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**Pre-Lecture**

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**I. You are the Provider**

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Time: 10 minutes

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Small Group Activity/Discussion

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**Purpose**

This activity is designed to help introduce your students to the content of this chapter.

**Instructor Directions**

1. Direct students to read the “You are the Provider” scenario found throughout Chapter 28.
2. You may wish to assign students to a partner or a group. Direct them to review the discussion questions at the end of the scenario and prepare a response to each question. Facilitate a class dialogue centered on the discussion questions.
3. You may also assign this as an activity and ask students to hand in their comments on a separate piece of paper.

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**Lecture**

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**I. Introduction**

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5 minutes

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Slides: 2, 3

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Lecture

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**A. Epidemiology**

1. Three of the top 15 causes of death in the US in 2003 were neurologic in nature.
2. Someone suffers a stroke every 45 seconds in this country.
3. Patients are extremely vulnerable, even helpless.
  - a. Reflexes may be hindered.
  - b. Airway at risk

**II. Anatomy and Physiology**

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Time: 10 minutes

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Slides: 4–8

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Lecture

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**A. Overview**

1. Two major structures
  - a. Brain
  - b. Spinal cord and thousands of nerves
2. Functions
  - a. Breathing
  - b. Heart rate
  - c. Blood pressure
  - d. High level activity
3. Structures divided into two categories
  - a. Central nervous system: responsible for thought, perception, feeling, and autonomic body functions
  - b. Peripheral nervous system: transmits commands from the brain to the body and receives feedback from the body

## **B. Brain Structures and Functions**

1. Diencephalon
  - a. Filters unnecessary information from the cerebral cortex
  - b. Sends commands without alerting
2. Brain stem
  - a. Midbrain: responsible for regulating the level of consciousness (LOC)
  - b. Reticular activating system (RAS): regulates patterns of tiredness
  - c. Pons: regulates respiratory pace and depth
  - d. Medulla oblongata: controls blood pressure and heart rate
3. Emotions
  - a. Limbic system: generates rage and anger
  - b. Hypothalamus (part of diencephalon): generates pleasure, thirst, and hunger
  - c. Prefrontal cortex: mediates all emotions and controls reactions to them
  - d. Pituitary and adrenal glands: release epinephrine and norepinephrine, increasing strength and cardiovascular reserves
4. Cerebellum
  - a. Manages complex motor activity
  - b. Tracks body position

## **C. Nerve Structures and Functions**

1. Synapses
  - a. Slight gap separating nerve cells
  - b. Release neurotransmitters
2. Neurotransmitters
  - a. Chemicals that connect nerve cells
  - b. Dopamine, acetylcholine, epinephrine, serotonin
3. Neuron connection
  - a. The first neuron fires, sending a signal along its axon to the axon terminal.

- b. The axon terminal releases neurotransmitters that trickle across the synapse.
  - c. Dendrites detect chemicals and send the signal to the cell's nucleus, which then transmits it down the axon, and so on.
  - d. Dendrites release neurotransmitter deactivators so that one impulse from cell 1 generates one response from cell 2.
  - e. Complexity derives from how the cells are connected (one connected to many, many connected to one).
4. Myelin
- a. Insulation that allows a cell to consistently send its signal without losing electricity to surrounding fluids and tissues
  - b. Increases the speed of conduction

### III. Pathophysiology

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Time: 5 minutes

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Slide: 9

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Lecture

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#### A. Neoplastic (Cancerous) Causes

1. Neoplasms
  - a. Medical term for cancer
  - b. Caused by errors that occur during cellular reproduction
  - c. The magnitude of the cancer depends on how effectively the altered cells get sufficient nutrients for their growth and reproduction.
  - d. Benign or malignant

#### B. Degenerative Causes

1. Normal structure is altered over time.
  - a. Wear and tear (Parkinson's disease)
  - b. Autoimmune effects (multiple sclerosis)

#### C. Developmental Causes

1. Portions of the nervous systems are not formed correctly.
  - a. At any point from embryo to fetus
  - b. The earlier the error occurs, the more severe the damage.
  - c. Spina bifida: cells do not fold correctly and remain outside the neural tube.
  - d. Infection or chemical agent may damage areas of the brain.
  - e. Genetics appear to play a role in many diseases.

#### D. Infectious Causes

1. Bacteria, viruses, fungi, or prions gain access to the body, where they reproduce and cause damage.
2. Damage due to one of two mechanisms
  - a. Body's reaction to the infection

- b. Activities of the attacking organisms
- 3. Most common sign is the presence of a fever
  - a. If the body's temperature becomes too high the brain can be affected (dulled thinking, difficulty concentrating, or headache).
  - b. Eventually a person may hallucinate, become delusional, or lose consciousness.
- 4. Infectious agents may destroy cells.
  - a. Endotoxin: proteins that are released by gram-negative bacteria when they die
  - b. Exotoxin: proteins that are secreted by some bacteria or fungi to aid in the death and digestion of other cells

### **E. Vascular Causes**

- 1. If a blood vessel becomes blocked, cells may become ischemic.
  - a. Anaerobic metabolism to survive
  - b. May occur gradually or suddenly
- 2. Aneurysms
  - a. Weaknesses in artery walls
  - b. Small tear or defect within the wall
  - c. Blood penetrates between layers of the artery.
  - d. Pressure builds up and the initially small tear increases in size.
  - e. The wall can no longer withstand normal pressure.
- 3. Plaque accumulates in blood vessels over the years.
  - a. Creates turbulence within the artery
  - b. Allows small clots to form on walls
  - c. Narrows the diameter of the arterial lumen

### **F. Multifactorial Causes**

- 1. Most diseases or conditions have multiple causes.
  - a. How well the body system was created during development
  - b. How effective the body's defense and repair mechanisms are
  - c. How severe or prolonged the factors trying to damage the body are

### **G. Intracranial Pressure**

- 1. Hemorrhagic strokes
  - a. Cause bleeding into the brain
  - b. Place patient at risk for ICP
- 2. Skull
  - a. Brain
  - b. Blood
  - c. Cerebrospinal fluid
  - d. Balanced exchange of pressure
- 3. Pressure climbs and remains high.
  - a. Brain may become ischemic due to lack of blood supply.

- b. Herniate: push through the ligaments that compartmentalize the brain
4. Cerebral perfusion pressure (CPP)
  - a. Pressure of blood within the cranial vault
  - b.  $CPP = MAP - ICP$
  - c. Mean arterial pressure (MAP)
5. If ICP rises sharply or blood pressure falls critically, patients may experience serious problems.
  - a. Carbon dioxide and oxygen levels are important.

## H. You are the Provider

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Slide: 10

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Discussion

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1. Present the case study provided on the slide:
  - a. You are dispatched to a private residence for a patient with altered mental status.
  - b. When you arrive on scene, you find a woman in her bed, responsive to verbal stimuli.
  - c. She is complaining of having a headache for the past two days.
  - d. *What is your treatment for this patient? What types of questions do you want to ask?*
    - Administer standard oxygen therapy and take vital signs. You want to ask the following: Did anything precipitate this event? Has it gotten worse? Does she have blurred vision? Does she have any neurological disorders associated with this? Also ask any other pertinent negatives. Also, determine whether she can follow commands.

## IV. General Assessment

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Time: 5 minutes

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Slides: 11–13

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Lecture

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### A. Scene Size-up

1. Patients with altered levels of consciousness may not be able to walk, may be combative, or may be completely unresponsive.
2. Examine the scene to ascertain the number of patients.
3. Consider the mechanism of injury.
4. If many patients exhibit similar symptoms, you should be very cautious.

### B. Initial Assessment

1. Begin as you would any other patient.
2. Two main abnormal postures
  - a. Decorticate posturing: contracts the arms and curls them toward the chest, points toes, wrists flexed. This position may indicate damage to the area directly below the cerebral hemispheres.

- b. Decerebrate posturing: points the toes, extends the arms outward and rotates lower arms in a palms-down manner, wrists flexed. This posture is more severe; damage is within or near the brain stem.
- 3. Airway
  - a. The trigeminal, glossopharyngeal, vagus, and hypoglossal nerves are responsible for airway control.
  - b. Allow for swallowing, controlling the tongue, and ensuring that muscles in the hypopharynx are slightly contracted
  - c. Trismus: teeth are clenched and closed (airway management difficult).
- 4. Breathing
  - a. Check the rate and rhythm of breathing.
  - b. The greater the deviation from normal, the more severely the nervous system is affected.
- 5. Circulation
  - a. Peripheral and central pulse pressures (Absence of a peripheral pulse with a central pulse suggests shock.)
  - b. Cushing's reflex (opposite of what is expected in shock)
  - c. Systolic pressure changes
  - d. Diastolic pressure changes
- 6. Transport decision
  - a. "Load and go" or "stay and play"
  - b. Critical patients (alterations in their initial assessment or significant mechanisms of injury) should be transported urgently.
  - c. Stable patients

### **C. Focused History and Physical Exam**

- 1. Rapid trauma assessment
  - a. Any patient who has an abnormal initial assessment, has a significant MOI/history of present illness, or whom you suspect may have a major problem
- 2. History
  - a. Same process as with other patients

### **D. Detailed Physical Exam**

- 1. Head
  - a. Area where you will spend the most time
  - b. Critical information on the functioning of the nervous system
  - c. Assess for trauma (DCAP-BTLS)
  - d. LOC: coma (state in which patient does not respond to verbal or painful stimuli)
  - e. Glasgow coma scale (GCS), see Table 28-4
  - f. Changes in the patient's mood or tempo should alert you to changes in neurologic status.
  - g. Ask the patient how easy it is for him or her to think.
- 2. Visual findings

- a. Ptosis (drooping eyelids) can indicate Bell's palsy or a stroke.
  - b. Cranial nerves: peripheral nerves that control various portions of the body (ability to respond, strength of response, and symmetry)
3. Speech
- a. Quality of speech
  - b. Quality of words
  - c. Subtle knowledge deficits (agnosia and apraxia)
  - d. Receptive aphasia: patient cannot understand speech, but is able to speak clearly.
  - e. Expressive aphasia: patient cannot speak clearly, but is able to understand speech.
  - f. Global aphasia: patient cannot understand speech and cannot speak clearly.
4. Pupils
- a. Pupillary shape
  - b. Anisocoria: unequal pupils (sign of increased ICP)
  - c. Nystagmus: involuntary, rhythmic movement of the eyes
5. Movement of the body
- a. Hemiparesis: weakness of one side of the body
  - b. Hemiplegia: paralysis of one side of the body
  - c. Decussation: nerves cross as they leave the cerebral cortex, move through the brain stem, and arrive at the spinal cord (weakness in one side of the body, facial droop on the other)
  - d. Cerebellum function: close eyes and lift arms; assess gait.
  - e. Ataxia: changes in a person's ability to perform coordinated motions like walking (Parkinson's disease patients exhibit a specific gait.)
  - f. Bradykinesia: routine motions slow dramatically.
  - g. Myoclonus: involuntary contraction of muscles that is rapid and jerky in nature
  - h. Dystonia: part of the body contracts and remains contracted.
  - i. Rest tremors: occur when the patient is at rest; common in Parkinson's disease
  - j. Intension tremors: occur when the patient tries to reach out and grab an object; common in MS
  - k. Postural tremors: occur when a body part is required to maintain the same position for a long period of time
  - l. Seizures: tonic activity (very rigid, contracted body pressure); clonic activity (rhythmic contraction and relaxation of muscle groups)
6. Sensation
- a. Altered ability to feel pain, temperature, pressure, or light touch
  - b. Paresthesia: a sensation of numbness
  - c. Anesthesia: a patient can feel nothing within a body part.
7. Blood glucose level
- a. Below 30 or above 300 mg/dL, confusion or unconsciousness
8. Chest
- a. 12-lead ECG in all patients with sudden loss of consciousness
  - b. Evaluate for the presence of adventitious sounds and equality of sounds.

9. Abdomen
  - a. Any masses?
  - b. Signs of nausea and vomiting are common with some neurologic conditions.
10. Pelvis
  - a. Incontinence (urinary or fecal) is common with seizures or syncope.
  - b. LOC must be decreased below that of sleep for incontinence to occur.
11. Extremities
  - a. Edema
  - b. Venipuncture marks

## **E. Ongoing Assessment**

1. Casual conversation allows close monitoring of the brain functions.

# V. General Management

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Time: 5 minutes

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Slide: 14

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Lecture

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## **A. Management Guidelines**

1. All patients who experience a change in LOC
2. Three major elements needed for brain function
  - a. Oxygen
  - b. Glucose
  - c. Normal temperature
3. Techniques (standard care)
  - a. BSI and scene safety
  - b. Evaluate airway and effectiveness of breathing.
  - c. Establish IV access and administer normal saline or lactate Ringer's solutions.
  - d. Continuously monitor the patient on an ECG.
  - e. Check the blood glucose level.
  - f. Look for the hallmarks of increased ICP (Table 28-6).
  - g. Check for drug use and watch for seizures.
  - h. Evaluate the patient's temperature.
  - i. Provide emotional support.

## **B. Administration of Dextrose/Glucose**

1. Consult local protocol.
2. Two medications are available for hyperglycemia.
  - a. Dextrose 50%
  - b. Glucagon
3. May need to give thiamine before administering dextrose.
  - a. Those who are malnourished lack B<sub>1</sub> to adequately metabolize dextrose.

- b. Thiamine allows the body to convert its store of glycogen into glucose.
4. No safe way to lower high blood glucose levels in the field
  - a. Insulin: problematic (overshoot the mark)

### C. Airway Management

1. Bag mask, laryngeal mask airway, Combitube, or endotracheal intubation initiated to ensure sufficient oxygen ventilation

### D. Administration of Naloxone

1. Treatment of unconscious/unknown patients or those with suspected narcotic overdose
2. Causes a rapid increase in LOC
  - a. May cause patients to become fearful and potentially angry or aggressive

### E. Temperature Assessment

1. Difficult to determine in the field
2. Oral, otic, transdermal, or rectal temperature can be measured.

### F. You are the Provider (continued)

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Slide: 15

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Discussion

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1. Continue reading the case study provided on the slide:
  - a. The patient's blood pressure is elevated, 240/110 mm Hg, and she has bounding pulses at a rate of 110 beats/min.
  - b. The family tells you she has not taken her medications (including her blood pressure medication) for three days.
  - c. *What is the relevance to the patient's noncompliance with her medication?*
    - Finding out whether a patient is compliant with his or her medication is very important, especially in this case. Does the patient have high blood pressure now because she hasn't taken her medicine for three days? More than likely. Is this the cause of her headache? Is there something else going on with the patient?

## VI. Assessment and Management of Specific Injuries and Illnesses

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Time: 30 minutes

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Slides: 16–21, 23–38

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Lecture

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### A. Stroke

1. Cerebrovascular accidents (CVAs)
  - a. Blood supply to areas of the brain becomes interrupted, resulting in ischemia.
2. The goal of treatment is early recognition and rapid, appropriate intervention.
3. Two basic types of strokes

- a. Ischemic: blood vessel is blocked; eventually tissue will die if blood flow is not restored.
- b. Hemorrhagic: worsens over time due to bleeding within the cranium; very severe headache
- c. Figure 28-19
- 4. Presentation
  - a. Language effects: slurred speech, aphasia, agnosia, and apraxia
  - b. Movement effects: hemiparesis, hemiplegia, arm drifting, facial droop, ptosis, and ataxia
  - c. Sensation effects: headache, sudden blindness, and unilateral paresthesia
  - d. Consciousness problems: decreased LOC, difficulty thinking, seizures, and coma
  - e. Hypertension
  - f. Figure 28-20
- 5. Prehospital management
  - a. Educate the community about stroke signs and symptoms, the effects of strokes, and EMS.
  - b. Cincinnati Prehospital Stroke Scale (Table 28-8)
  - c. Los Angeles Prehospital Stroke Screen (Table 28-9)
  - d. Fibrinolytic checklist (Table 28-10)
  - e. Aspirin only after CT scan or MRI at a hospital

## **B. Transient Ischemic Attack (TIA)**

- 1. Episodes of cerebral ischemia that do not inflict any permanent damage
- 2. Often signs of a serious vascular problem

## **C. Altered Level of Consciousness/coma**

- 1. Many possible causes
- 2. AEIOU-TIPS
  - a. Alcohol/acidosis, epilepsy, insulin, overdose, uremia, trauma, infection, psychosis, and stroke
- 3. Presentation
  - a. Speed of onset for altered LOC
  - b. Thought effects: decreasing LOC, confusion, hallucinations, delusions, psychosis, difficulty thinking, overly sleepy
  - c. Speech effects: slurred speech, agnosia, apraxia, aphasia
  - d. Movement effects: ataxia, seizures, posturing
  - e. Total unresponsiveness or coma
- 4. Prehospital management
  - a. First, support vital functions.
  - b. Second, gather information about the possible cause.

## **D. Seizure**

- 1. Sudden, erratic firing of neurons

2. Epilepsy
3. Medication compliance
4. Classification of seizures
  - a. Grand mal: tonic/clonic seizures provide the most challenges. Their pattern is as follows: aura, LOC, tonic phase, hypertonic phase, clonic phase, postseizure, postictal.
  - b. Petite mal: absence seizures; little or no movement; typically occur in children; stop movement or speech
  - c. Partial seizures: involve only a limited portion of the brain; Jacksonian March wave
5. Prehospital management
  - a. Determine whether trauma is a concern.
  - b. Don't restrain the patient or try to stop seizing movement.
  - c. Prevent the patient from striking objects and becoming injured.
  - d. Remove objects from the patient's mouth.
  - e. Provide ventilatory assistance only if prolonged.
  - f. Emotional support is important in the postseizure phase (privacy, calm and slow speech, reorient the patient to time and place).
  - g. All patients should be transported.
6. Status epilepticus
  - a. Seizure that lasts longer than 4 or 5 minutes or consecutive seizures that occur without consciousness returning between episodes
  - b. If prolonged the body can't remove lactic acid or ensure adequate glucose supplies.

## **E. Syncope**

1. Fainting
  - a. Sudden and temporary loss of consciousness without accompanying loss of postural tone
  - b. Table 28-13 lists the common causes of syncope.
2. Presentation
  - a. Standing position when the event occurs
  - b. Experience fear, emotional stress, or pain
  - c. The room will seem to spin and the individual will pass out.
  - d. Usually experience prodrome (signs or symptoms that precede a disease or condition): dizziness, weakness, shortness of breath, chest pain, headache, or visual disturbances
  - e. Incontinence is possible.
3. Prehospital management
  - a. Standard care
  - b. Determine if patient sustained trauma during the fall.
  - c. Provide emotional support.
  - d. Transport to the hospital.

## **F. Headache**

1. Originates from nerves within the scalp and face, blood vessels, and muscles of the neck and head
2. Types
  - a. Muscle tension: life stress that results in residual contractions within the face and head
  - b. Migraine: thought to be caused by changes in blood vessel size within the base of the brain
  - c. Cluster: rare vascular headaches that start in the face
  - d. Sinus: caused by inflammation or infection within the sinus cavities of the face
  - e. Others: caused by tumors, inflammation of the temporal artery, strokes, CNS infections, or hypertension
3. Clues to drug-seeking behavior
  - a. History of calling 9-1-1 for headaches
  - b. Allergies limit them to a small number of narcotic medications.
  - c. Reluctance to try other pain management options
  - d. Sudden relaxation after being told narcotics are on the way
4. Headaches can indicate a more serious problem.

### **G. You are the Provider (continued)**

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Slide: 22

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Discussion

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1. Continue reading the case study provided on the slide:
  - a. You are transporting the patient to the hospital and while en route, the patient begins to have focal seizures of her left arm.
  - b. She becomes unresponsive. A repeat of her blood pressure reveals the same measurement.
  - c. *What is your next step?*
    - You need to contact medical control for an antiseizure medication. (Make sure you know what your agency carries.) You should now begin to suspect something more than a hypertensive crisis, possibly an intracranial bleed of some sort. Then again, this could be a simple hypertensive crisis.

### **H. Abscess**

1. Infectious agent invades the brain or spinal cord.
  - a. Body creates a barrier to contain bacteria, dead or dying brain cells, dead white blood cells, and white blood cells fighting the infection.
  - b. Swelling
2. Two major consequences
  - a. Damage to the brain tissue
  - b. Abscess within the cranial vault leading to increased ICP
3. Low- or high-grade fever, persistent headache, drowsiness, confusion, focal motor or sensory impairments, and hemiparesis
4. Prehospital management

- a. Standard care
- b. Hyperventilation
- c. Take seizure precautions.
- d. Transport urgently.

### **I. Multiple Sclerosis (MS)**

1. Autoimmune condition in which the body attacks the myelin sheath of the neurons in the brain and spinal cord, leading to areas of scarring
2. More prevalent in temperate regions than in tropical regions
  - a. Environmental trigger (virus), although none has been identified
3. Presentation
  - a. Follows a pattern of attacks and remissions
  - b. Attacks vary in intensity and remissions vary in length.
  - c. Double vision and blurred vision are common complaints.
  - d. Other symptoms include muscle weakness; impairment of pain, temperature, and touch senses; pain; ataxia; intension tremors; speech disturbances; vision disturbances; vertigo; bladder or bowel dysfunction; sexual dysfunction; depression; euphoria; cognitive abnormalities; and fatigue.
4. Prehospital management
  - a. Standard care
  - b. Controlling symptoms
  - c. Anti-inflammatory medications
  - d. No cure

### **J. Neoplasms**

1. Cancer within the brain or spinal cord (for the purposes of this chapter)
2. Types
  - a. Primary: begin within the nervous system
  - b. Metastatic: begin in some other part of the body, gain access to the bloodstream or lymphatic system, and then take up residence in the nervous system
3. Signs and symptoms
  - a. Headache, nausea and vomiting, seizures, changes in mental status, and stroke-like symptoms
  - b. Rate and intensity depend on cancer's growth rate and location.
4. Prehospital management
  - a. Supportive

### **K. Dystonia**

1. Marked by severe, abnormal muscle spasms that cause bizarre contortions, repetitive motions, or postures
  - a. Involuntary and often painful
  - b. Onset may be precipitated by stress or continuous use of a muscle group.
2. Both a sign and a condition

- a. Secondary dystonia: patients who take antipsychotic medications
3. Prehospital management
  - a. Focus on ruling out other problems (seizures, strokes, or psychiatric medication reaction).
  - b. Provide compassionate care.

#### **L. Parkinson's Disease**

1. The substantia nigra (portion of the brain that produces dopamine) becomes damaged.
  - a. Dopamine ensures smooth muscular contraction.
2. Initial signs
  - a. Unilateral tremors
  - b. Over time, more areas become involved.
3. Presentation
  - a. Tremor, postural instability, rigidity, and bradykinesia
  - b. Rest tremors and postural tremors are common.
  - c. Depression, difficulty swallowing, speech impairments, and fatigue
4. Prehospital management
  - a. Standard care and emotional support

#### **M. Trigeminal Neuralgia**

1. Also called tic douloureux
2. Inflammation of the trigeminal nerve (fifth cranial nerve)
  - a. Receives sensory information from the face
  - b. Usual cause is irritation by an artery lying too close to the nerve, grating the myelin sheath off the nerve.
3. Patients experience severe shock-like or stabbing pain, usually on one side of the face.
  - a. Can be triggered by touching the face, speaking, brushing teeth, eating, putting on clothing, or the wind.
  - b. Typically no loss of taste, hearing, or facial sensation, and no loss of motor control over the face
4. Although not life-threatening, this condition can be quite debilitating.
  - a. Need compassion and understanding
5. Prehospital management
  - a. Standard care
  - b. Pain medication
  - c. Limit conversations to decrease facial movement.

#### **N. Bell's Palsy**

1. Temporary paralysis of the facial nerve (seventh cranial nerve)
  - a. Controls muscles on each side of the face, including those used in eye blinking and facial expression

- b. Also controls tear glands and saliva glands and transmits taste sensations from the tongue
2. Minor infection before it appears
  - a. Ptosis, facial droop or weakness, drooling, and loss of the ability to taste
3. Often resolves in 2 weeks
4. Prehospital management
  - a. Standard care

### **O. Amyotrophic Lateral Sclerosis (ALS)**

1. Lou Gehrig's disease
2. Death of voluntary motor neurons for unclear reasons
  - a. One theory suggests that the body's immune system selectively attacks and kills these motor neurons.
  - b. Some evidence indicates that genetics may play a role.
3. Initially subtle and progresses without drawing notice
  - a. Fatigue, general weakness of muscle group, and difficulty performing routine activities (eating, writing, and dressing) are early signs.
  - b. As it progresses, the patient loses the ability to walk, move arms, eat, and speak.
  - c. Speed of progression differs for every patient.
4. The average person diagnosed will die within 3 to 5 years.
  - a. Eventually unable to breathe effectively
  - b. Die of respiratory infections or other complications related to immobility
5. Prehospital management
  - a. Standard care
  - b. Assess the ability to swallow and monitor airway closely.
  - c. Transportation complicated by equipment

### **P. Guillain-Barré Syndrome**

1. Rare condition that begins as weakness and tingling sensations in the legs
  - a. Can quickly become severe and lead to paralysis
  - b. Cause is unclear (immune response)
2. Reversal of condition can be almost as dramatic.
  - a. Complete recovery in as little as several weeks in some patients
3. Prehospital management
  - a. Standard care and close assessment of the patient's ability to effectively protect the airway and ventilate

### **Q. Poliomyelitis**

1. Viral infection transmitted by the fecal-oral route
2. Incidence peaked in the 1950s.
  - a. Very effective vaccine
  - b. Likely to be eradicated worldwide within 10 years

3. Signs and symptoms
  - a. Sore throat, nausea, vomiting, diarrhea, stiff neck, and weakness or paralysis of muscles
4. Prehospital management
  - a. Standard care
  - b. In severe cases, ventilation assistance
5. Damage to the nervous system places patients at risk for problems decades after initial infection.
  - a. Motor neurons within the brain and brain stem are attacked.
  - b. Postpolio syndrome: breakdown of overcompensating motor neurons in the brain and brain stem

## **R. Cerebral Palsy (CP)**

1. Developmental condition in which damage is done to the brain (frontal lobe)
2. Condition is self-limiting and does not worsen over time.
3. Presentation
  - a. Begins in infancy (milestones delayed)
  - b. Spastic CP (70%–80% of cases): muscles are in a near-constant state of contraction.
  - c. Other types involve slow, uncontrolled writhing movements, tremors, or difficulties with coordination.
4. Prehospital management
  - a. Supportive
  - b. Standard care

## **S. Spina Bifida**

1. Developmental condition resulting from a neural tube defect
  - a. A portion of the spinal cord remains outside its normal location.
  - b. Severity depends on where the defect lies on the cord and how much it is displaced.
  - c. Spina bifida occulta: one small section of vertebrae is malformed and slightly displaced.
  - d. Myelomeningocele: a portion of the spinal cord remains completely outside the vertebral column and outside of the skin.
2. Consequences
  - a. Can range from no complications to complete loss of motor and sensory functions below the defect
  - b. Muscle problems, seizures, or severe neurologic impairments
3. Prehospital management
  - a. Standard care (latex allergies)
  - b. Technology concerns

## **T. Myasthenia Gravis**

1. Body creates antibodies against the acetylcholine receptors
  - a. Neurotransmitter needed to allow for muscular contraction

2. As acetylcholine levels fall
  - a. Muscle weakness (eyes, eyelids, and facial muscles)
3. Prehospital management
  - a. Standard care
  - b. Assist in ventilation

#### **U. Alzheimer's Disease**

1. Review Chapter 42.
2. Most common form of dementia
  - a. Chronic deterioration of a person's personality, memory, and ability to think
3. Progressive organic condition in which neurons die
  - a. No definitive treatment; standard care

#### **V. Peripheral Neuropathy**

1. Comprises a group of conditions in which the nerves leaving the spinal cord become damaged
  - a. Signals moving to or from the brain become distorted.
2. Causes
  - a. Trauma, toxins, tumors, autoimmune attacks, and metabolic disorders
3. Diabetic neuropathy
  - a. As blood glucose levels rise, peripheral nerves may become damaged, resulting in misfiring and shorting of signals.
  - b. Sensory or motor impairment
  - c. Loss of sensation, numbness, burning sensations, pain, paresthesia, and muscle weakness
  - d. May eventually lose the ability to feel their feet or other areas
  - e. Management is supportive (standard care).

#### **W. Muscular Dystrophy (MD)**

1. Nonneurologic condition of genetic origin marked by the degeneration of muscular tissue
  - a. Defective DNA causes an error in muscle tissue.
  - b. Diagnosed at age 2 to 5 and occurs only in males
2. Several forms
  - a. Distinguished by the involvement of a particular gene and a unique set of characteristics
3. Generally present
  - a. Progressive muscle weakness, delayed development of muscle motor skills, ptosis, drooling, and poor muscle tone
  - b. Duchenne's manifests itself in childhood and can include damage to the respiratory and cardiac muscles (shortened life expectancy).
4. Prehospital management
  - a. Standard care

- b. Ventilatory support may be necessary.
- c. Blood pressure support may be necessary (fluid and dopamine).

## X. You are the Provider Summary

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Slide: 39

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Discussion

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1. Continue reading the case study provided on the slide:
  - a. You administer 1 mg of Ativan IV push and have begun to administer a beta blocker for the patient's blood pressure.
  - b. When you arrive at the hospital the patient is slowly becoming more responsive.
  - c. Many times a headache is related to a hypertensive crisis; keep an open mind as to what else could be going on. It is very easy to get tunnel vision.

## Y. Summary

1. Epidemiology
2. Anatomy and physiology
3. Nervous system pathophysiology
4. Assessment of the patient with neurologic disorders
5. Management of neurologic disorders
6. Specific neurologic disorders

## Post-Lecture

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### I. Prep Kit Activities

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Time: 55 minutes

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*Note: This section contains various student-centered end-of-chapter activities designed as enhancement to instructor's preparation. As time permits, these activities may be presented in class. They are also designed to be used as outside homework/activities.*

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#### A. Assessment in Action

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Time: 20 minutes

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Individual/Small Group Activity/Discussion

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#### Purpose

This activity is designed to assist students in gaining a further understanding of the chapter content. This activity allows students an opportunity to analyze an emergency care scenario, develop responses, and integrate what they have learned.

#### Instructor Directions

1. Direct students to read the "Assessment in Action" scenario located in the Prep Kit at the end of Chapter 28.

2. Direct students to read and individually answer the quiz questions at the end of the scenario. Facilitate a class review and dialogue of the answers, allowing students to correct responses as may be needed. Use the quiz question answers noted below to assist in building this review.
3. You may also wish to assign these as individual activities and ask students to turn in their comments on a separate piece of paper.

### Answers to Multiple-Choice Questions

*You're just walking in the door to start your shift when you're sent to a diabetic emergency. En route to the job, the fire department delivers an update: The patient is a 78-year-old man who is unconscious and unresponsive. On arrival, you find the patient supine on his bed. The fire department is preparing to move him to the ambulance. You notice that he has sonorous respirations; his skin is warm, dry, and normal in color; blood pressure is 240/140 mm Hg; respirations are 24 breaths/min and shallow; pulse oximetry is 95% on room air; and heart rate is 78 beats/min. The patient has a left-side eye gaze and doesn't respond to painful or verbal stimuli.*

*When you interview the family, they report that the patient woke up today with no complaints and took a shower. After the shower, he collapsed onto the bed. They called 9-1-1 at approximately 8:00 AM. The patient has type II diabetes. You immediately perform a blood glucose check, which comes back as 191 mg/dL. The patient is unable to control his airway; however, his mouth is clenched shut and you are unable to insert an oral airway. While the patient is being transferred to the ambulance, his respiratory rate decreases, allowing you to insert an oral airway. You prepare to intubate the patient and ventilate him with 100% oxygen via a bag-valve device. En route to the hospital, you successfully intubate and secure the endotracheal tube.*

*Arriving at the hospital, you give your report to the emergency department. When you do your end-of-shift report, you are told the patient had a "huge cerebellum bleed." His prognosis is poor and the emergency department staff is speaking with the family about removing him from the ventilator.*

1. \_\_\_\_\_ is a serious medical condition in which blood supply to areas of the brain is interrupted, resulting in ischemia.
  - A. Myocardial infarction
  - B. Pulmonary embolism
  - C. Cerebrovascular accident
  - D. Bell's palsy

**Answer: C.** Cerebrovascular accidents (CVAs) or strokes are serious medical conditions in which blood supply to areas of the brain becomes interrupted, resulting in ischemia. Nearly half of all patients who suffer from strokes deny their symptoms. The goal of treatment is early recognition and rapid, appropriate intervention. "Time is brain."

2. The two basic types of strokes are ischemic and:
  - A. neurologic.
  - B. hemorrhagic.

- C. pathologic.
- D. neoplasm.

**Answer: B.** These two causes of stroke have different presentations. In ischemic stroke, a blood vessel is blocked, so the tissue distal to the blockage becomes ischemic. Hemorrhagic CVAs tend to worsen over time due to bleeding within the cranium, which increases ICP and leads to herniation of the brain stem.

3. A hallmark of a hemorrhagic CVA is the:
- A. “worst headache of my life.”
  - B. “worst chest pain of my life.”
  - C. “worst blurred vision of my life.”
  - D. “worst weakness of my life.”

**Answer: A.** Hemorrhagic stroke is often reported as the “worst headache of my life.” If the patient complains of a very severe headache and later can't speak, becomes more difficult to arouse, and shows signs of increased ICP, you should consider a diagnosis of hemorrhagic CVA.

4. The nervous system is the most complex organ in the human body. It consists of two major structures—the\_\_\_\_\_ and\_\_\_\_\_—and thousands of nerves allowing every part of the body to communicate.
- A. brain, myocardium
  - B. pulmonary, embolism
  - C. brain, spinal cord
  - D. spinal cord, myocardium

**Answer: C.** The nervous system is responsible for fundamental functions such as controlling breathing, heart rate, and blood pressure.

5. The major structures are divided into two main categories: the central nervous system and the:
- A. parasympathetic nervous system.
  - B. sympathetic nervous system.
  - C. peripheral nervous system.
  - D. autonomic nervous system.

**Answer: C.** The peripheral nervous system is responsible for transmitting commands from the brain to the body and receiving feedback from the body. The central nervous system is responsible for thought, perception, feeling, and autonomic body functions.

6. Weakness on one side of the body is called:
- A. hemiplegia.
  - B. decussation.
  - C. nystagmus.
  - D. hemiparesis.

**Answer: D.** Weakness of one side of the body is called hemiparesis; paralysis of one side of the body is called hemiplegia. In decussation, patients have weakness on one side of the body and facial droop on the other.

7. The \_\_\_\_\_ is located in the posterior, inferior area of the skull.
- A. medulla oblongata
  - B. cerebellum
  - C. midbrain
  - D. cerebrum

**Answer: B.** The cerebellum manages complex motor activity unconsciously. It helps keep track of body position and helps manage activities such as walking, swimming, and riding a bike.

8. The synapse, which is present wherever a nerve cell terminates, connects to the next cell through chemicals called:
- A. synapse.
  - B. dendrites.
  - C. neurotransmitters.
  - D. axon terminals.

**Answer: C.** A host of neurotransmitters are present within the brain and throughout the body, including dopamine, acetylcholine, epinephrine, and serotonin.

9. A hallmark of increased ICP is Cushing's reflex, which means:
- A. bradycardia, bradypnea, and widened pulse pressure.
  - B. tachycardia, tachypnea, and narrowing pulse pressure.
  - C. bradycardia, tachypnea, and widened pulse pressure.
  - D. tachycardia, bradypnea, and widened pulse pressure.

**Answer: A.** It is important to look for the hallmarks of increased ICP. Cushing's reflex includes bradycardia, bradypnea, and a widened pulse pressure.

10. Time is essential in treating either kind of stroke. The American Heart Association states:
- A. Time is muscle.
  - B. Time is brain.
  - C. Time is essential.
  - D. Time doesn't matter.

**Answer: B.** Time is brain. Hospitals will take different paths of care for each type of stroke, but one feature is common to all of them: Time is important. For ischemic strokes, fibrinolytics need to be administered within 3 hours of onset. In hemorrhagic stroke, the more the patient bleeds into the cranium, the greater the potential for increased ICP and brain stem damage.

### Challenging Questions

*You're dispatched to an assisted living home for an 83-year-old woman with an altered mental status. When you arrive and the patient is speaking to you, she appears confused and repeats her statements. Her vital signs are all within normal limits: blood pressure, 130/70 mm Hg; heart rate, 84 beats/min; respiratory rate, 18 breaths/min; and pulse oximetry, 99% on room air. The staff taking care of her reports that she "hasn't been right all day." The paperwork provided to you by the staff is incomplete; however, the medication list is there and you see Aricept.*

11. What type of medical history do you suspect based on this medication?

**Rationale:** You should suspect dementia. Dementia is a chronic deterioration of a person's personality, memory, and ability to think. Alzheimer's disease—a progressive organic condition in which neurons die—is the most common form of dementia. The initial diagnosis of the disease is frequently dismissed as forgetfulness or old age. Alzheimer's disease is *not* a natural part of aging. As this disease progresses, it becomes clear that more than just a simple memory loss is occurring. Some patients may become aggressive and violent as the disease damages their judgment centers. Confusion is a hallmark sign. Patients have an 8- to 10-year life expectancy after diagnosis, with most dying from aspiration pneumonia.

12. How should you care for this patient?

**Rationale:** Prehospital management is standard care. Be compassionate and be prepared to repeat yourself. There is no definitive treatment for the destroyed neurons.

## **B. Points to Ponder**

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Time: 20 minutes

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Individual/Small Group Activity/Discussion

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This activity addresses the affective objectives of the chapter, allowing you to help students probe the more difficult situations that they face. Use this as an opportunity to allow them to express differences of opinion and approach, while directing them to be thorough and decisive in their answers. Encourage challenges.

### **Purpose**

To allow students an opportunity to apply critical thinking analysis to a given case study.

### **Instructor Directions**

1. Direct students to read the "Points to Ponder" scenario found in the Prep Kit at the end of Chapter 28.
2. You may wish to assign students to a partner or a group and direct them to review the discussion question at the end of the scenario and prepare a response. Facilitate a class dialogue centered on the discussion point.
3. You may also ask students to complete this activity on their own and hand in their comments on a separate piece of paper.
4. Personally review the scenario and discussion question based on your experience and knowledge as an emergency care professional. Develop your own key points for guiding this discussion.

## Scenario

*You and your partner are dispatched to a private residence for a seizure. When you arrive on scene, you find a 24-year-old man who is responsive to verbal stimuli but is nonverbal. The family reports that the patient had a seizure, which lasted approximately 3 minutes. It was a full-body, normal seizure for the patient. He is in his normal postictal state as well. There is positive incontinence to urine and no tongue laceration. His blood pressure is 130/90 mm Hg; heart rate is 93 beats/min; respiratory rate is 16 breaths/min; and pulse oximetry is 98% on room air.*

*During transport to the hospital, the patient slowly becomes more responsive. He appears scared and keeps asking, "What happened?" You explain that he apparently had a seizure. You keep reassuring him throughout the transport to the hospital. On arrival, he is less apprehensive and you give your report to the emergency department. During your follow-up, you find out he was treated and released from the hospital. The patient apparently did not take his Dilantin for several days.*

How can you narrow down the cause of a seizure in the field?

What benefits does this provide for patient care?

## Issues

Understanding and Implementing Treatment of a Patient Who Experienced a Seizure, Empathy for the Patient Who Regains Consciousness Among Strangers.

## Discussion

Seizures are the sudden, erratic firing of neurons. Patients can experience an array of signs and symptoms during these experiences. Seizures can be limited to shaking of one hand, or involve the movement of every limb or the complete loss of consciousness. Some patients may remain aware of what's going on, while others will wake up afterward not knowing what happened. As long as there is random firing of neurons, the event is defined as a seizure.

You should try to determine the cause of the seizure. Ask the patient or family about medication compliance. As in this scenario, it turned out that the patient was noncompliant with his Dilantin regimen. Knowing the cause of the seizure will help manage the patient. Other causes of seizures might include fever, hypoglycemia, or brain trauma. (Refer to Table 28-11 for common causes of seizures.)

Seizures can be very disconcerting to both family and health care workers to watch. During the seizing process, respirations may become very erratic, loud, and obviously abnormal. The patient may stop breathing and become cyanotic. These periods of apnea are short-lived and do not require assistance.

Most seizures are self-limiting, so all you'll need to do is monitor and protect patients from injuring themselves. Prehospital management of patients with seizures begins with standard care. Determine whether trauma is a concern. Remain calm. Don't restrain the patient or try to stop the seizing movement. Prevent patients from striking objects and hurting themselves. Provide ventilatory assistance only if the seizure or apnea is prolonged.

In the postseizure state, emotional support is very important. Provide privacy and treat patients with respect and dignity. Speak calmly and slowly and be prepared to repeat yourself several times. Reorient patients to place and time. Unless a clear and reversible cause of the seizure is identified, you should transport all patients who have had a seizure to the hospital. Seizures can be a warning sign of a more serious nervous system problem.

## II. Lesson Review

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Time: 10 minutes

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Discussion

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*Note: Facilitate the review of this lesson's major topics using the review questions as direct questions or overhead transparencies. Answers are found throughout this lesson plan. Each question includes a reference to the slide where the information is covered.*

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1. What are the four major regions of the brain, and what does each do? (Lecture II-B)
2. How does impulse transmission occur across a synapse? (Lecture II-C)
3. What are the components of the neurologic physical exam? (Lecture IV-D)
4. What interventions are included in the general management of neurologic disorders? (Lecture V-A)
5. Describe the clinical presentation of stroke. (Lecture VI-A)
6. What are the types of seizures and the characteristics of each? (Lecture VI-D)
7. How are seizures managed? (Lecture VI-D)
8. What are the three types of headaches and how are they differentiated? (Lecture VI-F)
9. What causes multiple sclerosis? (Lecture VI-H)

## III. Assignments

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Time: 5 minutes

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Lecture

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1. Review all materials from this lesson and be prepared for a lesson quiz to be administered (date to be determined by instructor).
2. Read Chapter 29: *Endocrine Emergencies* for the next class session.