

# Chapter 29

## Neurology

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### Topics

- Anatomy and Physiology
- Pathophysiology
- General Assessment Findings
- Management of Nervous System Emergencies

### Anatomy and Physiology

- The Central Nervous System
  - The Neuron
  - Protective Structures
  - The Brain
  - The Spinal Cord

### Central Nervous System (1 of 7)

- The Neuron

### Central Nervous System (2 of 7)

- Protective Structures
  - The Skull

### Central Nervous System (3 of 7)

- Protective Structures
  - The Spine

### Central Nervous System (4 of 7)

- Protective Structures
  - The Meninges

### Central Nervous System (5 of 7)

- The Brain
  - Divisions of the Brain
  - Areas of Specialization

### Central Nervous System (6 of 7)

- The Brain

- Vascular Supply

## Central Nervous System (7 of 7)

- The Spinal Cord

### Anatomy and Physiology

- The Peripheral Nervous System
  - The Autonomic Nervous System
    - The Sympathetic Nervous System
      - “Fight-or-flight”
    - The Parasympathetic Nervous System
      - “Feed-or-breed” or “rest-and-repair”

### Peripheral Nerves

- 43 pairs of nerves originate from the CNS to form the PNS:
  - 12 pairs of cranial nerves originating from the brain
  - 31 pairs of spinal nerves originating from the spinal cord

## Peripheral Nervous System

### Pathophysiology (1 of 2)

- Alteration in Cognitive Systems
- CNS Disorders
  - Structural Lesions
  - Toxic Metabolic States
  - Other Causes
    - Cardiovascular
    - Respiratory
    - Infections
    - Drugs

### Pathophysiology (2 of 2)

- Peripheral Nervous System Disorders
  - Mononeuropathy
  - Polyneuropathy

## General Assessment Findings (1 of 5)

- Scene Size-up and Initial Assessment
  - AVPU
  - General Appearance
  - Speech

- Skin and Facial Drooping
- Mood, Thought, Perception, Judgment, Memory, and Attention

## General Assessment Findings (2 of 5)

- Focused History and Physical Exam

- History-Taking
  - Trauma-related
  - Underlying medical problems
  - Environmental clues
- Physical Exam
  - Face, eyes, nose, and mouth

## General Assessment Findings (3 of 5)

- Respiratory Patterns

## General Assessment Findings (4 of 5)

- Nervous System Status
  - Sensorimotor Evaluation
  - Motor System and Cranial Nerve Status

## General Assessment Findings (5 of 5)

- Nervous System Status
  - Glasgow Coma Scale

## Pediatric GCS (1 of 2)

## Pediatric GCS (2 of 2)

## General Assessment Findings (1 of 2)

- Vital Signs
  - Cushing's Reflex

## General Assessment Findings (2 of 2)

- Other Assessment Tools
  - End-Tidal CO<sub>2</sub> Detector
  - Pulse Oximeter
  - Blood Glucometer
- Geriatric Considerations in Neurological Assessment
- Ongoing Assessment

# Management of Neurological Emergencies

- General Principles
  - Airway and Breathing

- Circulatory Support
- Pharmacological Intervention
- Psychological Support
- Transport Considerations

## Altered Mental Status (1 of 3)

- AEIOU-TIPS
- Assessment
- Management
  - Initial Assessment
  - IV Access
  - Treatable Causes
    - Hypoglycemia, narcotic overdose, suspected alcoholic

## Altered Mental Status (2 of 3)

- AEIOU TIPS
  - A = acidosis or alcohol
  - E = epilepsy
  - I = infection
  - O = overdose
  - U = uremia
  - T = trauma
  - I = insulin
  - P = psychosis
  - S = stroke

## Altered Mental Status (3 of 3)

- Chronic Alcoholism
  - Wernicke's Syndrome
  - Korsakoff's Psychosis
- Increased Intracranial Pressure
  - Hyperventilation
  - Mannitol

## Stroke and Intracranial Hemorrhage (1 of 5)

- Occlusive Strokes
  - Embolic and Thrombotic Strokes
- Hemorrhagic Strokes

## Stroke and Intracranial Hemorrhage (2 of 5)

- Signs
  - Facial Drooping
  - Headache
  - Aphasia/Dysphasia
  - Hemiparesis
  - Hemiplegia
  - Paresthesia
  - Gait Disturbances
  - Incontinence
- Symptoms
  - Confusion
  - Agitation
  - Dizziness
  - Vision Problems

## Stroke and Intracranial Hemorrhage (3 of 5)

- Transient Ischemic Attacks
  - Indicative of carotid artery disease.
  - Symptoms of neurological deficit:
    - Symptoms resolve in less than 24 hours.
    - No long-term effects.
  - Evaluate through history taking:
    - History of HTN, prior stroke, or TIA.
    - Symptoms and their progression.

## Stroke and Intracranial Hemorrhage (4 of 5)

- Management
  - Scene safety and BSI.
  - Maintain the airway.
  - Support breathing.
  - Obtain a detailed history.
  - Position the patient.
  - Determine the blood glucose level.
  - Establish IV access.
  - Monitor the cardiac rhythm.
  - Protect paralyzed extremities.

## Stroke and Intracranial Hemorrhage

(5 of 5)

## Seizures (1 of 7)

- Generalized Seizures
  - Tonic-Clonic
    - Aura
    - Loss of consciousness
    - Tonic phase

- Hypertonic phase
- Clonic phase
- Postseizure
- Postictal
- Absence
- Pseudoseizures

## Seizures (2 of 7)

- Partial Seizures
  - Simple Partial Seizures
    - Involve one body area
    - Can progress to generalized seizure
  - Complex Partial Seizures
    - Characterized by auras
    - Typically 1–2 minutes in length
    - Loss of contact with surroundings

## Seizures (3 of 7)

- Assessment
  - Differentiating Between Syncope and Seizure
    - Bystanders frequently confuse syncope and seizure.

## Seizures (4 of 7)

- Patient History
  - History of Seizures
  - History of Head Trauma
  - Any Alcohol or Drug Abuse
  - Recent History of Fever, Headache, or Stiff Neck
  - History of Heart Disease, Diabetes, or Stroke
  - Current Medications
    - Phenytoin (Dilantin), phenobarbital, valproic acid (Depakote), or carbamazepine (Tegretol)
  - Physical Exam
    - Signs of head trauma or injury to tongue
    - Alcohol or drug abuse

## Seizures (5 of 7)

- Management
  - Scene safety and BSI.
  - Maintain the airway.
  - Administer high-flow, high-concentration oxygen.
  - Establish IV access.
  - Treat hypoglycemia if present.
  - Do not restrain the patient.
    - Protect the patient from the environment.
  - Maintain body temperature.

## Seizures (6 of 7)

- Management

- Position the patient.
- Suction if required.
- Monitor cardiac rhythm.
- Treat prolonged seizures.
  - Anticonvulsant medication
- Provide a quiet atmosphere.
- Transport.

## Seizures (7 of 7)

- Status Epilepticus
  - Two or More Generalized Seizures
    - Seizures occur without a return of consciousness.
  - Management
    - Management of airway and breathing is critical.
    - Establish IV access and cardiac monitoring.
    - Administer 25 g 50% dextrose if hypoglycemia is present.
    - Administer 5–10 mg diazepam IV.
    - Monitor the airway closely.

## Syncope (1 of 2)

- A Sudden, Temporary Loss of Consciousness
- Assessment
  - Cardiovascular:
    - Dysrhythmias or mechanical problems.
  - Noncardiovascular:
    - Metabolic, neurological, or psychiatric condition.
  - Idiopathic:
    - The cause remains unknown even after careful assessment.
  - Extended unconsciousness is NOT syncope.

## Syncope (2 of 2)

- Management
  - Scene safety and BSI.
  - Maintain the airway.
  - Support breathing.
  - Check circulatory status.
  - Monitor mental status.
  - Establish IV access.
  - Determine blood glucose level.
  - Monitor the cardiac rhythm.
  - Reassure the patient and transport.

## Headache (1 of 4)

- Types
  - Vascular
    - Migraines
      - Throbbing pain, photosensitivity, nausea, vomiting, and sweats; more frequent in women.
      - May last for extended periods of time.

- Cluster
  - One-sided with nasal congestion, drooping eyelid, and irritated or watery eye; more frequent in men.
  - Typically last 1–4 hours.

## Headache (2 of 4)

- Types
  - Tension
  - Organic
    - Occur due to tumors, infection, or other diseases of the brain, eye, or other body system.
    - Headaches associated with fever, confusion, nausea, vomiting, or rash can be indicative of an infectious disease.

## Headache (3 of 4)

- Assessment
  - What was the patient doing at the onset of pain?
  - Does anything provoke or relieve the pain?
  - What is the quality of the pain?
  - Does the pain radiate to the neck, arm, back, or jaw?
  - What is the severity of the pain?
  - How long has the headache been present?

## Headache (4 of 4)

- Management
  - Scene safety and BSI.
  - Maintain the airway.
  - Position the patient.
  - Establish IV access.
  - Determine blood glucose level.
  - Monitor the cardiac rhythm.
  - Consider medication.
    - Antiemetics or analgesics
  - Reassure the patient and transport.

## “Weak and Dizzy” (1 of 2)

- Assessment
  - Symptomatic of Many Illnesses
  - Focused Assessment
    - Include a detailed neurological exam.
    - Specific signs and symptoms:
      - Nystagmus
      - Nausea and vomiting
      - Dizziness

## “Weak and Dizzy” (2 of 2)

- Management
  - Scene safety and BSI.
  - Maintain airway and administer high-flow, high-concentration oxygen.
  - Position of comfort.
  - Establish IV access and monitor cardiac rhythm.
  - Determine blood glucose level.
  - Consider medication:
    - Antiemetic
  - Transport and reassure patient.

## Neoplasms (1 of 2)

- Tumors
  - Benign
  - Malignant
- Assessment
  - Signs and Symptoms
    - Recurring or severe headaches
    - Nausea and vomiting
    - Weakness or paralysis
    - Lack of coordination or unsteady gait
    - Dizziness, double vision
    - Seizures without a prior history of seizures

## Neoplasms (2 of 2)

- Assessment (cont.)
  - History
    - Surgery, chemotherapy, radiation therapy, or holistic therapy
    - Experimental treatments
- Management
  - Scene size-up and BSI.
  - Maintain airway and administer high-flow, high-concentration oxygen.
  - Position of comfort.
  - Establish IV access and monitor cardiac rhythm.
  - Consider medication administration:
    - Analgesics, antiseizure meds, anti-inflammatory meds
  - Transport and reassure patient.

## Brain Abscess

- Abscess
  - Collection of Pus
- Assessment
  - Signs and Symptoms
    - Lethargy, hemiparesis, nuchal rigidity
    - Headache, nausea, vomiting, seizures

- Management
  - Similar to Neoplasm

## Degenerative Neurological Disorders (1 of 3)

- Types of Disorders
  - Alzheimer's Disease
    - Most frequent cause of dementia in the elderly
    - Results in atrophy of the brain due to nerve cell death in the cerebral cortex
  - Muscular Dystrophy
    - Characterized by progressive muscle weakness
  - Multiple Sclerosis
    - Unpredictable disease resulting from deterioration of the myelin sheath
  - Dystonias

## Degenerative Neurological Disorders (2 of 3)

- Types of Disorders (cont.)
  - Parkinson's Disease
    - Tremor, rigidity, bradykinesia, postural instability
  - Central Pain Syndrome
  - Bell's Palsy
  - Amyotrophic Lateral Sclerosis
  - Myoclonus
  - Spina Bifida
  - Poliomyelitis

## Degenerative Neurological Disorders (3 of 3)

- Assessment
  - Obtain history.
  - Exacerbation of chronic illness or new problem?
- Management
  - Special Considerations
    - Mobility, communication, respiratory compromise, and anxiety.
  - Interventions
    - Determine blood glucose level.
    - Establish IV access.
    - Monitor cardiac rhythm.
    - Transport and reassure the patient.

## Back Pain and

## Nontraumatic Spinal Disorders (1 of 2)

- Low Back Pain
- Causes
  - Disk Injury
  - Vertebral Injury
  - Cysts and Tumors

- Other Causes

## Back Pain and Nontraumatic Spinal Disorders (2 of 2)

- Assessment
  - Evaluate history.
    - Speed of onset.
    - Risk factors such as vibration or repeated lifting.
    - Determine if pain is related to a life-threatening problem.
- Management
  - Consider c-spine.
    - Immobilize if in doubt.
  - Consider analgesics.

### Summary

- Anatomy and Physiology
- Pathophysiology
- General Assessment Findings
- Management of Nervous System Emergencies