Chapter 23
The Child with a Sensory or Neurological Condition

- Objectives
- Discuss the prevention and treatment of ear infections.
- Outline the nursing approach to serving the hearing-impaired child.
- Discuss the cause and treatment of amblyopia.
- Compare the treatment of paralytic and nonparalytic strabismus.
- Review the prevention of eyestrain in children.

Objectives (cont.)
- Discuss the functions or the 12 cranial nerves and nursing interventions for dysfunction.
- Describe the components of a “neurological check.”
- Outline the prevention, treatment, and nursing care for the child with Reye’s syndrome.
- Describe the symptoms of meningitis in a child.
- Describe three types of posturing that may indicate brain damage.

Objectives (cont.)
- Discuss the various types of seizures and the nursing responsibilities.
- Prepare a plan for success in the care of a mentally retarded child.
- Describe four types of cerebral palsy and the nursing goals involved in care.
- State a method of determining level of consciousness in an infant.

Objectives (cont.)
- Describe signs of increased intracranial pressure in a child.
• Discuss neurological monitoring of infants and children.
• Identify the priority goals in the care of a child who experienced near-drowning.
• Formulate a nursing care plan for the child with a decreased level of consciousness.
• Neurological Differences Between a Child and an Adult
  • Ears
  • Contains the receptors of the eighth cranial (acoustic) nerve
  • Two main functions
    — Hearing
    — Balance
  • Three divisions
    — External
    — Middle
    — Internal
  • Newborn
    — Tympanic membrane almost horizontal
    — More vascular
    — Inconsistent light reflex
    — Eustachian tube is shorter and straighter than in adult
  • Eustachian tube functions
    — Ventilation
    — Protection
    — Drainage
• Ears (cont.)

• Ear alignment is observed

• Top of ear should cross imaginary line drawn from outer canthus of eye to the occiput

• Low-set ears may be associated with kidney disorders

• Nursing Tip

• Before instilling ear drops in infants, gently pull the pinna of the ear down and back

• In children, gently pull the pinna of the ear up and back to straighten the external auditory canal

• Otitis Externa

• An acute infection of the external canal
  — Often referred to as swimmer’s ear
  — Pain and tenderness on manipulating the pinna or tragus

• Signs
  — Tympanic membrane is normal
  — Rule out the presence of a foreign body, cellulitis, diabetes mellitus, or herpes zoster

• Treatment
  — Irrigation and topical antibiotics or antivirals

• Acute Otitis Media

• Pathophysiology
  — Inflammation of the middle ear

• Structures lined by mucous membranes
  — Mastoid sinuses
— Middle ear
— Eustachian tube
  • Protects middle ear
  • Provides drainage
  • Equalizes air pressure

• Infection of the throat can easily spread to the middle ear and mastoid

• Otitis Media (OM)

• Occurs most often after upper respiratory infection

• Caused by various microorganisms, such as *Streptococcal pneumoniae* and *Haemophilus influenzae*

• Infants more prone because of ear anatomy

• Infant’s *humoral* defense mechanisms are immature

• Safety Nursing Tip for OM

• Signs and symptoms of ear infection can include
  — Rubbing or pulling at the ear
  — Rolling the head from side to side
  — Hearing loss
  — Loud speech
  — Inattentive behavior
  — Articulation problems
  — Speech development problems

• Otitis Media (OM) (cont.)

• Manifestations
— Tympanic membrane is reddened and bulging
— Eardrum can rupture if an abscess forms

• OM is considered chronic if the condition persists for more than 3 months

• Treatment
  — Broad-spectrum antibiotics
  — Eardrops—to instill, pull pinna down and back for infants; for children, pull the pinna up and back
  — Surgical intervention when conventional methods are not successful

• Teaching Nursing Tip
  • Instruct caregivers that the child’s condition may improve dramatically after antibiotics are taken for a few days
  • To prevent recurrence, caregivers must continue to administer the medication until the prescribed amount has been completed

• Hearing Impairment
  • Can affect speech, language, social and emotional development, behavior, and academic achievement
  • Two types: congenital deafness or acquired
    — Can acquire it from common colds, medications, exposure to loud noise levels, certain infectious diseases
    — Hearing loss can also be from cerumen (earwax) accumulation or from a foreign body being inserted in the ear canal

• Hearing Impairment (cont.)
  • Hearing loss can result from
    — Defects in the transmission of sound to the middle ear
    — Damage to the auditory nerve or ear structures
A mixed loss involving both a defect in nerve pathways and interference with sound transmission

- Behavior problems may arise because these children do not understand verbal directions

Hearing Impairment (cont.)

Diagnosis

- Routine newborn hearing screens are performed before discharge
- Lack of a response by the infant to sounds or music, or the lack of a startle reflex in infants under 4 months of age are the first signs that a hearing impairment may exist

Medical or surgical treatment

- Hearing aids
- Cochlear implants

Hearing Impairment (cont.)

Nursing care

- Some means of communicating with the hearing-impaired include
  - Lip reading, sign language, writing, visual aids
  - Body language communicates a lot

Patient Teaching

- When addressing a hearing-impaired child, the nurse should do the following
  - Be at eye level with the child
  - Be face-to-face with the child
  - Establish eye contact
  - Talk in short sentences
  - Avoid using exaggerated face or lip movements
• Barotrauma
  • An injury that occurs when the pressure in the atmosphere between a closed space and the surrounding area changes
    — Airplane descent
    — Underwater diving
  • The Eyes
    • Begin to develop in the 4-week-old embryo
    • Newborn sight is not mature
    • Shape of eye is less spherical in the newborn
    • Tears are not present until 1 to 3 months of age
    • Depth perception does not begin to develop until about 9 months of age
  • Health Promotion
    • At birth, the quiet alert infant will respond to visual stimuli by cessation of movement
    • Visual responsiveness to the mother during feeding is noted
    • The infant’s ability to focus and follow objects in the first months of life should be documented
    • Coordination of eye movements should be achieved by 3 to 6 months of age
  • Visual Acuity Tests
    • Ability of an infant to fixate and focus on an object can be demonstrated by 6 weeks of age
    • The object should not emit a sound
    • Testing should begin at 2 to 3 years of age
  • Dyslexia
• Reading disability
  • Involves a defect in the cortex of the brain that processes graphic symbols
  • Treatment involves remedial instruction

• Amblyopia
  • Reduction or loss of vision that usually occurs in children who strongly favor one eye
  • Treatment
    — Glasses, opaque contact lens, or patching the good eye
    • Forces the weaker eye to be used

• Strabismus
  • Also known as cross-eye
  • Child is not able to direct both eyes in same direction
    — Lack of coordination between the eye muscles that direct movement of the eyes
    — When coordination does not occur, the brain will disable one eye to provide a clear image
    — The disabled eye can develop permanent visual impairment due to sensory deprivation
  • Several types: nonparalytic and paralytic

• Health Promotion
  • Symptoms of strabismus include the following
    — Eye “squinting” or frowning to focus
    — Missing objects that are reached for
    — Covering one eye to see
    — Tilting the head to see
Dizziness and/or headache

Strabismus Treatment

Nonparalytic

- If found in infancy, parents are instructed to patch the unaffected eye, as it may improve through use

- Glasses and eye exercises usually correct the problem

- Surgery if none of the above work

Eye Strain

Symptoms

- Inflammation

- Aching or burning of the eyes

- Squinting

- A short attention span

- Frequent headaches

- Difficulties with schoolwork

- Inability to see the board at the front of the class

Nursing Interventions

- Observe

- Teach

- Prevent

- Refer

- Rehabilitate
• Conjunctivitis
  • Inflammation of the conjunctiva or mucous membrane that lines the eyelids
    — Caused by a variety of bacterial and viral organisms or from a blocked lacrimal duct
    — Acute form is commonly called *pink eye*
  • Common forms respond to warm compresses, topical antibiotic eye drops, or eye ointments

• Symptoms include
  — Itching
  — Tearing of one or both eyes
  — Edema of the eyelids and periorbital tissues
  — Child may appear distracted or irritable

• Hyphema
  • Presence of blood in the anterior chamber of the eye
  • One of the most common ocular injuries
  • Appears as a bright-red or dark-red spot in front of the lower portion of the iris

• Treatment
  — Bedrest with HOB elevated 30 to 45 degrees decreases intraocular pressure and intracranial pressure if there is an associated head injury
  — Topical medications may also be prescribed

• Retinoblastoma
  • A malignant tumor of the retina
  • Manifestations
Yellowish white reflex is seen in the pupil because of a tumor behind the lens

Called the *cat’s eye reflex* or *leukokoria*

May be accompanied by loss of vision, strabismus, hyphema, and in advanced tumors, pain

- Retinoblastoma *(cont.)*

- Treatment
  - Laser photocoagulation
  - Chemotherapy
  - External beam irradiation
  - Usually removal of the affected eye if no possibility exists to save the vision

- The Nervous System
  - The body’s communication center
    - Transmits messages to all parts of the body
    - Records experiences
    - Integrates certain stimuli

- Most neurological disabilities in childhood result from congenital malformation, brain injury, or infection

- Nursing Tip
  - Causes of altered level of consciousness (ALOC)
    - A fall to 60 mm Hg, or below, of PaCO₂
    - A rise above 45 mm Hg of PaCO₂
    - Low blood pressure causing cerebral hypoxia
    - Fever (*1°* rise in fever increases oxygen need by 10%)
— Drugs (sedatives, antiepileptics)
— Seizures (postictal state)
— Increased ICP

• Neurological Clock
• Reye’s Syndrome
• Acute noninflammatory encephalopathy and hepatopathy that follows a viral infection in children
• May be a relationship between the use of aspirin during a viral flu or illness
• Some studies show that a genetic metabolic defect triggers Reye’s syndrome when the stress of a viral illness produces vomiting and hypoglycemia

• Reye’s Syndrome (cont.)
• Manifestations
  — Ammonia accumulates in the blood due to liver involvement
  — In children, effortless vomiting and altered behavior, or ALOC after a viral illness, are characteristic of Reye’s syndrome

• Treatment
  — If early, can result in complete recovery
  — Goals are
    • Reducing ICP
    • Maintaining a patent airway
    • Cerebral oxygenation
    • Fluid and electrolyte balance
  — Observe for signs of bleeding due to liver dysfunction

• Safety Nursing Tip
• Discourage the use of aspirin and other medications that contain salicylates in children with flulike symptoms

• Advise parents to read medication labels carefully to determine their ingredients

• Sepsis

• Systemic response to infection with bacteria; also results from viral or fungal infections

• Causes a systemic inflammatory response syndrome (SIRS) due to the endotoxin of the bacteria that causes tissue damage

• Untreated can lead to septic shock, multiorgan dysfunction syndrome (MODS), and death

• Sepsis (cont.)

• Manifestations include
  — Fever
  — Chills
  — Tachypnea
  — Tachycardia
  — Neurological signs, such as lethargy

• Meningitis

• An inflammation of the meninges (the covering of the brain and spinal cord)

• Caused by bacterial, viral, or fungal (rare in immune-competent person) infection, Haemophilus influenzae most common

• Invades the meninges indirectly by way of the bloodstream (sepsis)

• Bacterial meningitis often referred to as purulent because of pus-forming that can occur

• Meningitis (cont.)

• Manifestations
If bacterial, symptoms are a result of intracranial irritation from the purulent toxins released by the bacteria.

The presence of petechiae suggests meningococcal infection.

- Symptoms
  - Severe headache
  - Drowsiness
  - Delirium
  - Irritability
  - Restlessness
  - Fever
  - Vomiting
  - Stiffness of the neck (nuchal rigidity)
  - High-pitched cry in infants
  - Seizures are common
  - Coma may occur

- Meningitis (cont.)

- Diagnosis confirmed by examination of the CSF

- Treatment
  - The child is placed in droplet isolation until 24 hours after the appropriate antibiotics have been initiated

- Nursing care
  - Neurological checks as ordered by physician
    - Report findings such as weakness of the limbs, speech difficulties, mental confusion, and behavior problems
Maintaining an accurate recording of vital signs and intake/output

Maintain a quiet environment to help decrease stimuli

- Encephalitis
- Inflammation of the brain
  - Also known as encephalomyelitis when the spinal cord is also infected

- Symptoms result from the CNS’s response to irritation
  - Headache followed by drowsiness
  - May proceed to coma
  - Convulsions are seen, especially in infants
  - Fever, cramps, abdominal pain, vomiting, nuchal rigidity, delirium, muscle twitching, abnormal eye movements

- Encephalitis (cont.)

- Treatment
  - Supportive
  - Provide relief from specific symptoms
  - Sedatives and antipyretics may be ordered
  - Seizure precautions are taken
  - Provide for adequate fluid and nutrition
  - Supplemental oxygen may be needed

- Brain Tumors

- Second most common type of neoplasm in children
- Most occur in lower part of the brain and commonly in school-age children
- Signs and symptoms directly related to location and size of tumor
• Diagnosis is made by clinical presentation, laboratory tests, head CT or MRI, EEG
• Surgical intervention in some cases, chemotherapy and/or radiation therapy in others
• Seizure Disorders
• Most commonly observed neurological dysfunction in children
• Etiology varies
• Sudden, intermittent episodes of ALOC that last seconds to minutes and may include involuntary tonic and clonic movements
• Causes of Seizures in Children
• Intracranial
  — Epilepsy
  — Congenital anomaly
  — Birth injury
  — Infection
  — Trauma
  — Degenerative disease
  — Vascular disorder
• Extracranial
  — Fever
  — Heart disease
  — Metabolic disorders
  — Hypocalcemia
  — Hypoglycemia
Dehydration and malnutrition

• Toxic
  • Anesthetics
  • Drugs
  • Poisons

• Types of Seizures
• Febrile
• Epilepsy
• Classified as
  • Generalized
    • Tonic-clonic or grand mal
    • Three distinct phases
  • Partial
    • Account for 40%
    • Consciousness may be intact or slightly impaired
    • Can have simple or complex seizures

• Patient Teaching
  • The following are common triggering factors for seizures
    • Flashing of dark/light patterns
    • Startling movements
    • Overhydration
    • Photosensitivity
• Seizure Diagnosis and Treatment
• Determine type, site, or cause
• Multiple diagnostic techniques can be used
  – CT/MRI, EEG
  – Laboratory tests to rule out poisoning or electrolyte abnormalities
• Drug of choice depends on the type of seizure
• Diet changes may be needed for patients who do not respond well to anticonvulsants
• Seizures Treatment (cont.)
• A fundamental principle of comprehensive seizure management is that the child must become an active member of the health care team
• Safety Alert
• The nurse is responsible for maintaining seizure precautions
  – Keep side rails up
  – Pad all sharp or hard objects around the bed
  – Make sure child wears a medical ID bracelet
  – Provide supervision during potentially hazardous play, such as swimming
  – Avoid triggering factors
  – Teach the importance of compliance with the medication regimen
• Other Conditions Causing Decreased Level of Consciousness
• Can be mistaken for seizures because of the paroxysmal ALOC
• These conditions do not respond to antiepileptic medications
Conditions are
- Benign paroxysmal vertigo
- Night terrors
- Breath-holding spells
- Cough syncope
- Prolonged QT syndrome
- Rage attacks or episodic dyscontrol syndrome

Cerebral Palsy (CP)
- A group of motor disorders caused by dysfunction of various motor centers in the brain and often related to antenatal or developmental factors
- Can be precipitated by many factors, such as birth injuries, congenital anomalies, neonatal anoxia, prematurity, subdural hemorrhage, and prenatal infection

Cerebral Palsy (CP) (cont.)
- Manifestations
  - Vary with each child
  - May range from mild to severe
  - Mental retardation sometimes seen
- Suspected during infancy if
  - There are feeding problems
  - Convulsions not associated with high fevers
  - Developmental milestones are not being achieved at expected age level

Types of CP

Treatment of CP
• Botulinum toxin has been used to manage spasticity problems
• Levodopa has helped to control some of the athetoid problems
• Specific treatment is highly individualized
  — Good skin care is essential
  — All precautions taken to prevent contractures
    • Braces are often used to treat these
    • Orthopedic surgery is sometimes indicated
• Treatment Protocol for CP
• Establish communication
• Establish locomotion
• Use and optimize existing motor functions
• Provide intellectual stimulation
• Promote socialization
• Provide technology to encourage self-care and promote growth and development
• Provide multidisciplinary approach to care
• Cognitive Impairment
• Elements involved in mental functioning
  — Level of consciousness
  — Thought processes
  — Expressive language
• Definition of Mental Retardation
• The American Association on Mental Retardation (AAMR):
Mild or severe
IQ below 75

Numerous test to measure intelligence
- Stanford-Binet
- All tests have limitations
- Accuracy depends on abilities of the person interpreting the results

Limitations in at least 2 of the following
- Communication
- Self-care
- Home living
- Social skills
- Community use
- Self-direction
- Health and safety
- Functional academics
- Leisure
- Work

Some Causes of Cognitive Impairment

Neonatal period
- PKU
- Hypothyroidism
- Fetal alcohol syndrome
- Down syndrome
--- Malformations of the brain
--- Maternal infections

- Birth injuries or anoxia during or shortly after delivery
- Heredity
- During childhood
  --- Meningitis
  --- Lead poisoning
  --- Neoplasms
  --- Encephalitis
  --- Living in a physically or emotionally deprived environment

- Health Promotion
  - Cognitively impaired children have the same psychosocial needs as all other children but cannot express or respond as other children do

- Success in the Approach to the Mentally Retarded Child
  - The nurse must assist the parents to understand that providing experiences that the child can be successful in, and concentrating on his or her strengths rather than on weaknesses, are the keys to dealing with a child who is developmentally different

- A child who experiences constant failure becomes angry
  - The anger causes behavior difficulties that can cloud the problem and therapy

- Management and Nursing Goals

- Individualized plan of care
  - Initial step is to present the findings to the family
  - Provide emotional support
The child’s competence and adaptive behaviors should be discussed along with the deficiencies

- If child is in the hospital, the nurse needs to obtain
- The child’s stage of maturation and ability
- Self-help activities
- Home routines

- Health Promotion
- Nursing responsibilities to disabled children
  - Emphasize the strengths present
  - Maintain communication with the family
  - Avoid labels; use simple terms
  - Contact the school nurse; plan for school needs
  - Provide daily experiences in which the child can succeed
  - Refer to local, state, and national support groups

- Nursing Tip
- Many mentally retarded children have a normal facial appearance
- Many children with unusual faces are not mentally retarded

- Head Injuries
- Major cause of death in children older than 1 year of age
- A concussion is a temporary disturbance of the brain that is usually followed by a period of unconsciousness
- A child’s response to a head injury may differ from that of an adult

- Safety Alert
A concussion with resulting amnesia and confusion can be more serious than the presence of a fractured skull with no clinical symptoms.

Complications of Head Injuries

Hypoxia, increased ICP, cerebral edema, and infection can occur within a few days of a head injury.

- Hypoxia causes the brain to need increased energy, which increases cerebral blood flow.
  - Increased blood flow causes cerebral edema.
  - If ICP rises too high, cerebral perfusion diminishes, brain damage or death results.

Shaken Baby Syndrome

Infants who are roughly shaken can sustain retinal, subarachnoid, and subdural hemorrhages in the brain, as well as high-level cervical spine injuries.

Can result in permanent brain injury or death.

Symptoms

- Headache (manifested as fussiness in a toddler)
- Drowsiness
- Blurred vision
- Vomiting
- Dyspnea

In severe cases child may be completely unconscious.

Posturing Seen in Brain Injury

Nursing Care of a Brain-Injured Child

Observe child for signs of increased ICP.
Four components of a cranial or neurological check

- LOC
- Pupil and eye movement
- Vital signs
- Motor activity

Nursing Care of a Brain-Injured Child (cont.)

- Subtle clues to change can be missed unless the nurse performs aggressive assessment in looking for them
- The lack of the child’s ability to communicate and cooperate poses a challenge in the neurological assessment of infants, but knowledge of normal growth and development aids the nurse in evaluating the status of the patient

Neurological Monitoring of Infants and Children

- Pain stimuli response
- LOC
- Arousal awareness
- Cranial nerve response
- Motor response
- Posturing
- Pupil response of the eyes
- Bulging fontanels
- Scalp vein distention
- Ataxia; spasticity of lower extremities
- Moro/tonic neck with withdrawal reflexes
• Safety Alert

• The presence of asymmetrical pupils after a head injury is a medical emergency

• Near-Drowning

• Accidental or near-drowning is the fourth leading cause of death in children under 19 years of age

• Near-drowning is defined as survival beyond 24 hours after submersion

• Priorities include immediate treatment of
  — Hypoxia
  — Aspiration
  — Hypothermia

• CNS injury remains the major cause of death or long-term disability

• Near-Drowning (cont.)

• Submersion for more than 10 minutes with failure to regain consciousness at the scene or within 24 hours is an ominous sign and indicates severe neurological deficits if the child survives

• Question for Review

• What is the difference in technique of instilling eardrops in an infant and in a child?

• Review

• Objectives

• Key Terms

• Key Points

• Online Resources

• Review Questions