of the nose. Be aware that facial asymmetry can be subtle; a family member of the patient may notice changes you wouldn't, so be sure to note those observations.
- **Arm weakness.** Is one arm weak or numb? Ask the patient to grip your hands; does he or she report numbness or tingling? Have the patient close the eyes and raise the arms for 10 seconds; watch for drift on one side.
- **Slurred speech.** As the patient talks, listen for slurring. Ask the patient to repeat a simple phrase; can he or she repeat it correctly?
- **Time.** If the patient has any of the above signs or symptoms, call 911 immediately and note the time of symptom onset. Don't confuse the time the patient awakened with symptoms with the last time the patient seemed "normal." If you're in a clinical setting, note the time you observed signs and symptoms, and immediately notify the provider or rapid response team (or ensure other appropriate escalation of care).

Many communities now teach emergency medical service (EMS) responders and triage nurses how to perform the BEFAST exam. BEFAST stands for:

- **Balance.** Is the patient experiencing sudden loss of balance or coordination?
- **Eyesight.** Is the patient experiencing sudden change in vision or other trouble seeing?
- **Face.** Does one side of the face droop when the patient smiles?
- **Arm or leg weakness.** Does one arm or leg drift downward when raised?
- **Speech.** Is the patient's speech slurred or strange?
- **Time to call 911.** If you observe any of these problems, call 911 immediately.

ing tPA correlate with poorer patient outcomes. The patient should undergo a CT scan within 25 minutes of arrival at a stroke center. The radiologist should read the CT scan within 45 minutes of patient arrival. A hemorrhagic stroke "lights up" the scan image with hyperdense areas of bleeding, making the patient ineligible for tPA. The scan also can detect a brain tumor, which also rules out tPA. A nurse, physician, or both must accompany the patient (who should be on a monitor) to the CT scan.

Inclusion and exclusion criteria for tPA

For patients with ischemic stroke, the goal is to rapidly restore brain perfusion to save ischemic but viable brain cells. Patients who receive tPA have a 30% higher chance of a good outcome at 3

months after the stroke.

To qualify for tPA, patients must meet strict inclusion criteria; those age 18 or older with a CT-confirmed ischemic stroke may meet these criteria. However, the physician must consider many important exclusion criteria. (See *Key contraindications for tPA*.)

A successful response to tPA requires careful adherence to the administration protocol. This therapy should begin as soon as possible—within 3 hours (or in some cases, 4.5 hours) of symptom onset. If the drug is given beyond this administration window, the risk of intracranial hemorrhage from tPA increases. (See *Golden hour: Door-to-treatment time for ischemic stroke patients*.)

To help determine your patient's tPA eligibility, conduct a thorough history and perform an assessment,

Key contraindications for tPA

Your knowledge of contraindications for tissue plasminogen activator (tPA) can help you gather the most pertinent information about your patient's history, such as recent surgeries and anticoagulant use. If the bleeding risk outweighs potential benefits of tPA therapy, the patient shouldn't receive this therapy.

Contraindications include:

- current intracranial hemorrhage
- signs or symptoms of subarachnoid hemorrhage (such as sudden severe headache, stiff neck, nausea, light sensitivity, decreased vision, and altered level of consciousness)
- active internal bleeding
- recent (within the last 3 months) intracranial or intraspinal surgery, stroke, or serious head trauma
- computed tomography confirmation of multilobar infarction
- intracranial neoplasm, aneurysm, or arteriovenous malformation
- bleeding disorders
- current anticoagulant therapy
- elevated blood pressure (systolic pressure above 185 mm Hg or diastolic pressure above 110 mm Hg).

Other exclusion criteria may include major surgery or trauma within the last 14 days, pregnancy, advanced age (typically older than 80), rapidly improving stroke symptoms, and urinary tract or GI bleeding within the last 21 days. Also, an abnormally low blood glucose level (below 50 mg/dL) may mimic stroke symptoms; unless the glucose level is normalized, tPA administration is contraindicated.

including vital signs and point-of-care blood glucose level. If a family member is present, ask this person if he or she knows what time the patient's symptoms began. Use your assessment time wisely. Keeping tPA exclusion criteria in mind, gather as much pertinent information as possible about the patient's history.

The decision to initiate tPA treatment must be carefully considered after consultation between the physician and the patient or patient's spokesperson. The patient or spokesperson must consent to the procedure after being fully advised of risks and benefits. Risks include bleeding in the brain, internal bleeding (other than in the brain), and allergic reactions. The most common allergic reaction is angioedema, which occurs in 1% to 2% of patients. Stay alert for hives and lip or other perioral swelling; notify the physician immediately if these occur.

Critical care monitoring

To evaluate for neurologic deterioration, patients receiving tPA must undergo neurologic assessment every 15 minutes with the NIHSS or mNIHSS (depending on facility protocol) during the 1-hour infusion and the first hour after the infusion ends. Neurologic checks should be repeated every 30 minutes for the next 6 hours and then hourly until 24 hours after the infusion. Expect the physician to order a follow-up CT or magnetic resonance imaging scan at the 24-hour mark.

Continue to monitor and control BP as needed every 15 minutes for the first hour after the infusion ends, every 30 minutes for the next 6 hours, and then hourly from the eighth post-infusion hour until hour 24. Withhold oral intake until a swallow evaluation is completed and documented. Nurses working in stroke centers receive education in performing a bedside swallow

screen using a validated tool. The swallow evaluation is a priority for stroke patients, who are at high risk for aspiration pneumonia—a serious complication that accounts for 15% to 20% of stroke-related deaths.

Stent clot retrieval devices for acute ischemic stroke

In addition to tPA, 2015 updated guidelines from the American Heart Association/American Stroke Association endorse use of stent clot retrieval devices (similar to those used to open clogged coronary arteries) for carefully screened patients with acute ischemic large-vessel strokes. This endovascular treatment, done by a neurointerventionalist, can greatly reduce the risk of permanent disability.

Stent clot retrievers are fine wire mesh tubes that trap the blood clot and allow it to be pulled from the brain. Done with the patient under sedation or general anesthesia, the procedure resembles cardiac catheterization. It's offered to patients who've received tPA and must be initiated within 6 hours of stroke onset and completed by hour 8.

This procedure has certain risks. Also, only a limited number of comprehensive stroke centers offer it, although the number is increasing. Fortunately, rapid critical care transport to a comprehensive stroke center is a growing reality, even from rural locations. (*Note:* Primary stroke centers are certified to take care of most patients with ischemic stroke. Comprehensive stroke centers offer care for all types of stroke patients, offering minimally invasive procedures for clot retrieval and neurosurgery for complex procedures, such as brain aneurysm clipping.)

Nursing care: A critical difference for stroke patients

Mr. Sarangelo responds well to two I.V. pushes of 10 mg labetalol to lower his systolic pressure below 185 mm Hg and diastolic pressure

Golden hour: Door-to-treatment time for ischemic stroke patients

The following table outlines critical actions that need to happen within the first hour after a patient with a suspected stroke arrives in the emergency department (ED).

Clock time	Goal action
Time zero	<ul style="list-style-type: none"> • Patient arrives at ED and stroke alert is initiated.
10 minutes or less	<ul style="list-style-type: none"> • Physician performs and documents brief neurologic evaluation using NIHSS or another scale. Evaluate patient clinically for illicit drug or alcohol use. • Primary nurse establishes and documents the time patient was last seen in normal state. • Nurse performs STAT point-of-care blood glucose test (hypoglycemia can mimic stroke or seizure) and draws blood for STAT lab work—prothrombin time, INR, complete blood count without differential, chem 7 panel, troponin, blood typing and cross-matching. • Nurse records vital signs, provides oxygen to keep oxygen saturation above 94%, and places patient on cardiac monitoring, pulse oximetry, and continuous vital sign monitoring. • Nurse establishes two large-bore I.V. sites (preferably 18G antecubital). Back-up I.V. site is recommended if tPA will be given.
15 minutes or less	<ul style="list-style-type: none"> • Charge nurse notifies neurology and CT department of pending patient arrival and notifies pharmacy of potential tPA preparation. • ED tech obtains 12-lead ECG. (Don't delay CT scan to obtain ECG.) • ED tech weighs patient and documents weight. (tPA is a weight-based medication.) • Patient is kept NPO until swallow screen is completed.
25 minutes or less	<ul style="list-style-type: none"> • Head CT scan is obtained, with patient accompanied by RN or physician.
45 minutes or less	<ul style="list-style-type: none"> • CT scan is read and patient's eligibility for tPA is determined. Once decision is made to give drug, nurse obtains or prepares tPA.
60 minutes or less	<ul style="list-style-type: none"> • As ordered, nurses give tPA bolus and begin tPA infusion. Two nurses should check dosage of this high-alert medication before it's administered.

CT: computed tomography. ECG: electrocardiogram. INR: International normalized ratio. NIHSS: National Institutes of Health Stroke Scale. NPO: Nothing by mouth. tPA: tissue plasminogen activator.

below 110 mm Hg. After clinicians determine he's a good candidate for tPA, he receives the infusion.

Eventually, Mr. Sarangelo recovers fully from his stroke with no residual deficits. A month later, he returns to the stroke center to thank the nursing staff. Luckily for him, his wife recognized the warning

signs of a stroke and called 911 right away. Otherwise, he might have been ineligible for the brain-saving thrombolytic therapy he received.

Even if you don't work in a stroke center, your knowledge of stroke assessment and the timeline

for emergent care of ischemic stroke can help minimize the devastating effects of stroke and even save your patient's life. Teach patients about signs and symptoms of stroke. Provide education on the major modifiable risk factors for stroke and encourage patients to make lifestyle changes to lower their stroke risk. Most importantly, urge them to call 911 if they or a loved one exhibits stroke signs and symptoms. ★

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Selected references

Broderick JP, Jauch EC, Derdeyn CP. American Stroke Association Stroke Council Update: sea change for stroke and the American Stroke Association. *Stroke*. 2015;46(6):e145-6.

Centers for Disease Control and Prevention. Stroke Facts. Updated March 24, 2015. cdc.gov/stroke/facts.htm

Davis SM, Donnan GA. 4.5 hours: the new time window for tissue plasminogen activator in stroke. *Stroke*. 2009;40(6):2266-7.

Jauch EC, Saver JL, Adams HP, et al; American Heart Association Stroke Council; Council on Cardiovascular Nursing; Council on Peripheral Vascular Disease; Council on Clinical Cardiology. Guidelines for the early management of patients with acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2013;44(3):870-947.

Lansberg MG, Bluhmki E, Thijs VN. Efficacy and safety of tissue plasminogen activator 3 to 4.5 hours after acute ischemic stroke: a metaanalysis. *Stroke*. 2009;40(7):2438-41.

McDavid JC, Bellamy LM, Thompson CJ. Abstract NS12: Is online NIHSS certification enough training. *Stroke*. 2015;46(Suppl 1).

Meyer BC, Lyden PD. The modified National Institutes of Health Stroke Scale: its time has come. *Int J Stroke*. 2009;4(4):267-73.

Powers WJ, Derdeyn CP, Biller J, et al.; on behalf of the American Heart Association Stroke Council. 2015 AHA/ASA Focused Update of the 2013 Guidelines for the Early Management of Patients with Acute Ischemic Stroke Regarding Endovascular Treatment: A Guideline for Healthcare Professionals from the American Heart Association/American Stroke Association. *Stroke*. 2015;46(10):3020-35.

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Anita Longwood is a 70-year-old white woman with a 15-year history of type 2 diabetes, well managed with an oral hypoglycemic agent, diet, and exercise. Her most recent hemoglobin A1c level was 4.3% and her last total cholesterol level was 180 mg/dL. She lives in an apartment and volunteers at the local community center twice a week. One evening, Ms. Longwood arrives in your emergency department (ED)

with symptoms that may indicate a stroke. You learn that her mother had a stroke at age 75.

Ms. Longwood's blood pressure is 136/78 mm Hg. Her last cholesterol level was 180 mg/dL. At 5'6" tall, she weighs 150 lb. You observe she is in normal sinus rhythm. As you answer the following questions, keep Ms. Longwood in mind.

Please mark the correct answer online.

1. Which statement about the type of stroke Ms. Longwood may be having is correct?

- About 87% of strokes are hemorrhagic.
- Thrombotic strokes are more lethal than hemorrhagic strokes.
- The two types of ischemic strokes are thrombotic and embolic.
- Ischemic strokes cause about half of all stroke deaths.

2. Which of the following stroke risk factors does *not* apply to Ms. Longwood?

- Age
- Race
- High cholesterol level
- Family history

3. Which of the following puts Ms. Longwood at higher risk for stroke?

- Type 2 diabetes
- Cholesterol level
- Her blood pressure
- Her weight

4. The paramedic who transported Ms. Longwood to the ED says he conducted the BEFAST exam. Which exam result would lead you to suspect Ms. Longwood is having a stroke?

- She reports increasing balance difficulty over the past 8 years.
- Her smile is equal on both sides.
- She has used reading glasses for the past 5 years.
- Her left arm drifts downward when raised.

5. Fortunately, Ms. Longwood does not have a history of TIA. Which of the following statements about TIAs is correct?

- TIAs usually last fewer than 5 minutes.
- TIAs usually last about 15 minutes.
- TIAs aren't associated with stroke syndromes.
- TIAs are caused by a small hemorrhage.

6. You assess Ms. Longwood's airway, breathing, and circulation and don't find immediate problems. You then use the

modified National Institutes of Health Stroke Scale (mNIHSS) to assess Ms. Longwood. This scale:

- is more widely used than the older NIHSS.
- consists of 22 items that rate neurologic function.
- objectively quantifies a patient's stroke impairment.
- has lower inter-rater reliability than the older NIHSS.

7. Based on your assessment and consultation with Ms. Longwood's physician, you alert the stroke team. Which statement would indicate the team is responding to Ms. Longwood's needs correctly?

- A computed tomography (CT) scan is obtained 15 minutes after her arrival at the ED.
- A CT scan is obtained 30 minutes after her arrival at the ED.
- Nurses don't have preassigned roles to facilitate response.
- Clinicians decide she doesn't need an oximetry monitor at this time.

8. Which of the following would lead Ms. Longwood's physician to decide she is a candidate for thrombolytic therapy?

- She is diagnosed with a hemorrhagic stroke.
- Her CT scan shows multilobar infarction.
- She had urinary tract bleeding 7 days ago.
- Her diagnosis is ischemic stroke.

9. The goal is to start Ms. Longwood's tissue plasminogen activator (tPA) therapy within how many hours of her symptom onset?

- 1 hour
- 3 hours
- 7 hours
- 9 hours

10. You monitor Ms. Longwood for adverse effects of tPA, including angioedema. Which statement about this condition is correct?

- Signs and symptoms include hives and perioral swelling.

- It occurs in 15% to 18% of patients who receive tPA.
- It is the least common allergic reaction to tPA.
- You should monitor symptoms for 1 hour before notifying the physician.

11. During and after the tPA infusion, you monitor Ms. Longwood's neurologic status closely, including:

- every 30 minutes during the infusion.
- every 15 minutes during the infusion.
- every 2 hours for 6 hours after the infusion ends.
- every 3 hours for 24 hours after the infusion ends.

12. After her tPA infusion, you monitor Ms. Longwood's blood pressure closely, checking it:

- every 90 minutes for the first 6 hours after the infusion ends.
- every 60 minutes for the first 4 hours after the infusion ends.
- every 30 minutes for the first hour after the infusion ends.
- every 15 minutes for the first hour after the infusion ends.

13. Ms. Longwood is being considered for clot retrieval. Which statement about this procedure is correct?

- It is performed under local anesthesia.
- It must be completed within 6 hours of stroke onset.
- It can reduce the risk of permanent disability.
- It must begin within 4 hours of stroke onset.

14. Ms. Longwood responds well to tPA and has minimal residual problems from her stroke. You take this opportunity to teach her and her family about FAST. Which action step for FAST is correct?

- Ask the person to close the eyes and raise the arms for 30 seconds.
- Ask the person to close the eyes and raise the arms for 10 seconds.
- If FAST discovers symptoms, observe the patient for 30 minutes before calling 911.
- If FAST discovers symptoms, observe the patient for 45 minutes before calling 911.