Chapter 17 - Neurologic Emergencies

2 National EMS Education Standard Competencies (1 of 3)
   Medicine
   Applies fundamental knowledge to provide basic emergency care and transportation based
   on assessment findings for an acutely ill patient.

3 National EMS Education Standard Competencies (2 of 3)
   Neurology
   • Anatomy, presentations, and management of
     – Decreased level of responsiveness
     – Seizure
     – Stroke

4 National EMS Education Standard Competencies (3 of 3)
   Neurology (cont’d)
   • Anatomy, physiology, pathophysiology, assessment, and management of
     – Stroke/transient ischemic attack
     – Seizure
     – Status epilepticus
     – Headache

5 Introduction (1 of 4)
   • Stroke is the fifth-leading cause of death and the leading cause of adult disability in the
     United States.
     – Common in geriatric patients

6 Introduction (2 of 4)
   • Other contributing factors for stroke include family history and race.
   • Treatments are available for stroke.
     – Many hospitals are certified stroke centers.
     – Rapid transport is vital.

7 Introduction (3 of 4)
   • Seizures and altered mental status may also occur.
   • Seizures may occur as a result of:
     – A recent or prior head injury
     – A brain tumor
     – A metabolic problem
     – Fever
     – A genetic disposition

8 Introduction (4 of 4)
   • Possible causes of altered mental status include:
     – Intoxication
     – Head injury
     – Hypoxia
     – Stroke
– Metabolic disturbances
  • Treatment varies widely.

9 **Anatomy and Physiology (1 of 7)**
  • The brain is the body’s computer.
    – Controls breathing, speech, and all body functions
  • Three major parts: brain stem, cerebellum, and cerebrum
    – The cerebrum is the largest part.

10 **Anatomy and Physiology (2 of 7)**

11 **Anatomy and Physiology (3 of 7)**
  • The brain stem controls the most basic functions.
    – Breathing, blood pressure, swallowing, pupil constriction
  • The cerebellum controls muscle and body coordination.
    – Walking, writing, picking up a coin, playing piano

12 **Anatomy and Physiology (4 of 7)**
  • The cerebrum is divided into right and left hemispheres.
    – Each controls activities on the opposite side of the body.
    – The front of the cerebrum controls emotion and thought.
    – The middle controls sensation and movement.
    – The back processes sight.

13 **Anatomy and Physiology (5 of 7)**
  • In most people, speech is controlled on the left side of the brain near the middle of the cerebrum.
  • Messages sent to and from the brain travel through nerves.
    – Twelve cranial nerves run directly from the brain to parts of the head: eyes, ears, nose, and face.

14 **Anatomy and Physiology (6 of 7)**
  • The rest of the nerves join in the spinal cord and exit the brain through a large opening in the base of the skull called the foramen magnum.
    – At each vertebra in the neck and back, two nerves branch out (spinal nerves).
    – These carry signals to and from the body.

15 **Anatomy and Physiology (7 of 7)**

16 **Pathophysiology (1 of 2)**
  • Many different disorders may cause brain dysfunction.
    – May affect the patient’s level of consciousness, speech, and voluntary muscle control
  • The brain is sensitive to changes in oxygen, glucose, and temperature.

17 **Pathophysiology (2 of 2)**
  • General rule:
    – If a problem is caused primarily by disorders in the heart and lungs, the entire brain is affected.
    – If the primary problem is in the brain, only part of the brain is affected.

18 **Headache (1 of 6)**
  • One of the most common complaints
  • Can be a symptom of another condition or a neurologic condition on its own
• Only a small percentage of headaches are caused by a serious medical condition.

19 Headache (2 of 6)
• Tension headaches, migraines, and sinus headaches are the most common.
  – Not life-threatening

20 Headache (3 of 6)
• Tension headaches
  – Caused by muscle contractions in the head and neck
  – Attributed to stress
  – Pain is usually described as squeezing, dull, or as an ache.
  – Usually do not require medical attention

21 Headache (4 of 6)
• Migraine headaches
  – Thought to be caused by changes in blood vessel size in the base of the brain.
  – Experienced by both adults and children
  – Pain is usually described as pounding, throbbing, and pulsating.
  – Often associated with nausea and vomiting, and may be preceded by visual changes
  – Can last for several hours or days

22 Headache (5 of 6)
• Sinus headaches
  – Caused by pressure that is the result of fluid accumulation in the sinus cavities
  – Patients may also have cold-like symptoms of nasal congestion, cough, and fever.
  – Prehospital emergency care is not required.

23 Headache (6 of 6)
• Serious conditions that include headache as a symptom are hemorrhagic stroke, brain tumor, and meningitis.
  – Be concerned if patient complains of a sudden-onset, severe headache or a sudden headache that has associated symptoms.
  – Suspect stroke in patients with a severe headache, seizures, and altered mental status.
  – Increasing ICP may be caused by a hemorrhagic stroke, tumor, or recent head trauma.

24 Stroke (1 of 2)
• Also called a cerebrovascular accident (CVA)
• Interruption of blood flow to an area within the brain
• Results in the loss of brain function
• Lacking oxygen, brain cells stop functioning and begin to die within minutes.
• Once the brain cells die, not much can be done.

25 Stroke (2 of 2)
• Brain cells develop ischemia, causing them to stop functioning properly.
• It may take several hours or more for cell death to occur.
• With prompt restoration of blood flow, the cells will not die, and function can be preserved or restored.
• There are two main types of stroke: ischemic and hemorrhagic.

26 Ischemic Stroke (1 of 2)
• Most common, accounting for more than 80% of strokes
• Results from thrombosis or an embolus
• Symptoms may range from nothing at all to complete paralysis.
• Atherosclerosis in the blood vessels is often the cause.

27 Ischemic Stroke (2 of 2)
• Atherosclerosis
  – Plaque forms inside the walls of the blood vessels and may obstruct blood flow.
  – Eventually, it causes complete occlusion of an artery.

28 Hemorrhagic Stroke (1 of 3)
• Accounts for 13% of strokes.
• Results from bleeding inside the brain
• Cerebral hemorrhages are often fatal.
• People at high risk include those experiencing stress or exertion.
• People at highest risk are those who have very high blood pressure.

29 Hemorrhagic Stroke (2 of 3)
• Aneurysm
  – Swelling or enlargement of the wall of an artery resulting from a defect or weakening of the arterial wall

30 Hemorrhagic Stroke (3 of 3)
• Symptom may be the sudden onset of a severe headache
• When a hemorrhagic stroke occurs in an otherwise healthy young person, it is likely caused by a berry aneurysm.
  – Surgical repair may be possible if care is sought immediately.

31 Transient Ischemic Attack (TIA) (1 of 2)
• When blood flow to the brain is obstructed due to atherosclerosis or a small blood clot, the patient may exhibit signs of a stroke.
• When stroke-like symptoms go away on their own in less than 24 hours, the event is called a TIA.
• No actual death of tissue occurs with a TIA.

32 Transient Ischemic Attack (TIA) (2 of 2)
• Symptoms of a TIA can last up to 24 hours,
  – May not be able to differentiate between a stroke and a TIA
• Every TIA is an emergency.
• May be a warning sign that a more significant stroke may occur in the future
• All patients with a TIA should be evaluated by a physician.

33 Signs and Symptoms of Stroke (1 of 4)
• Facial drooping
• Sudden weakness or numbness in the face, arm, leg, or one side of body
• Decreased or absent movement and sensation on one side of the body
• Lack of muscle coordination (ataxia) or loss of balance

34 Signs and Symptoms of Stroke (2 of 4)
• Sudden vision loss in one eye
• Blurred and double vision
• Difficulty swallowing
• Decreased level of responsiveness
• Speech disorders

35 Signs and Symptoms of Stroke (3 of 4)
• Aphasia
  – Difficulty expressing thoughts or inability to use the right words (expressive aphasia)
  – Difficulty understanding spoken words (receptive aphasia)
• Slurred speech (dysarthria)
• Sudden and severe headache
• Confusion
• Dizziness

36 Signs and Symptoms of Stroke (4 of 4)
• Weakness
• Combativeness
• Restlessness
• Tongue deviation
• Coma

37 Left Hemisphere
• Stroke in the left cerebral hemisphere may cause aphasia.
  – Inability to produce or understand speech
  – Speech problems can vary widely.
• Stroke may also cause paralysis of the right side of the body.

38 Right Hemisphere
• Stroke may cause paralysis of the left side of the body.
• Usually, patients can understand language and are able to speak
  – Words may be slurred
• Patients may be oblivious to their problem (neglect).
• Neglect and lack of pain cause many patients to delay seeking help.

39 Bleeding in the Brain
• Patients may have high blood pressure.
  – May be the cause of the bleeding
  – May be caused by the bleeding, as a compensatory response
• Increasing blood pressure is an important sign.
• Significant drops in blood pressure may occur as the patient’s condition worsens.
• Monitor the blood pressure for changes.

40 Conditions That May Mimic Stroke (1 of 2)
• Hypoglycemia
  – Not enough blood glucose
• Postictal state
  – Period following seizure that lasts between 5 and 30 minutes
  – Characterized by labored respirations and some degree of altered mental status
• Subdural or epidural bleeding
  – Blood near the skull presses on the brain
Conditions That May Mimic Stroke (2 of 2)

Seizures

- A neurologic episode caused by a surge of electrical activity in the brain
- Can take the form of a convulsion and/or can be associated with a temporary alteration in consciousness.
- Two basic groups: generalized and partial (focal).

Generalized Seizure

- Results from abnormal electrical discharges from large areas of the brain
- Typically characterized by unconsciousness and a generalized severe twitching of all muscles lasting several minutes or longer.
- May simply be characterized by a brief lapse of consciousness.
  - Does not involve any changes in motor activity

Partial Seizure (1 of 2)

- Simple partial seizure
  - No change in the patient’s level of consciousness
  - May have numbness, weakness, dizziness, visual changes, or unusual smells/tastes
  - May have some twitching or brief paralysis

Partial Seizure (2 of 2)

- Complex partial seizure
  - Altered mental status
  - Results from abnormal discharges from the temporal lobe of the brain
  - Lip smacking, eye blinking, isolated jerking
  - Unpleasant smells, visual hallucinations, uncontrollable fear, repetitive physical behavior

Aura

- Patients may experience an aura prior to a seizure.
  - Can include visual changes or hallucinations
- People with a history of seizures recognize their auras and usually take steps to minimize injury.
- Auras do not occur prior to every seizure, and not all patients with a seizure disorder experience an aura.

Generalized Seizure (1 of 2)

- Characterized by sudden loss of consciousness, chaotic muscle movement and tone, and apnea.
- May exhibit bilateral muscle movement characterized by a cycle of muscle rigidity and relaxation, usually lasting 1 to 3 minutes.

Generalized Seizure (2 of 2)

- Tachycardia, hyperventilation, sweating, and intense salivation
- Most seizures last 3 to 5 minutes.
- Postictal state (5 to 20 minutes) follows.
  - Gradual return to consciousness

Absence Seizure
• Formerly called petit mal
• May last for seconds
• Patient fully recovers with a brief lapse of memory

50 **Status Epilepticus**
• Seizures lasting more than 5 minutes are likely to progress to status epilepticus.
• Seizures that continue every few minutes without the person regaining consciousness or last longer than 30 minutes are referred to as status epilepticus.

51 **Causes of Seizures (1 of 4)**
• Some seizure disorders are congenital.
• Others may be caused by high fever, structural problems in the brain, or metabolic or chemical problems.

52 **Causes of Seizures (2 of 4)**
• Epileptic seizures usually can be controlled by medications.
  – Levetiracetam (Keppra)
  – Phenytoin (Dilantin)
  – Phenobarbital
  – Carbamazepine (Tegretol)
  – Valproate (Depakote)
  – Topiramate (Topamax)
  – Clonazepam (Klonopin)

53 **Causes of Seizures (3 of 4)**
• Seizures may be caused by an abnormal area in the brain (structural cause), such as:
  – A benign or cancerous tumor
  – An infection (brain abscess, meningitis)
  – Scar tissue from some type of injury

54 **Causes of Seizures (4 of 4)**
• Seizures from a metabolic cause can result from:
  – Abnormal levels of certain blood chemicals
  – Hypoglycemia
  – Poisons
  – Drug overdoses
  – Sudden withdrawal from routine heavy alcohol or sedative drug use
  – Prescribed medications
• Seizures can also result from sudden high fevers, particularly in children.

55 **The Importance of Recognizing Seizures (1 of 2)**
• Recognize when a seizure is occurring and whether this episode differs from previous ones.
  – Patient may turn cyanotic.
  – Seizures may prevent the patient from breathing normally.
  – In a patient with diabetes, the blood glucose level may decrease.
  – If protocol allows, monitor blood glucose levels after a patient with diabetes has a seizure.
The Importance of Recognizing Seizures (2 of 2)

- Look at other problems associated with the seizure.
  - Patients who have fallen during a seizure may have a head injury.
  - Patients having a generalized seizure may also experience incontinence.

The Postictal State (1 of 2)

- After a seizure, the muscles relax, becoming almost flaccid, and breathing becomes labored.
  - This breathing pattern helps the body balance the acidity in the bloodstream.
  - With normal circulation and liver function, the patient will begin to breathe more normally within minutes.

The Postictal State (2 of 2)

- May be characterized by hemiparesis, resembling a stroke.
- Most commonly characterized by lethargy and confusion
  - Patient may be combative
  - Be prepared for these circumstances.
- If the patient's condition does not improve, consider hypoglycemia or infection.

Syncope

- Seizures are often mistaken for syncope, or fainting.
  - Fainting typically occurs while the patient is standing.
  - Seizures may occur in any position.
  - Fainting is not associated with a postictal state.

Altered Mental Status

- Aside from stroke and seizures, the most common neurologic emergency
- Patient is not thinking clearly or is incapable of being aroused
- In some cases, the patient will be unconscious; in others, the patient may be alert but confused.

Causes of AMS (1 of 5)

- Hypoglycemia
  - Patients can have signs and symptoms that mimic stroke and seizures.
  - May have hemiparesis
  - A patient who has had a stroke may be alert and attempting to communicate.
  - A patient with hypoglycemia almost always has an altered or decreased LOC.

Causes of AMS (2 of 5)

- Hypoglycemia (cont'd)
  - Patients commonly take medications that lower blood glucose level.
  - Patients can also experience seizures.
  - The mental status is not likely to improve, even after several minutes.
  - Consider hypoglycemia in a patient who has AMS after an injury such as a motor vehicle crash.

Causes of AMS (3 of 5)

- Delirium
  - A symptom, not a disease
  - Presents as a new complaint
  - Temporary state that may have a physical or mental cause, such as:
• Infection
• Changes in medication
• Hypoxia
  – May be reversed with treatment

64 Causes of AMS (4 of 5)
  • Delirium (cont’d)
    – Signs and symptoms
    – Rapid alteration between mental states
    – Symptoms may mimic intoxication, drug abuse, or severe psychological disorders.

65 Causes of AMS (5 of 5)
  • Other causes of AMS
    – Consideration of other possibilities becomes important because a patient with AMS may be combative and refuse treatment/transport.
    – In most cases, a patient who appears intoxicated is just that.
    – Psychological disorders and medication complications are possible causes.
    – Infections, particularly those involving the brain or bloodstream, may cause AMS.

66 Scene Size-up (1 of 2)
  • Scene safety
    – Dispatcher may be able to provide a description of the patient’s problem.
    – Patients with AMS may exhibit a wide range of signs, symptoms, and behaviors.
    – Do not be distracted by the seriousness of the situation or frightened family members.
    – Consider the need for spinal immobilization.

67 Scene Size-up (2 of 2)
  • Mechanism of injury/nature of illness
    – Look for clues to determine the NOI.
    – Special considerations for a patient with a suspected neurologic emergency:
      • An evaluation of the environment for signs of potential trauma
      • Indications of a previous medical condition
      • Evidence of a seizure
      • Ask family when was the last time the patient appeared normal

68 Primary Assessment (1 of 5)
  • Look for and treat life-threatening conditions.
  • Perform a rapid exam.
  • As you approach the patient:
    – Gather information from the scene.
    – Note the patient’s body position and LOC.
    – Initial impression will help you determine the severity of the situation.
    – You should be able to tell if a seizure took place.
    – Use the AVPU scale.

69 Primary Assessment (2 of 5)
  • Airway and breathing
    – Patients may have difficulty swallowing and choke on their own saliva.
    – Be prepared to provide suction.
– Position the patient to prevent aspiration.
– Check for foreign body obstruction.
– Assess the patient’s breathing.
  • All patients with an AMS, regardless of the cause, should receive high-flow oxygen.

70 Primary Assessment (3 of 5)
• Airway and breathing (cont’d)
  – Ventilate the patient at proper rate with proper volume.
    • Deliver each breath during a period of 1 second at a rate of 10 to 12 breaths/min.
    • Do not hyperventilate the patient.
  – Hyperventilation may have negative consequences.
    • Decrease in cardiac output
    • Risk of regurgitation and aspiration
    • Further injury to the brain in patients with intracerebral bleeding and increased intracranial pressure

71 Primary Assessment (4 of 5)
• Circulation
  – Check the pulse if the patient is unresponsive.
  – If no pulse is found, immediately begin CPR and attach an AED.
  – If the patient is responsive, determine if the pulse is fast or slow, weak or strong.
  – Evaluate the patient quickly for external bleeding.

72 Primary Assessment (5 of 5)
• Transport decision
  – Establish priorities based on your assessment of the patient’s LOC and ABCs.
  – If the patient is experiencing a stroke, rapidly transport to an appropriate facility.

73 History Taking (1 of 2)
• Investigate the chief complaint.
  – For unresponsive patients, gather any history from family or bystanders.
  – If no one is around, quickly look for explanations for the AMS.
    • Stroke (hemiparesis or one-sided weakness)
    • Seizure (incontinence or bitten tongue)
  – Ask a responsive patient what happened.
  – Evaluate a responsive patient’s speech.

74 History Taking (2 of 2)
• Gather a SAMPLE history.
  – Time is critical.
  – Try to determine the exact time the patient last appeared healthy.
  – Collect or list all medications.
  – Ask if the patient has a history of seizures.
  – Ask if this episode differs from previous episodes and what medications the patient takes.
  – If not, a serious condition should be suspected.

75 Secondary Assessment (1 of 10)
• Physical examinations
  – Full-body secondary assessment, paying special attention to the system involved
  – If you suspect your patient is having a stroke, direct particular attention to your
    neurologic assessment.

76 Secondary Assessment (2 of 10)
• Vital signs
  – Significant intracranial bleeding leads to a great deal of pressure in the skull,
    compressing the brain.
    • Slows the pulse and causes erratic respirations
    • Blood pressure is usually high to compensate for poor perfusion.
    • Unequal pupil size and reactivity indicate significant bleeding and pressure on the
      brain.

77 Secondary Assessment (3 of 10)
• Vital signs (cont’d)
  – If the patient has an AMS, check the blood glucose level.
  – During most active seizures, it is impossible to evaluate vital signs and this should not
    be your priority
  – In most cases, vital signs of a patient in a postictal state will be close to normal limits.

78 Secondary Assessment (4 of 10)
• Stroke Assessment
  – Rapidly identify stroke in the field with a stroke scale.
  – Stroke scales evaluate the face, arms, and speech.
    • Cincinnati Prehospital Stroke Scale
    • Los Angeles Prehospital Stroke Screen
    • 3-Item Stroke Severity Scale (LAG)
      – Looks at level of consciousness, arm drift (motor function), and gaze.

79 Secondary Assessment (5 of 10)
• FAST mnemonic
  – Facial droop
  – Arm drift
  – Speech
  – Time

80 Secondary Assessment (6 of 10)

81 Secondary Assessment (7 of 10)

82 Secondary Assessment (8 of 10)

83 Secondary Assessment (9 of 10)
• All patients with an AMS should also have a Glasgow Coma Scale (GCS) score calculated.

84 Secondary Assessment (10 of 10)

85 Reassessment (1 of 4)
• Focus on reassessing the ABCs, vital signs, and interventions.
Stroke patients can lose airway or stop breathing without warning.

Interventions
- Multiple interventions may be necessary.

**Reassessment (2 of 4)**
- Interventions (cont’d)
  - Airway adjuncts
  - Positive-pressure ventilations
  - Other treatments
- Compare baseline information with updated information.
- Notify the receiving facility of patient’s chief complaint and assessment findings.

**Reassessment (3 of 4)**
- Communication and documentation
  - Call a “stroke alert” to designated stroke centers.
  - Be sure to communicate:
    - Time that the patient was last seen healthy
    - Findings of your neurologic examination
    - Time you anticipate arriving at the hospital

**Reassessment (4 of 4)**
- Communication and documentation (cont’d)
  - For patients who have had a seizure, give a description of the seizure activity if known.
  - If the patient has a history of seizure activity, determine how often the seizures occur and if there is any history of status epilepticus.
  - Document interventions and the patient’s response.

**Emergency Medical Care (1 of 4)**
- Some conditions are easier to identify.
- Cause of other neurologic emergencies may not always be obvious
- ED physicians determine if there is bleeding in the brain for patients with a suspected stroke with a CT scan of the head
  - Blood clot–dissolving medication may be given if there is no bleeding

**Emergency Medical Care (2 of 4)**
- Notify hospital staff.
  - Treatments are available if started right away.
  - Communicate the last time the patient was known to be well.

**Emergency Medical Care (3 of 4)**
- Patients who have had a seizure require definitive evaluation and treatment.
  - Supplemental oxygen is strongly advised.
  - For patients who are having a seizure:
    - Protect them from harm.
    - Maintain a clear airway by suctioning.
    - Provide oxygen as quickly as possible.
    - If head or neck trauma is suspected, provide spinal immobilization.
• For patients who continue to have a seizure, as in status epilepticus:
  – Suction the airway.
  – Provide positive-pressure ventilations.
  – Transport quickly to the hospital.
  – Rendezvous with ALS, if possible.

Emergency Medical Care: Headache
• Most headaches are harmless and do not require emergency medical care.
• You should be concerned if the patient complains of:
  – A sudden-onset, severe headache
  – A sudden headache with fever, seizures, AMS, or following trauma

Emergency Medical Care: Migraine
• Always assess the patient for other signs and symptoms that might indicate a more serious condition.
• Apply high-flow oxygen, if tolerated.
• Provide a darkened, quiet environment.
• Do not use lights and sirens during transport.

Emergency Medical Care: Stroke (1 of 3)
• Support ABCs and provide rapid transport to a stroke center.
• Patient may require manual airway positioning.
• Use suction as needed and monitor the patient’s oxygen saturation.
  – Maintain a SpO₂ level of at least 94%
• Oxygen therapy not recommended unless the patient is in respiratory distress or is hypoxic

Emergency Medical Care: Stroke (2 of 3)
• Paralyzed extremities will require protection from harm.
• Keep the patient informed.
• Thrombolytic therapy may reverse stroke symptoms.

Emergency Medical Care: Stroke (3 of 3)
• Spend as little time at the scene as possible.
  – Stroke is an emergency, and “time is brain.”
  – If possible, transport to a designated stroke center.

Emergency Medical Care: Seizure (1 of 3)
• The patient may be in a postictal state upon your arrival.
• The patient may still be having a seizure:
  – Continue to assess and treat ABCs.
  – Try administering oxygen.

Emergency Medical Care: Seizure (2 of 3)
• It is difficult to safely prepare a patient for transport who is having a seizure.
  – Assess for trauma.
  – Use spinal immobilization if indicated.
  – Never attempt to restrain a patient having a seizure.

Emergency Medical Care: Seizure (3 of 3)
• Not every patient who has had a seizure wants to be transported.
  – Your goal is to encourage the patient to be seen by a physician.
  – Be prepared to discuss the situation with the hospital staff.

Emergency Medical Care: Altered Mental Status
• Signs and symptoms vary from simple confusion to coma.
• AMS is always an emergency that requires immediate attention.
  – Even if the cause appears to be intoxication or minor head trauma

Review
1. A 41-year-old man presents with slow, irregular breathing; hypotension; and dilated pupils. These signs MOST likely indicate dysfunction of the:
   A. brain stem.
   B. hypothalamus.
   C. cerebrum.
   D. cerebellum.

Answer: A
Rationale: The brain stem is responsible for functions such as breathing, blood pressure, and pupil constriction. Brain stem dysfunction would result in abnormal findings with these functions.

Review (1 of 2)
1. A 41-year-old man presents with slow, irregular breathing; hypotension; and dilated pupils. These signs MOST likely indicate dysfunction of the:
   A. brain stem.
     Rationale: Correct answer
   B. hypothalamus.
     Rationale: The hypothalamus causes changes to occur in the heart rate, body temperature, and thirst.

Review (2 of 2)
1. A 41-year-old man presents with slow, irregular breathing; hypotension; and dilated pupils. These signs MOST likely indicate dysfunction of the:
   C. cerebrum.
     Rationale: The cerebrum causes changes to occur in emotion, thought, touch, and movement.
   D. cerebellum.
     Rationale: The cerebellum causes changes to occur in muscle control, body coordination, standing, walking, and writing.

Review
2. An acute ischemic stroke is caused by:
   A. a ruptured cerebral artery.
   B. increased intracranial pressure.
   C. an acute rise in a person’s blood pressure.
   D. a blocked cerebral artery.

Answer: D
Rationale: There are two types of stroke—hemorrhagic and ischemic. A hemorrhagic stroke
is caused by a ruptured cerebral artery (aneurysm), which causes bleeding within the brain and increased intracranial pressure. An ischemic stroke is caused by a blocked cerebral artery—either from a clot that grows locally (thrombus) or that travels to the brain from another part of the body (embolus).

**Review (1 of 2)**
2. An acute ischemic stroke is caused by:
   A. a ruptured cerebral artery.
      Rationale: This is known as a hemorrhagic stroke.
   B. increased intracranial pressure.
      Rationale: This can be caused by swelling, bleeding, or tumors.

**Review (2 of 2)**
2. An acute ischemic stroke is caused by:
   C. an acute rise in a person’s blood pressure.
      Rationale: This is known as a hypertensive crisis.
   D. a blocked cerebral artery.
      Rationale: Correct answer

**Review**
3. A 56-year-old man experienced a sudden, severe headache and then became unresponsive. He has a history of high blood pressure. The MOST likely cause of his condition is a(n):
   A. hemorrhagic stroke.
   B. acute ischemic stroke.
   C. severe migraine headache.
   D. transient ischemic attack.

**Review**
Answer: A
Rationale: Hemorrhagic strokes are typically preceded by a sudden, severe headache (signals the rupture of a cerebral artery), after which the patient becomes unresponsive due to bleeding within the brain. Ischemic strokes and transient ischemic attacks generally do not cause a sudden, severe headache, and migraine headaches typically do not cause a loss of consciousness.

**Review (1 of 2)**
3. A 56-year-old man experienced a sudden, severe headache and then became unresponsive. He has a history of high blood pressure. The MOST likely cause of his condition is a(n):
   A. hemorrhagic stroke.
      Rationale: Correct answer
   B. acute ischemic stroke.
      Rationale: This generally does not cause a sudden, severe headache.

**Review (2 of 2)**
3. A 56-year-old man experienced a sudden, severe headache and then became unresponsive. He has a history of high blood pressure. The MOST likely cause of his condition is a(n):
   C. severe migraine headache.
      Rationale: This generally does not cause a loss of consciousness.
   D. transient ischemic attack.
      Rationale: This generally does not cause a sudden, severe headache.
4. Unlike an ischemic stroke, a transient ischemic attack is characterized by all of the following, EXCEPT:
   A. symptoms that resolve within 24 hours.
   B. symptoms that persist for longer than 24 hours.
   C. weakness or paralysis to one side of the body.
   D. an acute onset of confusion and slurred speech.

Review
Answer: B
Rationale: Signs and symptoms of a transient ischemic attack (TIA) are usually identical to those of an acute ischemic stroke (eg, hemiparesis, slurred speech, confusion, facial droop). Unlike the ischemic stroke, however, the symptoms of a TIA usually resolve within 24 hours.

5. A patient with a suspected stroke presents with slurred speech that is difficult for you to understand. This is referred to as:
   A. aphasia.
   B. dysphasia.
   C. dysphagia.
   D. dysarthria.

Review
Answer: D
Rationale: Dysarthria is defined as slurred, poorly articulated speech; it is common in stroke patients. Dysphasia is defined as difficulty speaking; the patient’s speech may or may not be slurred. Aphasia is the inability to speak. Dysphagia is defined as difficulty swallowing.
Rationale: Dysphasia is difficulty in speaking.

5. A patient with a suspected stroke presents with slurred speech that is difficult for you to understand. This is referred to as:
   C. dysphagia.
   Rationale: Dysphagia is difficulty in swallowing.
   D. dysarthria.
   Rationale: Correct answer

6. A type of seizure that is characterized by severe twitching of all the body’s muscles and lasts for several minutes or longer is called a(n):
   A. partial seizure.
   B. absence seizure.
   C. tonic-clonic seizure.
   D. generalized seizure.

Answer: D
Rationale: Generalized seizures are characterized by generalized severe twitching of all of the body’s muscles; they often last for several minutes or longer. An absence seizure is characterized by a blank stare; generalized muscle twitching is absent.

6. A type of seizure that is characterized by severe twitching of all the body’s muscles and lasts for several minutes or longer is called a(n):
   A. partial seizure.
   Rationale: A partial seizure is broken down into simple (jerking of one part of the body) and complex (changes in behavior and emotion).
   B. absence seizure.
   Rationale: An absence seizure does not involve any changes in motor activity.

C. tonic-clonic seizure.
   Rationale: A tonic-clonic seizure exhibits muscle contraction and incontinence.
   D. generalized seizure.
   Rationale: Correct answer

7. The MOST important reason for promptly transporting a stroke patient to the hospital is:
   A. a transient ischemic attack can be ruled out.
   B. medications may be given to reverse the stroke.
   C. the clot in the coronary artery may be dissolved.
   D. he or she needs close blood pressure monitoring.

Answer: B
Rationale: Fibrinolytic medications (clot busters) have been shown to reverse the symptoms of a stroke by dissolving the clot that is blocking the cerebral artery. However, for the patient to be eligible for this therapy, it must be initiated within 3 hours after the onset of
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symptoms. For this reason, prompt transport of the stroke patient is critical.

Review (1 of 2)
7. The MOST important reason for promptly transporting a stroke patient to the hospital is because:
   A. a transient ischemic attack can be ruled out.
      Rationale: In a TIA, stroke symptoms resolve (on their own), usually in less than 24 hours with no neurologic deficits.
   B. medications may be given to reverse the stroke.
      Rationale: Correct answer

Review (2 of 2)
7. The MOST important reason for promptly transporting a stroke patient to the hospital is because:
   C. the clot in the coronary artery may be dissolved.
      Rationale: The coronary artery is in the heart and not the brain.
   D. he or she needs close blood pressure monitoring.
      Rationale: Monitoring of a patient’s blood pressure is important, but dissolving the clot and stopping the progression of damage is more important.

Review
8. Which of the following are components of the Cincinnati Prehospital Stroke Scale?
   A. Arm drift, blood pressure, speech
   B. Speech, pupil response, arm drift
   C. Facial symmetry, speech, arm drift
   D. Pupil response, facial droop, speech

Answer: C
Rationale: The three components of the Cincinnati Prehospital Stroke Scale are facial symmetry, speech, and arm drift. Both sides of the patient’s face should move symmetrically (equally) when he or she smiles. The patient’s speech should be easily understandable and without slurring. The patient should be able to hold both arms out in front of his or her body—with eyes closed and palms up—without one arm drifting down to his or her side.

Review
8. Which of the following are components of the Cincinnati Prehospital Stroke Scale?
   A. Arm drift, blood pressure, speech
      Rationale: The scale does not use blood pressure.
   B. Speech, pupil response, arm drift
      Rationale: The scale does not use pupil response.
   C. Facial symmetry, speech, arm drift
      Rationale: Correct answer
   D. Pupil response, facial droop, speech
      Rationale: The scale does not use pupil response.

Review
9. Your patient opens his eyes when you say his name, is making incomprehensible sounds, and withdraws when you pinch his earlobe. What is his GCS score?
   A. 9
   B. 8
   C. 11
D. 12

**Review**

Answer: A

Rationale: The Glasgow Coma Scale gives a score of 3 to a patient who opens his or her eyes in response to speech. “Incomprehensible sounds” has a score of 2, and “withdraws to pain” has a score of 4. When added together, this patient’s GCS score is 9.

**Review**

9. Your patient opens his eyes when you say his name, is making incomprehensible sounds, and withdraws when you pinch his earlobe. What is his GCS score?
   A. 9  
   Rationale: Correct answer
   B. 8  
   Rationale: This is not the right score.
   C. 11  
   Rationale: This is not the right score.
   D. 12  
   Rationale: This is not the right score.

**Review**

10. If a patient complains of a severe migraine, how should she be transported?
   A. In a brightly lit ambulance so she can see while her vision is impaired
   B. With loud sirens so she can get to the hospital as soon as possible
   C. Without lights and sirens
   D. This patient should not be transported.

**Review**

Answer: C

Rationale: Treatment of a migraine headache is supportive; however, you should always assess the patient for other signs and symptoms that might indicate a more serious condition. Applying high-flow oxygen, if tolerated, may help ease the patient’s condition. When possible, provide a darkened and quiet environment because patients are sensitive to light and sound. Do not use lights and sirens during transport.

**Review (1 of 2)**

10. If a patient complains of a severe migraine, how should she be transported?
   A. In a brightly lit ambulance so she can see while her vision is impaired
      Rationale: Migraine patients are sensitive to light.
   B. With loud sirens so she can get to the hospital as soon as possible
      Rationale: Migraine patients are sensitive to loud noises.

**Review (2 of 2)**

10. If a patient complains of a severe migraine, how should she be transported?
   C. Without lights and sirens
      Rationale: Correct answer
   D. This patient should not be transported.
      Rationale: A migraine could indicate a more serious condition.