



Certified Pediatric Nurse Review Course: Neurologic Disorders

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Objectives

- Describe alterations in sensory, integrative, and motor functions of the central nervous system.
- Discuss interventions to promote the growth, development, safety, and comfort of a child with alterations in any component of the sensory-motor arc.
- Differentiate among the multiple disorders that can increase intracranial pressure.

Central Nervous System Disorders

- The Central Nervous System (CNS) is a communication system that receive sensory stimuli from external or internal environment
- CNS Disorders
 - Defects in any part of the CNS can alter sensory, integrative, or motor function
 - The degree of disability depends on the amount and location of damage
 - Damaged nerve cells usually cannot be replaced
 - Flaccid muscles usually indicate a CNS disorder

Intellectual Disability/Cognitive Impairment

- A disability that features limitations in both intellectual and adaptive functioning
 - Difficulty
 - Reasoning, Problem Solving, Planning, Abstract Thinking, Judgment, Academic Learning, & Learning From Experience
 - Functioning Deficits
 - Failure to meet developmental and sociocultural standards for independence
 - Communication, social participation, independent living
 - Various degrees
 - Mild, Moderate, Severe, Profound

Nursing Considerations

- Support the optimal development of the child
 - Set realistic, reachable short-term goals
 - Tasks should be broken into small steps to encourage their successful completion
- Provide a safe environment
- Communicate at the child's mental age, rather than chronological age

Trisomy 21 (Down syndrome)

- Related to the improper separation of 3 chromosomes on the 21st pair
- Assessment findings
 - Small head with slow brain growth, upward slanting of palpebral fissures, a broad flat nose and low-set ears, hypotonia,
 - Mild to moderate intellectual disability
 - It is important to promote adaptation through play and communication based on child's mental age rather than chronological
 - Protruding tongue and small oral cavity
 - These physical features in conjunction with hypotonia may interfere with infant feeding
 - Children should be fed using a small but long, straight-handled spoon
 - This will help push food toward the back and side of mouth

Phenylketonuria (PKU)

- Inborn error of metabolism
- Results from a defect in hydroxylation of phenylalanine (essential amino acid) to form tyrosine (nonessential amino acid)
 - This leads to a build up of too much phenylalanine
 - Causes brain damage and intellectual disability
 - Assessment Finding- Urine will have a musty odor
 - Newborns are screened shortly after birth through blood test

Cerebral Palsy (CP)

- Nonprogressive neuromuscular disorder resulting from damage to the interfere brain, specifically the area that controls motor function
 - Disabilities may include
 - Abnormal muscle tone and coordination
 - Most common problem and helps classify the type
 - Spastic, athetoid, ataxic, or mixed
 - Speech, vision, or hearing disturbances
 - Dental anomalies
 - Seizures

Cerebral Palsy (CP)

- Assessment
 - Spastic
 - Hypertonic, poor posture control, leg scissoring, persistent primitive reflexes, poor quality of speech, persistent muscle contraction leading to contractures
 - Dyskinetic-athetotic
 - No contractures
 - Decreased ability on fine motor skills
 - Abnormal, constant, involuntary worm or wave like movements
 - Disappear during sleep, increase with stress, affect facial muscles
 - Ataxic
 - Uncoordinated movements, poor equilibrium and muscle coordination, unsteady wide-based gait,

Cerebral Palsy (CP)

- Interventions
 - Increase caloric intake for the child with increased motor function
 - Provide a safe environment
 - Use range of motion exercises- maintain proper body alignment
 - Divide tasks into small steps
 - Consult therapies (PT, OT, SLP) as appropriate
 - Consider growth and development, adjust interventions to achieve the highest possible development level

Seizure Disorder

- A sudden, episodic involuntary alteration in consciousness, motor activity, behavior, sensation, or autonomic function
 - Never cells become hyperexcitable and surpass the seizure threshold
 - Most common neurological disorder in children

Seizure Disorder

Assessment

- Detailed history
 - Auras or a peculiar sensation just before seizure onset
- Determine nature of the seizure
 - What the seizure looks like. What muscles are involved. Positioning. Movement. Level of consciousness and respiratory status
- Determine postictal response
 - Orientation after seizure. Drowsiness. Uncoordinated movements

Seizure Disorder

Interventions

- Promote safety
- Pad crib or bed for any patient with a history of a seizure
- Stay with the child during the seizure
- Do not try to interrupt the seizure, do not restrain the patient, ensure the area around them to free of any objects that may hurt them
- Maintain patent airway
 - Do not place anything in or near their mouth
 - If the child becomes cyanotic or hypoxemic, administer oxygen when the seizure ends and regular respirations resume
 - Place child on their side to let saliva drain and allow tongue to fall forward and open airway

Seizure Classification- Focal

Type	Description	Symptoms
Focal	Previously called simple and complex partial seizures. Originates in ONE hemisphere	May be aware or have impaired awareness. Can be motor or non-motor onset

Seizure Classification- Generalized

Generalized onset = motor or non-motor, but initial onset appears in BOTH hemispheres

Type	Description	Symptoms
Absence	Sudden onset; last 5-10 seconds. Interruption of daily activity. Brief blank stare. Precipitated by stress, hypoventilation, hypoglycemia, fatigue	Loss of responsiveness but no loss of posture control. May include twitching eyelids and lip smacking. No post-ictal symptoms.
Clonic	Opposing muscles contract and relax alternately in rhythmic pattern; may occur in one limb more than others	Mucus production
Tonic	Muscles are maintained in continuous contracted state (rigid)	Variable LOC, pupils dilate, eyes roll up, glottis closes, possible incontinence, may foam at mouth
Tonic-Clonic	Violent total body seizure	Aura. Tonic first (20-40 seconds), then clonic. Post-ictal
Atonic	Drop and fall attack; need to wear protective helmet	Loss of posture tone

Seizure Classification- Unknown

Type	Description	Symptoms
Febrile	Seizure threshold is lowered by elevated temperature. One seizure per fever. Most commonly when temperature is rapidly rising.	Less than 5 minutes. Generalized. May only happen once, or may recur
Status Epilepticus	Prolonged or frequent repetition of seizures without interruption. Results are anoxic, cardiac and respiratory arrest	Consciousness not regained between seizures. Lasts more than 5 minutes

Ketogenic Diet

- High-fat, low-carbohydrate, moderate protein diet that causes the body to burn fat for energy
- When the body is in ketosis, it can help control seizures in some children
- Dietician works closely with the family
- Monitor weight as weight loss should be expected
- Avoid carbs found in sugary or starchy foods (ex. Grains, potatoes, fruit)...even toothpaste and lotions!
- Use normal saline instead of dextrose containing IV fluid

Increased Intracranial Pressure

- Increase in intracranial pressure (ICP) can be caused by inflammation, tissue enlargement, or increased fluid accumulation
- Persistent increase in ICP destroys healthy brain tissue and alters mental function

Increased Intracranial Pressure

Assessment

- Prior to closure of cranial sutures
 - Head circumference
 - Full, tense, bulging fontanelles
- After closure of cranial sutures
 - Altered level of consciousness, irritability, behavior changes and lethargy
 - Nausea, vomiting, headache
 - Monitor for seizures
 - Vital signs
 - Increase in BP, decreased HR, low RR

Interventions

- Elevate head of the bed to greater than 30 degrees
 - Decreases cerebral edema
- Keep head midline
 - Assists with venous drainage
- Limit fluids to decrease blood volume
 - Maintenance fluids may be kept at 3/4s usual IV + PO fluid therapy
- Avoid activities that increase ICP
 - Pain, seizures, fever, stress, crying, coughing, straining

Hydrocephalus

- An increase in the amount of cerebrospinal fluid (CSF) in the ventricles and subarachnoid spaces of the brain
 - Ventricles dilate causing brain to be compressed
- Can be caused by
 - Congenital conditions, hemorrhage, tumor, infection, head injury

Hydrocephalus

- Assessment
 - Prior to fontanelles closing- skull enlarges. Measure and record the head circumference. Note a rapid increase
 - Full, tense, bulging fontanel and widening suture lines
 - High pitched cry
 - Sunset eyes (sclera visible above the iris)
 - Inability to support head when upright
 - Transillumination of the skull (light will reflect off of the opposite side of the skull)
 - Closed fontanelles- symptoms of ICP

Hydrocephalus

- Interventions post shunt insertion
 - First 24 hours- keep patient flat to prevent headache and loss of fluid from gravity
 - Avoid laying the patient on the side of the shunt to prevent compression
 - Support child's head when upright
 - Provide proper skin care, turn head frequently
 - Educate parents on the signs of increasing ICP

Neural Tube Defect

- A group of related CNS defects resulting from incomplete development of the neural tube during embryonic period
 - Anencephaly: absence of both cerebral hemispheres
 - Encephalocele: herniation of brain through defect in skull
 - **Spina Bifida**
 - Meningocele: hernial protrusion of a saclike cyst containing meninges and CSF, but not the spinal cord
 - Myelomeningocele: posterior portion of the vertebral laminae fails to close anywhere along the spinal cord resulting in a protruding sac containing CSF, meninges, and a portion of the spinal cord

Defects can be found early in gestation.
Amniotic fluid will contain high levels of
alpha fetoprotein from leaking CSF

Neural Tube Defects

- Assessment for spina bifida pre-op
 - Check for leakage from the sac
 - Assess for signs and symptoms of CNS infection
 - Assess for sensation and motor activity below the sac
 - Measure head circumference to establish baseline
 - Assess bowel and bladder function and patterns.

Neural Tube Defects

- Interventions
 - Implement measures to prevent sac from drying
 - Cover it with a saline-soaked sterile dressing
 - Institute measures to keep the sac free from infection
 - Avoid contamination from urine or stool
 - Prevent trauma by keeping pressure off of the sac
 - Child should be positioned on one side with knees flexed or on the abdomen

Neural Tube Defects

- Assessment post-op
 - Note the degree of leg movement in response to discomfort
 - Note the degree of sensitivity to touch below the level of the lesion- paralysis is possible
 - Observe for club foot
 - Observe for dribbling of urine, distended bladder, or the involuntary release of stool
 - Could indicate neurogenic bowel and bladder
 - Observe for signs of ICP related to hydrocephalus
 - Measure head circumference

Neural Tube Defect

- Interventions Post-Op
 - Pain management
 - Thorough skin care, especially if paralysis occurs
 - Prevent constipation and bladder distention
 - Be aware of increased incidence of latex allergies with this population!
 - Use only latex free no-elastic pants, nipples, and pacifiers
 - There is cross reactivity with kiwi, bananas, and avocados that can result in allergic reactions

Meningitis

- An inflammation of the meninges, cause by viral or bacterial agents and transmitted by the spread of droplets
 - Organisms enter the blood from the nasopharynx or the middle ear
- It is common in infants and toddlers
 - Incidence has decreased with the administration of Haemophilus influenzae type B vaccine
- Viral (aseptic)
 - No antibiotics unless initiated prior to identification of underlying cause (most commonly enteroviruses)
- Bacterial (septic)
 - Antibiotics as ordered

Meningitis

- Assessment
 - Note seizures
 - Observe for signs of increased ICP
 - Petechial or purpuric rash
 - Lumbar puncture will show increase in CSF pressure, cloudy color, increased WBC and protein counts, decreased glucose count (if bacterial)
 - Abnormal Postures
 - Opisthotonos- hyperextension of the neck and spine- can be a later sign
 - Brudzinski- flex knees and hips in response to passive neck flexion
 - Kernig- complain of pain when their knees are flexed and their legs are raised

Meningitis

- Interventions
 - Antibiotics
 - Seizure precautions
 - Isolation for at least 24 hours after antibiotic therapy begins
 - Neuro assessments frequently
 - Monitor signs of ICP
 - Low stimuli environment
 - HOB flat

Brain Tumor

- Second most prevalent type of cancer and most common solid tumor in children
 - Commonly diagnosed between ages 5-10
- One half to two thirds are infratentorial involving the cerebellum or brain stem
 - Remaining tumors are supratentorial and mainly involve the cerebrum

Brain Tumor

- Assessment
 - Alterations in neurologic function, especially visual acuity and behavior changes
 - Decline in school performance
 - Headache is most commonly an initial sign
 - Usually occurs early in the morning, when sneezing, coughing, straining
 - Vomiting, hypotonia, posturing, seizing, change in vital signs
 - Ataxia, cranial nerve palsies, anorexia, head tilt, nystagmus, decreased reflexes, vertigo
 - Pressure on the pituitary resulting in diabetes insipidus, visual problems, difficulty regulating body temperature

Head Injuries

- Common cause of death in children older than 1
- Epidural, intracranial hemorrhage
 - Bleeding into the spaces between the dura mater and the skull
- Subdural hemorrhage
 - Bleeding between the dura mater and the arachnoid layer of meninges
- Abusive Head Trauma
 - “Shaken Baby Syndrome”
 - Significant tearing of blood vessels with high morbidity and mortality

Head Injuries

- Concussion
 - Transient state of neurologic dysfunction caused by a jarring of the brain
 - May or may not have LOC
 - If not healed before starting activities again, another head trauma can occur
 - Second Impact Syndrome
 - Can lead to death
- Skull fracture
 - Linear (simple),
 - Depressed (depression of bone toward brain)
 - Basilar (at skull base)

Head Injuries

- Assessment
 - Signs and symptoms of increased ICP
 - Prepare for a CT
 - Check ear or nose drainage for glucose
 - CSF will test positive for glucose
 - Concussions
 - Note the child's level of consciousness and memory of the accident.
 - Headaches, dizziness, vision problems, change in emotions or behaviors, sleepy disturbances, vomiting, difficulty remembering.

Head Injuries

- Interventions
 - Seizure precautions
 - Prepare for any surgical procedures
 - Promote bed rest
 - Limit unnecessary body movements
 - Slightly elevate HOB
 - Monitor fluid status
 - Restrict as needed to decrease ICP
 - Prevention
 - Use of helmets, seatbelts, and protective athletic equipment

Lead Poisoning

- Occurs in children through the ingestion of lead in
 - Lead based paint chips or dust
 - Contaminated drinking water from lead-based pipes
 - Dust from lead ammunition
 - Battery casing
 - Collectible toys
 - Some jewelry and art supplies



Most
common in
children
under 6!!

Lead Poisoning

- There is NO absolute safe blood level for children
 - 3.5 $\mu\text{g}/\text{dL}$ or greater is concerning
- Lead is carried by Red Blood Cells and deposited into bones and tissues
- Accumulation leads to
 - Anemia, kidney damage, growth delay
 - Neurologic Impairment
 - Low doses- impulsivity, hyperactivity, hearing loss, mild intellectual deficits, distractibility
 - High doses- encephalopathy, cognitive defects, paralysis, blindness, seizures, coma, death
- Excreted in urine bile, VERY slowly. Half-life is 10 months

Lead Poisoning

- Assessment
 - Nausea/vomiting, anorexia, constipation, abdominal pain
 - Symptoms of anemia
 - Pallor, fatigue, tachycardia
 - Neurologic signs
 - Behavior changes, distractibility, learning difficulty
 - Severe cases = signs of encephalopathy, seizures, coma
 - Monitor kidney function

Lead Poisoning

- Interventions
 - Lead screening at routine health visits
 - Begin at 6 months
 - Chelation therapy
 - Binds with the lead and excretes it from the body
 - Monitor fluid status
 - Promote kidney function and lead excretion
 - Education is key for prevention

Migraine Headaches

- Often associated with extreme sensitive to light and sound
- May or may not have an aura
- Lasts 4-72 hours
- May have triggers like lack of food, sleep, dehydration, anxiety, stress, and changes in hormones
- Goal is to prevent attacks and improve quality of life

Knowledge Check Questions



Knowledge Check 1

- The nurse would expect which of the following as an early symptom seen in a toddler with lead poisoning?
 - A. Hyperactivity
 - B. Seizures
 - C. Intellectual disability
 - D. Blindness

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Knowledge Check 2

- The nurse is caring for a 2 year old with altered level of consciousness due to increased intracranial pressure. When taking his vital signs, the nurse knows that the following changes would be a medical emergency?
 - A. Decreased BP, Decreased HR, Decreased respiratory rate
 - B. Increased BP, Decreased HR, Decreased respiratory rate
 - C. Increased BP, Increased HR, Increased respiratory rate
 - D. Decreased BP, Increased HR, Increased respiratory rate

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Knowledge Check 3

- The nurse is admitting a patient with bacterial meningitis to an acute care unit from the emergency department. When preparing to provide care to the patient, the nurse knows to don the follow PPE.
 - A. Standard Precautions
 - B. Mask and Gloves
 - C. Gloves and Gown
 - D. Gloves, Gown, Mask

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Knowledge Check 4

- While caring for a patient with a myelomeningocele preoperatively the nurse knows the highest priority intervention is:
 - A. Strict monitoring of intake and output
 - B. Maintain the patient on bedrest in a supine position
 - C. Assessing head circumference twice a shift
 - D. Maintaining integrity of the protruding sac

Knowledge Answer 4

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Knowledge Check 5

- The nurse is caring for a 5-year-old patient with epilepsy who begins having a tonic-clonic seizure during his admission assessment. Which of the following is the most appropriate action by the nurse?
 - A. Turn him to his side and suction his mouth
 - B. Confirm siderails are up and go find another nurse to help
 - C. Observe seizure activity and call for help if necessary
 - D. Prepare to administer rescue nasal versed

Knowledge Answer 5

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References

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