

TRANSITION SERIES  
**TOPICS FOR THE EMT**

TOPIC **17**  
Neurology: Stroke

ALWAYS LEARNING

PEARSON



## Objectives

- Review the frequency with which strokes occur.
- Discuss the common types of strokes to include pathophysiology and findings.
- Review current treatment standards for patients suffering from a stroke.

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Discuss objectives.



## Introduction

- Stroke is an acute emergency resulting in disruption of blood flow to a region of the brain.
- Can result in temporary or permanent abnormalities of cerebral functioning.
- EMS must rapidly identify and transport the potential stroke patient.

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Stroke is an emergency involving the disruption of blood flow through a cerebral vessel within the brain.

It may result in significant :

- motor (movement)
- sensory
- cognitive (thought or perception) dysfunction
- even death

It is also commonly referred to as a “brain attack,” as immediate recognition and management can reduce the amount of disability or death associated with stroke.

Most recently, stroke is being referred to as an acute cerebrovascular syndrome.



## Epidemiology

- 700,000 strokes occur per year
  - About one every 45 seconds
- Strokes are the third leading cause of death in the U.S.
  - One stroke-related death every 3 minutes
- Higher risk to women, African Americans, and Hispanics/Latinos
- Major cause of permanent disability

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Discuss the epidemiological findings relating to strokes.

An ominous sign that the patient is experiencing a hemorrhagic stroke is a continuous deterioration in mental status.

# Pathophysiology

- Types of strokes
  - Ischemic
    - Thrombotic
    - Embolic
    - TIA
    - RIND
    - Hypoperfusion
  - Most common
    - 80%-85%

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Ischemic strokes occur most frequently, and are caused by an obstruction of blood flow to a region of the brain.

Often caused by atherosclerosis.

- Thrombotic stroke—stationary clot that develops in a cerebral blood vessel. Symptoms often progressive over time from continued occlusion of blood flow.
- Embolic stroke—a clot or piece of intravascular material breaks off and travels through blood vessels till it lodges in a cerebral hemisphere. Typically symptoms present very suddenly as blockage is a sudden event.
- TIA—transient ischemic attack occurs when there is a temporary disruption of blood flow from either an embolism or disruption of an atherosclerotic blood vessel in brain. Symptoms last commonly for minutes or hours—usually resolves in 24 hours.
- RIND—reversible ischemic neurologic deficit is similar to a TIA in etiology. RIND resolves in 24-72 hours after onset.
- Hypoperfusion—occurs when there is low perfusion to the brain due to some failure of the effectiveness of the heart. Findings are global rather than focal since the entire brain is affected by the hypoperfusive state.

# Pathophysiology

- Types of strokes
  - Hemorrhagic
    - ICH
    - SAH
  - Etiology
    - AVM
    - Aneurysm
  - Frequency
    - 10%-15%

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A hemorrhagic stroke is caused by a rupture of a cerebral vessel with resultant bleeding into brain tissue or areas surrounding the brain. Approximately 10 percent to 15 percent of all strokes are hemorrhagic in nature.

Hemorrhagic strokes cause a “structural” problem in the brain. The space occupying accumulation of blood shifts and compresses surrounding brain tissue that then causes elevations in the intracranial pressure. Hemorrhagic strokes are more fatal than ischemic strokes.

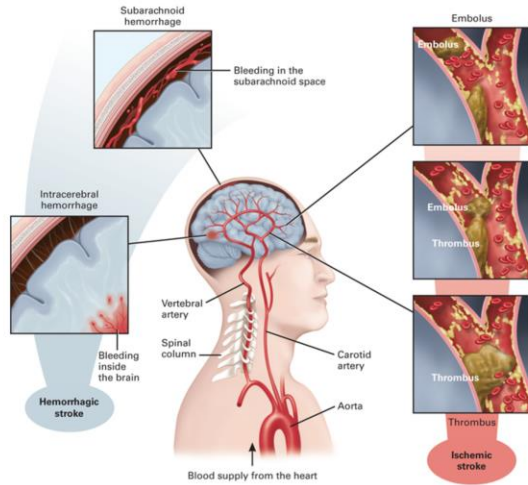
Etiology:

- Arteriovenous malformations (AVMs) is a weakened area in a blood vessel that balloons out. It may continue to weaken and eventually rupture and bleed into the brain or its surrounding tissue.
- An aneurysm is a weakened area in a blood vessel that balloons out. It may continue to weaken and eventually rupture and bleed into the brain or its surrounding tissue. Often causes SAH.

Types:

- Intracerebral hemorrhage (ICH) is a rupture of a cerebral blood vessel and blood spills directly onto the brain tissue. ICH is most common type of hemorrhagic stroke.
- Subarachnoid hemorrhage (SAH) is when the vessel ruptures into the subarachnoid space.

**Figure 17-1** Causes of stroke. Blood is carried from the heart to the brain via the carotid and vertebral arteries, which form a ring and branches within the brain. An ischemic stroke occurs when a thrombus is formed on the wall of an artery or when an embolus travels from another area until it lodges in and blocks an arterial branch. A hemorrhagic stroke occurs when a cerebral artery ruptures and bleeds into the brain (examples shown: subarachnoid bleeding on the surface of the brain and intracerebral bleeding within the brain).



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# Pathophysiology

- Progression of neurologic dysfunction and damage in stroke
  - Loss/diminishment of blood flow
  - Cells become electrically “silent”
  - Na<sup>+</sup>/K<sup>+</sup> pump failure, cells swell and rupture
    - “Cytotoxic edema”
  - Ischemic penumbra receives diminished flow
    - It may also become electrically silent

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If a patient is disoriented, then at a minimum the RAS and one hemisphere is intact.

If a patient is unconscious, then either BOTH hemispheres or the RAS is no longer intact.





## Clinical Findings

- Assessment of the stroke patient
  - Time is paramount
  - Narrow window for thrombolytic drugs
  - Careful assessment for baseline findings and changes important
    - Always try to determine onset time for symptoms

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Stress importance of determining onset time, baseline findings, ongoing changes during prehospital treatment and transport.

Decisions regarding if the patient is a candidate for medications depends upon many of these answers.



## Clinical Findings

- Signs and symptoms of stroke
  - Facial droop and/or slurred speech
  - Dysphasia and aphasia
  - Unilateral numbness
  - Headache/Dizziness (severe in ICH/SAH)

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Discuss common findings of a stroke, and that a TIA or RIND may also present with symptoms of a full stroke.

Prehospital determination of stroke type is not more important than maintain vital body functions and providing rapid transport to the receiving facility.



## Clinical Findings

- Signs and symptoms of stroke
  - Weakness/Paralysis
  - Mental status changes
  - Vision changes
  - Cognitive changes
  - Incontinence

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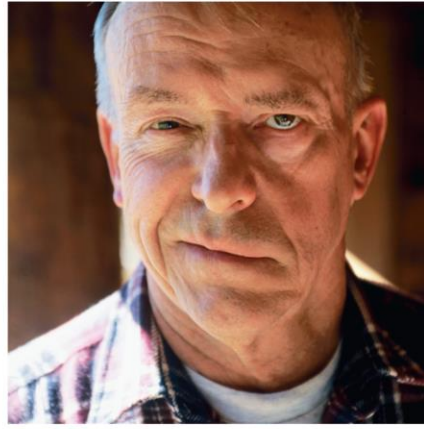
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**Figure 17-2** (a) The face of a nonstroke patient has normal symmetry. (b) The face of a stroke patient often has an abnormal, drooped appearance on one side. (© Michal Heron)



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**Figure 17-3** (a) A patient who has not suffered a stroke can generally hold the arms in an extended position with eyes closed. (b) A stroke patient will often display “arm drift” or “pronator drift”—one arm will remain extended when held outward with eyes closed, but the other arm will drift or drop downward and pronate (palm turned downward).



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**Figure 17-4** The Cincinnati Prehospital Stroke Scale (CPSS).

<b>Cincinnati Prehospital Stroke Scale</b>		
<b>Sign of Stroke</b>	<b>Patient Activity</b>	<b>Interpretation</b>
<b>Facial droop</b>	Have patient look up at you, smile, and show his teeth.	<i>Normal:</i> Symmetry to both sides. <i>Abnormal:</i> One side of the face droops or does not move symmetrically.
<b>Arm drift</b>	Have patient lift arms up and hold them out with eyes closed for 10 seconds.	<i>Normal:</i> Symmetrical movement in both arms. <i>Abnormal:</i> One arm drifts down or asymmetrical movement of the arms.
<b>Abnormal speech</b>	Have the patient say, "You can't teach an old dog new tricks."	<i>Normal:</i> The correct words are used and no slurring of words is noted. <i>Abnormal:</i> The words are slurred, the wrong words are used, or the patient is aphasic.

Kothari R. U., Pancioli A., Liu T., Broderick J. Cincinnati Prehospital Stroke Scale: Reproducibility and validity. *Annals of Emergency Medicine*. 1999; 33:373-378.



**Figure 17-5** The Los Angeles Prehospital Stroke Screen (LAPSS).

**Los Angeles Prehospital Stroke Screen (LAPSS)**

Considerations	Yes	Unknown	No
Age <b>greater than</b> 45 years			
<b>No</b> history of seizures or epilepsy			
Duration of symptoms is <b>less</b> than 24 hours			
Patient is <b>not</b> wheelchair bound or bedridden			
Blood glucose level <b>between 60 and 400 mg/dL</b>			
<b>Physical exam to determine unilateral asymmetry</b>	<b>Equal</b>	<b>R Weakness</b>	<b>L Weakness</b>
A. Have patient look up, smile, and show teeth		Droop	Droop
B. Compare grip strength of upper extremities		Weak grip	Weak grip
		No grip	No grip
C. Assess arm strength for drift or weakness		Drifts down	Drifts down
		Falls rapidly	Falls rapidly

Kidwell C. S., Saver J. L., Schubert G. B., Eckstein M., Starkman S. Design and retrospective analysis of the Los Angeles Prehospital Stroke Screen (LAPSS). *Prehospital Emergency Care*. 1998;2:267-273.  
 Kidwell C. S., Starkman S., Eckstein M., Weems K., Saver J. L. Identifying stroke in the field: Prospective validation of the Los Angeles Prehospital Stroke Screen (LAPSS). *Stroke*. 2000;31:71-76.



## Emergency Medical Care

- Consider spinal precautions, determine onset of symptoms
- Support lost function
  - Airway, breathing, circulation
- Assess BGL level
  - Hypoglycemia may mimic stroke

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The emergency care provided to a stroke patient is primarily supportive.

Ensure that an adequate airway is:

- Established
- Maintained

Ensure the breathing is adequate:

- Use oxygen via NRB if breathing adequately
- If the patient is breathing inadequately, begin ventilation at a rate of 12 per minute.
- Apply a pulse oximeter to monitor the oxygen saturation levels.

Be sure to respond immediately to:

- Declines in oxygen saturation by reassessing the adequacy of the airway or ventilation
- Managing the airway or ventilating if necessary
- Increasing the oxygen concentration

Obtain a blood glucose level, as hypoglycemia can mimic stroke. Protect and rapidly transport an acute stroke patient to the most appropriate medical facility for proper medical management.



## Emergency Medical Care

- Protect paralyzed limbs
  - Be sure to properly secure paralyzed limbs to prevent accidental trauma during patient movement
- Arrange ALS back-up or intercept

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## Case Study

You are called to treat a patient with a severe headache. Upon arrival, the patient meets you at the door and walks you into the living room. As the patient walks, you note that he has to hold himself against chairs and tables to keep from falling.

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Discuss presentation.



## Case Study

- Scene Size-Up
  - Adult male patient, 59 years of age
  - No sign of struggle or trauma in room
  - Patient now sitting in chair, holding head in his hands
  - Entry and exit clear of obstacles
  - Standard precautions taken

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Discuss presentation.



## Case Study

- Primary Assessment Findings
  - Patient responsive/oriented to verbal stimuli
  - c/o severe headache that “just started”
  - Airway patent, speech slightly slurred
  - Respirations are intact and normal
  - Central and peripheral pulses present

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Discuss as needed.



## Case Study

- Is this patient a high or low priority? Why?
- Based on the primary survey, what emergency care would be warranted at this time?
- Should the EMT perform a rapid physical exam or the SAMPLE history first?

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The patient would be categorized most likely as a potentially unstable. The major bodily functions are intact, but the slurred speech and difficulty in walking point initially as a potentially serious condition.

Thus far, the patient should receive high-flow oxygen via nonrebreather mask. There is not a need yet for airway or ventilatory assistance, but if this is in fact a stroke, those interventions may be needed.

Care for this patient will be:

- Largely supportive in nature
- Initiated during the SAMPLE history

At this time, if the patient is still able to respond appropriately, the EMT may want to gather the SAMPLE history so the clinical findings can be rapidly identified and documented.



## Case Study

- Medical History
  - High blood pressure is only history
- Medications
  - Patient takes a pill for his blood pressure, but he ran out and hasn't taken it in a week
- Allergies
  - None

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The absence of any blood pressure medicine for a week may be a contributing clue.



## Case Study

- Pertinent Secondary Assessment Findings
  - Left pupil is slightly larger, but responds to light, facial droop is noted
  - Airway patent, speech is increasingly garbled
  - Breathing is not labored, lungs clear
  - Peripheral perfusion intact, skin warm and dry
  - Abdomen soft, patient is becoming nauseous

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Discuss case progression.



## Case Study

- Pertinent Secondary Assessment Findings
  - Right-sided extremities are weak as compared to left
  - Blood sugar level is 113 mg/dL
  - Patient stated headache is very severe, it started suddenly about 2 hours ago
  - Heart rate 82, respirations 22, blood pressure 190/110

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Discuss case progression.





## Case Study

- What is your field impression thus far?
- Discuss the relationship between the patient findings and your field impression
- What contribution would the history of not taking blood pressure meds have?

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Thus far, the patient presents as having a stroke. Given the findings, it is most consistent with a hemorrhagic type stroke—probably either a ICH or SAH.

Differentials would include ischemic stroke or some other type of space occupying lesion in the cranial vault (such as abscess, encephalitis, brain cancer).

The relationship between clinical presentation and etiology is consistent with the asymmetry findings of a space occupying lesion. With a rapidly expanding hemorrhage in the brain, it creates findings of unilateral disturbances (the left pupil dilation and right sided weakness is consistent with a left hemispheric lesion).

The most common contributing factor to hemorrhagic strokes is high blood pressure. Since this is a condition the patient has, and they have not taken their meds for a period of time, the spike in blood pressure may have been high enough to rupture a cerebral blood vessel.



## Case Study

- Care provided:
  - Time of symptom onset documented
  - Patient receiving high-flow oxygen
  - Place on wheeled cot in semi-Fowler position
  - ALS contacted for intercept en route to hospital

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Discuss as needed.



## Case Study

- What type of information would the hospital want in this situation?
- What are the three components of the Cincinnati Prehospital Stroke Scale, and how do you think this patient would perform on each assessment step?

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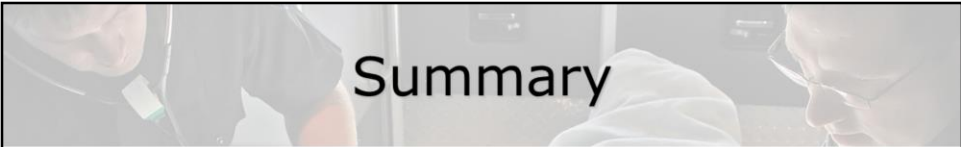
A common treatment for certain types of strokes is thrombolytic medications to bust down the clots in certain types of ischemic strokes. Whether or not this will be the case for this patient, the hospital will need have:

- Time of onset
- Progression of symptoms
- A full medical history
- Care rendered thus far
- Response to this care

The Cincinnati Stoke Scale evaluates three parameters:

- Facial droop
- Arm drift
- Abnormal speech pattern

This patient already displays the facial droop (which is probably contributing to the dysphasia), the weakness on one side of the body will probably result in the pronator drift, and finally the abnormal speech is present.



## Summary

- A stroke occurs when there is interruption of blood flow to a region of the brain.
- Although symptoms may present as mild initially, it is often not known early on how severely the patient may deteriorate.
- Prehospital identification and treatment are integral to the successful overall management of stroke patients.

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Discuss as needed.