The neurological or nervous system is composed of two primary areas: the central nervous system, which includes the brain and the spinal cord, and the peripheral nervous system, which includes the entire network of nerves extending from the central nervous system.

**PHYSIOLOGY OF THE NEUROLOGICAL SYSTEM**

### Central Nervous System

The brain and the spinal cord within the vertebral column make up the central nervous system (CNS).

A. The brain and the spinal cord are protected by the rigid bony structure of the skull and by the vertebral column, respectively (Figure 15-1).

B. Meninges: the protective membranes that cover the brain and are continuous with those of the spinal cord.
   1. Pia mater: covers the surfaces of the brain and the spinal column.
   2. Arachnoid: waterproof membrane that encases the entire CNS; the subarachnoid space contains the cerebrospinal fluid.
   3. Dura mater: a tough membrane that provides protection to the brain and spinal cord.

C. Cerebrospinal fluid (CSF) (Figure 15-2).
   1. Serves to cushion and protect the brain and spinal cord; the brain literally floats in CSF.
   2. CSF is clear, colorless, watery fluid; approximately 100- to 200-mL total volume, with a normal fluid pressure of 70 to 150 cm of water (average: 125 cm of water pressure).
   3. Formation and circulation of CSF: CSF is formed continuously by the choroid plexus located in the ventricles of the brain. It is reabsorbed by the arachnoid villi in the ventricles at the same rate it is formed.

D. Brain: The basic brain anatomy consists of the cerebrum, the cerebellum, the brain stem, and the interior structures.
   1. Cerebrum: the largest portion of the brain; separated into hemispheres. Each hemisphere is divided into four lobes: frontal, parietal, occipital, and temporal.
      a. Frontal: memory, language, personality, and emotions are primarily controlled here; highly vulnerable to traumatic brain injury.
      b. Parietal: integrates sensory information and interprets spatial relationships.
      c. Occipital: center for visual perception and integration.
      d. Temporal: controls auditory, verbal, visual, memory, and personality functions.
      e. Some functions of the brain occur in more than one lobe.
   2. Cerebellum: contains more neurons than the rest of the brain combined. It serves to interpret motor and mental dexterity, as well as sense of balance.
   3. Brain stem: conduit for all information transmission between upper and lower nervous system. Consists of pons, midbrain, and medulla.
      a. Pons: responsible for alertness; relays sensory information between cerebellum and cerebrum.
      b. Midbrain: interprets auditory and visual reflexes.
      c. Medulla: lower portion of the brain stem. Controls autonomic functions.
         (1) Respiratory center for changes in rate and depth of breathing.
         (2) Controls heart rate.
         (3) Vomiting reflex center.
         (4) Swallowing reflex center.

---

**FIGURE 15-1** Major divisions of the central nervous system.
(From Lewis SL et al: Medical-surgical nursing: assessment and management of clinical problems, ed 7, St. Louis, 2007, Mosby.)
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a. Thalamus: receives and relays auditory, sensory, and visual signals.
b. Hypothalamus: controls body temperature regulation, sleep/wake cycles, and appetite; regulates the pituitary gland.
5. Limbic system: regulates emotions, drives, and appetite.
E. Spinal cord: a nerve bundle transmitting messages to and from the body.
1. Extends from medulla to first or second lumbar vertebra.
2. Nerves exit and enter the spinal cord at each vertebral body and communicate with specific areas of the body.
3. Rings of bony vertebrae surround and protect cord and nerve roots.
4. Intervertebral disks cushion and provide flexibility to the spinal column.

Peripheral Nervous System (PNS)
The PNS consists of sensory and motor neurons. The PNS is subdivided into the sensory/somatic nervous system and the autonomic nervous system.
A. Types of nerves.
1. Sensory (afferent or ascending) nerves relay sensations to the brain for response.
2. Motor components of cranial nerves (efferent or descending) send messages from the brain to muscles, glands, and specialized tissues (e.g., heart and lungs).
B. Functions of PNS: both sensory/somatic and autonomic responsibilities.
1. Sensory/somatic nervous system consists of cranial nerves and spinal nerves.
   a. Cranial nerves: responsible for a variety of functions, from hearing and balance to regulation of chemoreceptors in the aortic body.
   b. Spinal nerves: each pair of nerves is numbered according to the level of the spinal cord from which it originates.
2. Autonomic nervous system: regulates involuntary activity (e.g., cardiovascular, respiratory, metabolic, body temperature) (Table 15-1).
   a. Parasympathetic division: maintains normal body functions.
   b. Sympathetic division: prepares the body to meet a challenge or an emergency; “fight or flight.”
   c. Most of the organs of the body receive innervation from both the parasympathetic and the sympathetic divisions.

System Data Collection
A. History.
1. Neurological history.
2. Medical history:
   a. Chronic, concurrent medical problems.
   b. Medications (especially tranquilizers, sedatives, and narcotics).
   c. If client is an infant or young child, a pregnancy and delivery history of the mother is obtained.
   d. Sequence of growth and development.
3. Family history: presence of hereditary or congenital problems.
4. Personal history: activities of daily living; any change in routine.
5. History and symptoms of current problem:
   a. Paralysis or paresthesia.

![Figure 15-2: Cerebrospinal fluid circulation. Cerebrospinal fluid is produced by choroid plexus in lateral ventricles and flows around brain and spinal cord until it reaches arachnoid villi, from which it is absorbed into venous circulation. Arrows indicate major pathway of cerebrospinal fluid flow. From From Monahan FD et al: Medical-surgical nursing: health and illness perspectives, ed 8, St. Louis, 2007, Mosby.](image-url)
TABLE 15-1 AUTONOMIC NERVOUS SYSTEM

<table>
<thead>
<tr>
<th>AREA AFFECTED</th>
<th>SYMPATHETIC (FIGHT OR FLIGHT)</th>
<th>PARASYMPATHETIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupil</td>
<td>Dilates</td>
<td>Constricts</td>
</tr>
<tr>
<td>Bronchi</td>
<td>Dilates</td>
<td>Constricts</td>
</tr>
<tr>
<td>Heart</td>
<td>Increases rate</td>
<td>Decreases rate</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>Inhibits peristals</td>
<td>Stimulates peristals</td>
</tr>
<tr>
<td></td>
<td>Stimulates sphincter</td>
<td></td>
</tr>
<tr>
<td>Bladder</td>
<td>Relaxes bladder muscle</td>
<td>Contracts bladder muscle</td>
</tr>
<tr>
<td></td>
<td>Constricts sphincter</td>
<td></td>
</tr>
</tbody>
</table>

b. Syncope, dizziness.
c. Headache.
d. Speech problems.
e. Visual problems.
f. Changes in personality.
g. Memory loss.
h. Nausea, vomiting.

B. Physical assessment.
1. General observation of client.
   a. Posture, gait.
   b. Position of rest for the infant or young child.
   c. Personal hygiene, grooming.
   d. Evaluate speech and ability to communicate.
      (1) Pace of speech: rapid, slow, halting.
      (2) Clarity: slurred or distinct.
      (3) Tone: high pitched, rough.
      (4) Vocabulary: appropriate choice of words.
   e. Facial features may suggest specific syndromes in children.

2. Mental status (must take into consideration the client’s age, culture, and educational background)
   (Box 15-1, Box 15-2).
   a. General appearance and behavior.
   b. Level of consciousness.
      (1) Oriented to person, place, and time.
      (2) Appropriate response to verbal and tactile stimuli.
      (3) Memory, problem-solving abilities.
   c. Mood.
   d. Thought content and intellectual capacity.
   e. Judgment and abstract thinking.
   f. Perceptual distortion.

3. Assess pupillary status and eye movements.
   a. Size of pupils should be equal.
   b. Reaction of pupils.
      (1) Direct light reflex: constriction of pupil when light is shown directly into eye.
      (2) Accommodation: pupillary constriction to accommodate near vision.
   c. Evaluate eye movements.
      (1) Note nystagmus: fine, jerking eye movement.
      (2) Ability of eyes to move together.
      (3) Resting position should be at mid-position of the eye socket.
   d. PERRLA: Indicates that Pupils are Equal, Round, and Reactive to Light, and that Accommodation is present.

4. Evaluate motor function.
   a. Assess face and upper extremities for equality of movement and sensation; evaluate swallow reflex.
   b. Evaluate appropriateness of motor movement—spontaneous and on command.
   c. Movement of extremities should always be evaluated bilaterally, comparing tone, strength, and muscle movement of each side.
   d. Presence of inappropriate, nonpurposeful movement (e.g., posturing).
      (1) Decerebrate: extension and adduction of the arms; hyperextension of the legs.

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BOX 15-1 OLDER ADULT CARE FOCUS
Assessing Neurologic Function in Older Adults

Signs of Cognitive Impairment
- Significant memory loss (person, place, and time).
- Person: Does client know who he or she is, and can client give you his or her full name?
- Place: Can client identify his or her home address and where he or she is now?
- Time: What was the most recent holiday; what month, time of day, day of the week is it now?
- Does client show a lack of judgment?
- Is client agitated and/or suspicious?
- As determined from client’s appearance and family’s response, does client have problems with ADLs?
- Short-term memory: Can the client recall your name, name of the President, or name of his or her doctor?
- Short-term recall: Ask the client to name three or four common objects; then ask client to recall them within the next 5 minutes.
- Does the client have sensory deficits (hearing and vision) of which he or she is not aware?


**Causes of Confusion in the Older Adult Client**

### Decreased Cardiac Output
- Myocardial infarction
- Dysrhythmias
- Congestive heart failure

### Hypoxia/Respiratory Acidosis
- Pneumonia
- Infection
- Hypoventilation

### Neurologic
- Vascular insufficiency
- Infections
- Cerebral edema

### Metabolic – Altered Homeostasis
- Electrolyte imbalance
- Hypoglycemia/hyperglycemia
- Dehydration
- Urinary tract infections

### Environmental
- Strange surroundings
- Hypothermia/hyperthermia

---

(2) Decorticate: flexion, internal rotation of the arms; extension of the legs.

(3) Presence of nonpurposeful involuntary movements such as tremors, jerking, twitching.

(4) Opisthotonos position: rigid arching of the back.

- Ability of an infant to suck and to swallow.
- Asymmetrical contraction of facial muscles.

5. Evaluate reflexes.
   - Gag or cough reflex.
   - Swallow reflex.
   - Babinski reflex: Normal sign is negative in adults and children over 1 year; positive sign is dorsal flexion of the foot and large toe with fanning of the other toes.

6. Assess vital signs and correlate with other data; changes often occur slowly, and the overall trend needs to be evaluated.
   - Blood pressure and pulse rate: Intracranial problems precipitate changes: blood pressure may increase and pulse rate may decrease.
   - Respiration: Rate, depth, and rhythm are sensitive indicators of intracranial problems.
   - Temperature: Evaluate changes in temperature as related to a neurological control versus infection.

7. Presence of projectile vomiting not associated with nausea.

8. Infants: assess fontanel(s) and suture lines.
   - Size of fontanel(s) for growth and development level.
   - Fontanel(s) should be soft to touch, with slight pulsations.
   - Normal approximation of cranial suture lines.

---

**Increased Intracranial Pressure**

*An increase in intracranial pressure (ICP) occurs any time there is an increase in the size or amount of intracranial contents.*

**A.** The cranial vault is rigid, and there is minimal room for expansion of the intracranial components.

**B.** An increase in any one of the components necessitates a reciprocal change in other cranial contents; this frequently results in ischemia of brain tissue. An increase in ICP results from one of the following:
1. Increased intracranial blood volume (vasodilation).
2. Increased CSF.
3. Increase in the bulk of the brain tissue (edema).

**C.** Cerebral edema.
1. Edema occurs when there is an increase in the volume of brain tissue caused by an increase in the permeability of the walls of the cerebral vessels.
   - Protein-rich fluid leaks into the extracellular space.
   - Edema is most often the cause of increased ICP in adults, which reaches maximum pressure in 48 to 72 hours.
2. Cytotoxic (cellular) edema occurs as a result of hypoxia. This results in abnormal accumulation of fluid within the cells (intracellular) and a decrease in extracellular fluid.

D. Poor ventilation will precipitate respiratory acidosis, or an increase in the Paco2.
   1. Carbon dioxide has a vasodilating effect on the cerebral arteries, which increases cerebrovascular blood flow and increases ICP.
   2. Clients should be adequately ventilated to prevent cyclic vasodilation, which increases intracranial pressure.

E. Regardless of the cause, increased ICP will result in progressive neurologic deterioration; the specific deficiencies seen are determined by the area and extent of compression of brain tissue.

F. If the infant’s cranial suture lines are open, increased ICP will cause separation of the suture lines and an increase in the circumference of the head.

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### NURSING PRIORITY

There is no single set of symptoms for all clients with increased ICP; symptoms depend on the cause and on how rapidly increased ICP develops.

### Data Collection

A. Risk factors/etiology.
   1. Cerebral edema caused by some untoward event or trauma.
   2. Brain tumors.
   3. Intracranial hemorrhage (closed head injuries or ruptured blood vessels).
   4. Subarachnoid hemorrhage, hydrocephalus.
   5. Cerebral embolism and thrombosis.
   7. Reye’s syndrome.

B. Clinical manifestations (bedside neurologic checks) (Figure 15-3).

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### TABLE 15-2 GLASGOW COMA SCALE

<table>
<thead>
<tr>
<th>CATEGORY OF RESPONSE</th>
<th>APPROPRIATE STIMULUS</th>
<th>RESPONSE</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyes open</td>
<td>Approach bedside</td>
<td>Spontaneous response</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Verbal command</td>
<td>Opening of eyes to name or command</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Pain</td>
<td>Lack of opening of eyes to previous stimuli but opening to pain</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lack of opening of eyes to any stimulus</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Untestable</td>
<td>U</td>
</tr>
<tr>
<td>Best verbal response</td>
<td>Verbal questioning with maximum arousal</td>
<td>Appropriate orientation, conversant, correct identification of self, place, year, and month</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Confusion; conversant, but disorientated in one or more spheres</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inappropriate or disorganized use of words (e.g., cursing), lack of sustained conversation</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incomprehensible words, sounds (e.g., moaning)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lack of sound, even with painful stimuli</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Untestable</td>
<td>U</td>
</tr>
<tr>
<td>Best motor response</td>
<td>Verbal command (e.g., “raise your arm, hold up two fingers.”)</td>
<td>Obedience in response to command</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Localization of pain, lack of obedience but presence of attempts to remove offending stimulus</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flexion withdrawal*, flexion of arm in response to pain without abnormal flexion posture</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Abnormal flexion, flexing of arm at elbow and pronation, making a fist</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Abnormal extension, extension of arm at elbow, usually with adduction and internal rotation of arm at shoulder</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lack of response</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Untestable</td>
<td>U</td>
</tr>
</tbody>
</table>

A score of 7 or less indicates coma. The highest possible score is 15. Often reported as E4V3M6 - meaning eyes open to name or command, inappropriate or disorganized use of words, and obeys motor command.


*Added to the original scale by many centers.
1. Assess for changes in level of consciousness, because change is the cardinal indicator of increased intracranial pressure.
   a. Any alteration in level of consciousness (early sign for both adults and children)—irritability, restlessness, confusion, lethargy, and difficulty in arousing—may be significant.

2. Changes in vital signs.
   a. Increase in systolic blood pressure with increase in pulse pressure.
   b. Decrease in pulse rate.
   c. Alteration in respiratory pattern (Cheyne-Stokes respiration, hyperventilation, ataxia).
   d. Assess temperature with regard to overall problems; temperature usually increases.

3. Pupillary response: normal pupils should be round, midline, equal in size, and equally briskly reactive to light and should accommodate to distance.

4. Decrease in motor and sensory function, unilateral or bilateral weakness or paralysis, failure to withdraw from painful stimuli, seizure activity.

5. Headache, photophobia.


7. Infants.
   a. Tense, bulging fontanel(s).
   b. Separated cranial sutures.
   c. Increasing frontal-occipital circumference.
   d. High-pitched cry.

C. Diagnostics (see Appendix 15-1).

Treatment

A. Treatment of the underlying cause of increasing pressure.

B. Neurologic checks every hour or as ordered.
   1. May involve correlation of several variables including level of consciousness, vital signs, speech, facial symmetry, grasp strength, leg strength, and pupil responses.
   2. Careful comparison to previous assessment is critical to detect incremental changes.

C. Change client’s position slowly; avoid extreme hip flexion and extreme rotation or flexion of neck. Maintain the head midline.
D. Monitor urine specific gravity.
E. Evaluate intake and output.
1. In response to diuretics.
2. As correlated with changes in daily weight.
F. Maintain intake evenly during therapeutic treatment.
G. Minimize respiratory suctioning and ensure hyperoxegenation before suctioning.
H. Sedatives and narcotics can depress respiration; use with caution because they mask symptoms of increasing ICP.
I. Client should avoid strenuous coughing, Valsalva maneuver, and isometric muscle exercises.
J. Avoid straining with stools (increases intrathoracic pressure sporadically).
K. In infants, measure frontal-occipital circumference to evaluate increase in size of the head.
L. Control hyperthermia.
M. Maintain head and spinal column in midline position.

**Goal:** To maintain respiratory function.

**NURSING PRIORITY:** An obstructed airway is one of the most common problems in the unconscious client; position to maintain patent airway or use airway adjuncts.

A. Prevent respiratory problems of immobility.
B. Evaluate patency of airway frequently; as level of consciousness decreases, client is at increased risk for accumulating secretions and airway obstruction by the tongue.
C. Suction secretions as necessary, but in short duration with rest periods.
D. Do not suction the nasopharyngeal area of a client when a cerebrospinal fluid leak is present (craniotomy, head injury, or basilar skull fracture).

**Goal:** To protect client from injury.

**NURSING PRIORITY:** Notify charge nurse or primary health care provider when client demonstrates signs of potential complications; interpret what data for a client need to be reported immediately.

**Home Care**

A. Teach client and family signs of increased ICP.
B. Call the doctor if any of the following are observed:
   1. Changes in vision.
   2. Increased drainage from incision area or clear drainage in the ears.
   3. Abrupt changes in sleeping patterns or irritability.
   4. Headache that does not respond to medication.
   5. Changes in coordination, disorientation.
   6. Slurred speech, unusual behavior.
   7. Seizure activity, vomiting.
C. Review care of surgical incision, wounds, or drains.
Brain Tumors

Brain tumors may be benign, malignant, or metastatic; malignant brain tumors rarely metastasize outside the CNS. Regardless of the origin, site, or presence of malignancy, problems of increased ICP occur because of the limited area in the brain to accommodate an increase in the intracranial contents.

Data Collection
A. Clinical manifestations: Symptoms correlate with the area of the brain initially involved.
   1. Headache.
      a. Recurrent. May vomit on arising and then feel better.
      b. More severe in the morning.
      c. Affected by position.
      d. Headache in infant may be identified by persistent, irritated crying and head rolling.
   2. Vomiting: initially with or without nausea; progressively becomes projectile.
   3. Papilledema (edema of the optic disc).
   4. Seizures (focal or generalized).
   5. Dizziness and vertigo.
   6. Mental status changes: lethargy and drowsiness, confusion, disorientation, and personality changes.
   7. Localized manifestations:
      a. Focal weakness: hemiparesis.
   8. Sensory disturbances.
      a. Language disturbances.
      b. Coordination disturbances.
      c. Visual disturbances.
   9. Head tilt: child may tilt the head because of damage to extraocular muscles; may be first indication of a decrease in visual acuity.
   10. Changes in vital signs indicative of increasing ICP.
   11. Cranial enlargement in the infant younger than 18 months.
B. Diagnostics (see Appendix 15-1).

Treatment
A. Medical.
   1. Dexamethasone (see Appendix 5-7).
   2. Chemotherapy.
   3. Anticonvulsants (see Appendix 15-2).
B. Radiation: x-rays, gamma knife, stereotactic radiosurgery.

Complications
Complications include meningitis, brainstem herniation, diabetes insipidus. Residual effects include a wide array of complications such as seizures, dysarthria, dysphasia, dis-equilibrium, and permanent brain damage.

Nursing Interventions
✦ Goal: To provide appropriate preoperative nursing interventions.
A. General preoperative care with exceptions, as noted (see Chapter 3).
B. Carefully assess and discuss with surgeon the appropriateness of a preoperative enema.
C. Prepare client and family for appearance of the client after surgery, including partial or complete hair loss.
D. Encourage verbalization regarding concerns about surgery.
E. Skin preparation is usually done in the operating room.
✦ Goal: To monitor changes in ICP after craniotomy (see Box 15-3).
A. Obtain vital signs and perform neurologic checks and cranial nerve assessments as necessary.
B. Maintain pulmonary function and hygiene.
C. Anticipate use of anticonvulsants and antiemetics.
D. Discourage coughing.
E. Carefully evaluate level of consciousness; increasing lethargy or irritability may be indicative of increasing ICP.
F. Evaluate dressing.
   1. Location and amount of drainage.
   2. Clarify with surgeon whether the nurse or the surgeon will change dressing.
   3. Evaluate for CSF leak through the incision and report any drainage to charge nurse.
G. Maintain semi-Fowler’s position if there is a CSF leak from ears or nose.
H. Postoperative positioning for client who has had infratentorial surgery:
   1. Bed should be flat.
   2. Position client on either side; avoid supine position.
   4. Keep NPO for 24 hours to reduce edema around medulla and reduce vomiting.
I. Postoperative position for client who has had supratentorial surgery: semi- to low-Fowler’s position.
J. Trendelenburg position is contraindicated.
K. Maintain fluid regulation.
   1. After client is awake and the swallow and gag reflexes have returned, begin offering clear liquids by mouth.
   2. Closely monitor intake and output.
L. Evaluate neurologic status in response to fluid balance and diuretics.
M. Evaluate changes in temperature: may be due to respiratory complications or to alteration in the function of the hypothalamus.
N. Provide appropriate postoperative pain relief.
   1. Avoid narcotic analgesics.
   2. Acetaminophen is frequently used.
   4. Avoid sudden movements.
O. Prevent complications of immobility (see Chapter 3).
P. Maintain seizure precautions (see Appendix 15-5).

Home Care

See home care for client with increasing ICP.

Head Injury

A. Classification.
   1. Penetrating head injury: dura is pierced, as in stabbing or shooting.
   2. Closed or blunt head injury: head is either drastically accelerated (whiplash) or decelerated (collision); most common head injury in civilian life.
B. Children and infants are more capable of absorbing direct impact because of the pliability of the skull.
C. Coup-contrecoup injury: damage to the site of impact (coup) and damage on the side opposite the site of impact (contrecoup) when brain “bounces” freely inside skull.
D. Primary injury to the brain occurs by compression and/or tearing and shearing stresses on vessels and nerves.
E. Although brain volume remains unchanged, secondary injury occurs from the cerebral edema in response to the primary injury and frequently precipitates an increase in ICP.
F. Types of head injuries.
   1. Concussion: temporary interference in brain function; may affect memory, speech, reflexes, balance, and coordination.
      a. Only small number of victims actually “black out.”
      b. Usually from blunt trauma including contact sports.
      c. Usually does not cause permanent damage.
      d. Transient, self-limiting.
   2. Contusion (a bruise on the brain).
      a. Multiple areas of petechial hemorrhages.
      b. Headache, pupillary changes, dizziness, unilateral weakness.
      c. Blood supply is altered in the area of injury; swelling, ischemia, and increased ICP.
      d. May last several hours to weeks.
   3. Intracranial hemorrhage.
      a. Epidural (extradural) hematoma: a large vessel (generally an artery) in the dura mater is damaged; a hematoma rapidly forms between the dura and the skull, precipitating an increase in ICP.

Data Collection

A. Clinical manifestations.
   1. Epidural hematoma: decreased GCS (Table 15-2), pupillary changes, unilateral weakness.
   2. Subdural hematoma: headache, change in LOC, numbness, headache, slurred speech, or inability to speak.
B. Diagnostics (see Appendix 15-1).

Complications

Complications include residual increased ICP, meningitis, diabetes insipidus, seizures, and permanent neurologic compromise.

Treatment

NURSING PRIORITY: The primary treatment objectives for the client with a head injury are to maintain a patent airway, to prevent hypoxia and acidosis, and to identify the occurrence of increased ICP.

A. The majority of clients who experience concussion are treated at home.
B. A period of unconsciousness or presence of seizures is considered a serious indication of injury.
C. Surgical intervention.
   1. Burr holes to evacuate the hematoma.
   2. Craniotomy/craniectomy.

Nursing Interventions

Goal: To provide instruction for care of the client in the home environment (Box 15-4).
A. Problems frequently do not occur until 24 hours or more after the initial injury.
B. Observe the client for increased periods of sleep; if client is asleep, awaken every 3 to 4 hours to determine whether client can be aroused normally.
C. Maintain contact with physician for reevaluation if complications occur.

D. Health care provider should be notified when any of the following are observed:
1. Any change in level of consciousness (increased drowsiness, confusion).
2. Inability to arouse client, seizures.
3. Bleeding or watery drainage from the ears or nose.
4. Loss of feeling or sensation in any extremity.
5. Blurred vision, slurred speech, vomiting.

NURSING PRIORITY: Written and oral instructions should be given to the client and to the family. Increased anxiety may affect comprehension of oral directions (see Box 15-4).

Goal: To maintain homeostasis and to monitor and identify early symptoms of increased ICP.
A. Bed rest and clear liquids initially.
B. Frequent neurologic checks for increased ICP.
   1. Change or decrease in level of consciousness is frequently the first indication.
   2. Instruct clients with head injury not to cough, sneeze, or blow nose.
C. Notify nurse or PCP of any drainage from nose, ears, and mouth.
   1. Do not clean out the ears: place loose cotton in the auditory canal and change when soiled.
   2. Check continuous clear drainage from the nose with Dextrostix; if glucose is present, it is indicative of a CSF leak, spinal fluid also dries with a yellow halo around edges of drainage.

3. If a CSF leak occurs, keep the head of the bed elevated and monitor for development of an infection (meningitis).
D. Seizure precautions (see Appendix 15-5).
E. Maintain adequate fluid intake by IV infusion or oral intake; do not overhydrate.
F. Assess for other undetected injuries; stabilize spine after head injury until spinal cord injury is ruled out.

Goal: To provide appropriate nursing interventions for the client experiencing an increase in ICP (see nursing goals for increased ICP).

Goal: To provide adequate nutritional and caloric intake for the client with a head injury (see Appendix 13-6).
A. Provide enteral feedings if client is unable to eat.
B. Assist client to take oral feedings once swallow reflex is normal; client is at increased risk for aspiration.

Hydrocephalus

Hydrocephalus is a condition caused by an imbalance in the production and absorption of CSF in the ventricles of the brain.

Data Collection

A. Risk factors/etiology.
   1. Neonate: usually the result of a congenital malformation.
   2. Older child, adult.
      a. Space-occupying lesion.
      b. Preexisting developmental defects.
B. Clinical manifestations: infant.
   1. Head enlargement: increasing circumference in excess of normal 2 cm per month for first 3 months.
   2. Separation of cranial suture lines.
   3. Fontanel becomes tense and bulging.
   4. Dilated scalp veins.
   5. Frontal enlargement, bulging “sunset eyes.”
   6. Symptoms of increasing ICP.
C. Clinical manifestations: older child, adult.
   1. Symptoms of increasing ICP.
   2. Specific manifestations related to site of the lesion.
D. Diagnostics (see Appendix 15-1).
   1. Increasing head circumference is diagnostic in infants.

Treatment

A. Ventriculoperitoneal shunt; CSF is shunted into the peritoneum.
B. Surgery: removal of the obstruction (cyst, hematoma, tumor).

Nursing Interventions

Goal: To monitor for the development of increasing ICP.
A. Daily measurement of the frontal-occipital circumference of the head in infants.
B. Assess for symptoms of increasing ICP (see Box 15-3).
C. Infant is often difficult to feed; administer small feedings at frequent intervals because vomiting may be a problem.

Goal: To maintain patency of the shunt and monitor ICP after shunt procedure.

A. Position supine, with head turned opposite side up to prevent pressure on the shunt valve and to prevent too-rapid depletion of CSF.
B. Position is not a problem with children who are having a shunt revision; they have not had an increase in ventricular pressure.
C. Monitor for increasing ICP and notify charge nurse.
D. Monitor for infection, especially meningitis or encephalitis.

Home Care
A. Teach parents symptoms of increasing ICP.
B. Have parents participate in care of the shunt before client’s discharge.
C. Encourage parents and family to ventilate feelings regarding client’s condition.
D. Refer client to appropriate community agencies.

Reye’s Syndrome

Reye’s syndrome is a rare acute illness that occurs after a viral illness (frequently, after aspirin has been consumed) and results in liver problems and increased intracranial pressure.

Data Collection
A. Clinical manifestations.
   1. Primarily affects children from the age of 6 months to adolescence.
   2. Frequently, the affected child has received salicylate (aspirin) for control of fever during the preceding viral infection.
   3. Severe persistent vomiting, lethargy leading to irritability, and IICP.

Treatment
A. Measures to decrease ICP.

Nursing Interventions

Goal: To monitor progress of disease state and maintain homeostasis.
A. IV fluids.
B. Monitor serum electrolytes and liver function studies.
C. Maintain respiratory status; prevent hypoxia.
D. Assess for problems of impaired coagulation due to liver problems.
E. Decrease stress, anxiety: child may not remember events before the critical phase.

Goal: To monitor for and implement nursing actions appropriate for increasing ICP.

Stroke (Brain Attack)

Stroke or brain attack is the disruption of the blood supply to an area of the brain, resulting in tissue necrosis and sudden loss of brain function. It is the leading cause of adult disability in the United States.
A. Atherosclerosis (see Chapter 11), resulting in cerebrovascular disease, frequently precedes the development of a stroke.
B. Types of stroke.
   1. Ischemic stroke.
      a. Thrombotic stroke: formation of a clot that results in the narrowing of a vessel lumen and eventual occlusion; most common stroke.
      b. Associated with hypertension and diabetes.
      d. Common site of origin is the endocardium.
      e. May affect any age group
   2. Hemorrhagic stroke.
      a. Rupture of a cerebral artery caused by hypertension, trauma, or aneurysm.
      b. Bleeding compresses the brain and causes inflammation.
C. The area of edema resulting from tissue damage may precipitate more damage than the vascular damage itself.
D. TIA and RIND.
   1. Transient ischemic attack (TIA, silent stroke).
      a. Brief episode, less than 24 hours, of neurologic dysfunction; usually resolves within 30-60 minutes.
      b. Should be considered a warning sign of an impending stroke.
      c. Neurologic dysfunction is present for minutes to hours, but no permanent neurologic deficit remains.
   2. Reversible ischemic neurologic deficit (RIND).
      a. Symptoms similar to TIA.
      b. Neurologic symptoms last longer than 24 hours, but less than a week.
   3. Stroke: client has neurologic deficits related to mobility, sensation, and cognition.
E. Neuromuscular deficits resulting from a stroke are due to damage of motor neurons of the pyramidal tract.
   1. Damage to the left side of the brain will result in paralysis of the right side of the body (Figure 15-4).
   2. Both upper and lower extremities of the involved side are affected.
Data Collection
A. Clinical manifestations.
1. Transient ischemic attack (TIA) and reversible ischemic neurologic deficit (RIND).
   a. Visual defects: blurred vision, diplopia, blindness of one eye, tunnel vision.
   b. Transient hemiparesis, gait problems.
   c. Slurred speech, confusion.
   d. Transient numbness of an extremity.
2. Complete stroke (occurs suddenly with an embolism, more gradually with hemorrhage or thrombosis); symptoms vary according to which cerebral vessels are involved.
   a. Hemiplegia: loss of voluntary movement; damage to the right side of the brain will result in left-sided weakness and paralysis.
   b. Aphasia: defect in using and interpreting the symbols of language; may include written, printed, or spoken words.
   c. May be unaware of the affected side; neglect syndrome.
   d. Cranial nerve impairment: chewing, gag reflex, dysphagia, impaired tongue movement.
   e. May be incontinent initially.
   f. Agnosia: a perceptual defect that causes a disturbance in interpreting sensory information; client may not be able to recognize previously familiar objects.
   g. Cognitive impairment of memory, judgment, proprioception (awareness of one’s body position).
   h. Hypotonia (flaccidity) for days to weeks, followed by hypertonia (spasticity).
   i. Visual defects.
C. Diagnostics (see Appendix 15-1).

Treatment
A. Prophylactic.
1. Aspirin, platelet inhibitors.
2. Antihypertensives, anticoagulants.
B. Immediate treatment (differs depending on whether thrombotic or hemorrhagic stroke).
1. Medical.
   a. Medications to decrease cerebral edema.
      (1) Osmotic diuretics.
      (2) Corticosteroids (dexamethasone).
   b. Anticoagulants for thrombotic stroke (never administered to a client with hemorrhagic stroke).
   c. Anticonvulsants.
   d. Thrombolytic therapy or fibrinolytic therapy (such as recombinant tissue plasminogen activator [rtPA [Retavase]] considered for nonhemorrhagic strokes within 3 hours of first manifestation of stroke signs.
   e. Antihypertensives and antidysrhythmics.
2. Surgical.
   a. Carotid endarterectomy, especially for transient ischemic attack.
   b. Craniotomy for evacuation of hematoma.
   c. Extracranial-intracranial bypass for mild strokes.
C. Specific therapies to resolve physical, speech or occupational complications, including use of assistive devices.

Nursing Interventions

Goal: To prevent stroke through client education (see Box 15-5).

A. Identification of individuals with reversible risk factors and measures to reduce them.
B. Appropriate medical attention for control of chronic conditions conducive to the development of stroke.
C. Teach high risk clients early signs of TIA and RIND and to seek medical attention immediately if they occur.

Goal: To maintain patent airway and adequate cerebral oxygenation.

A. Place client in side-lying position with head elevated.
B. Assess for symptoms of hypoxia; administer oxygen or assist with endotracheal intubation and mechanical ventilation as necessary (see Appendix 10-8).
C. Maintain patent airway; use oropharyngeal airway to prevent airway obstruction by the tongue.
D. Client is prone to obstructed airway and pulmonary infection; have client cough and deep-breathe every 2 hours.
   ❖ **Goal:** To assess for and implement measures to decrease ICP (see nursing goals for increased ICP).
   ❖ **Goal:** To maintain adequate nutritional intake.

   A. Before oral feedings, evaluate need for swallow studies.
   B. Administer oral feedings with caution; start after first 24 hours; check for presence of gag and swallowing reflexes before feeding.
   C. Place food on the unaffected side of the mouth; begin with clear foods (gelatins).
   D. Select foods that are easy to control in the mouth (thick liquids) and easy to swallow; liquids often promote coughing, because client is unable to control them.
   E. Maintain high-Fowler’s position for feeding.
   F. Maintain privacy and unrushed atmosphere.
   G. If client is unable to tolerate oral intake, enteral feedings may be initiated.
   
   **TEST ALERT:** Identify potential for aspiration; assess client’s ability to eat.

   ❖ **Goal:** To preserve function of the musculoskeletal system.

   A. Passive range of motion (ROM) on affected side; begin early because the exercises are more difficult if muscles begin to tighten.
   B. Active ROM on unaffected side.
   C. Prevent foot drop: passive exercises; rigid boots; have client out of bed as soon as possible.
   D. Legs should be maintained in a neutral position; prevent external rotation of affected hip by placing a trochanter roll or rolled pillow at the thigh.
   E. Reposition every 2 hours, but limit the period of time spent on the affected side.

   **NURSING PRIORITY:** Protect the client’s affected side: do not give injections on that side, watch for pressure areas when positioning, have client spend less time on affected side than in other positions.

   F. Assess for adduction and internal rotation of the affected arm; maintain arm in a neutral (slightly flexed) position with each joint slightly higher than the preceding one.
   G. Restraints should be avoided because they often increase agitation.
   H. Maintain joints in position of normal function to prevent flexion contractures.
   I. Assist client out of bed on the unaffected side; this allows client to provide some stabilization and balance with the good side.

   **TEST ALERT:** Mobility: Assist client to ambulate, perform active and passive ROM exercises, assess for complications of immobility, prevent DVT, prevent skin breakdown and encourage independence.

   ❖ **Goal:** To maintain homeostasis.

   A. Evaluate adequacy of cardiac output.
   B. Monitor hydration status; prevent fluid overload.
      1. Carefully regulate IV fluid intake.
      2. Evaluate response to diuretics.
      3. Assess for the development of peripheral edema.
      4. Restrict fluid intake, as indicated.
      5. Assess respiratory parameters indicative of fluid overload.
   C. Determine previous bowel patterns and promote normal elimination.
      1. Avoid use of urinary catheter, if possible; if catheter is necessary, remove as soon as possible.
      2. Offer bedpan or urinal every 2 hours; help establish a schedule.
      3. Prevent constipation: provide increased bulk in diet, stool softeners, etc.
      4. Provide privacy and decrease emotional trauma related to incontinence.

   **TEST ALERT:** Assess and manage a client with an alteration in elimination. Establish a toileting schedule; the client who has had a stroke will need assistance in reestablishing a normal bowel and bladder routine.
D. Prevent problems of skin breakdown through proper positioning and good skin hygiene.
E. Assist client to identify problems of vision.
F. Maintain psychologic homeostasis.
  1. Client may be very anxious because of a lack of understanding of what has happened and because of his or her inability to communicate.
  2. Speak slowly and clearly and explain what has happened.
  3. Assess client’s communication abilities and identify methods to promote communication.

Home Care
A. Encourage independence in ADLs.
B. Provide clothing that is easy to get in and out of.
C. Active participation in ROM; have client do his or her own ROM on affected side.
D. Physical, occupational, and speech therapy for retraining of lost function.
E. Assist client to maintain sense of balance when in the sitting position; client will frequently fall to the affected side (unilateral neglect syndrome).
F. Encourage participation in carrying out daily personal hygiene.
G. Teach client safe transfer from bed to wheelchair and provide assistance as needed.
H. Bowel and bladder training program.
  1. To promote bladder tone, encourage urination (with or without assistance) every 2 hours rather than allowing the client to void when he or she feels the urge.
  2. Teach client to perform Kegel exercises regularly.
  3. Advise client to avoid caffeine intake.
  4. Increased bulk in diet will help avoid constipation.
  5. Increase fluids to 2000 mL per day as tolerated.
  6. Administer stool softeners PRN.
  7. Establish regular daily time for bowel movements.
I. Encourage social interaction.
  1. Speech therapy.
  2. Frequent and meaningful verbal stimuli.
  3. Allow client plenty of time to respond.
  4. Speak slowly and clearly; do not give too many directions at one time. Use short sentences.
  5. Do not “talk down to” client or treat client as a child (elder speak).
  6. Client’s mental status may be normal; do not assume it is impaired.
  7. Nonverbal clients do not lose their hearing ability.
J. Evaluate family support and the need for home health services.

Cerebral Aneurysm, Subarachnoid Hemorrhage

A cerebral aneurysm occurs when a weakened saccular outpouching of the cerebral vasculature bulges from pressure on the weakened tissue. A Berry aneurysm is a cerebral aneurysm occurring in the arterial junction of the circle of Willis. A ruptured cerebral aneurysm often results in hemorrhagic stroke.

A. A subarachnoid hemorrhage is a potentially fatal condition in which blood accumulates below the arachnoid mater in the subarachnoid space; most often occurs secondary to an aneurysm.
B. An aneurysm frequently ruptures and bleeds into the subarachnoid space.
C. Symptoms occur when an aneurysm enlarges, or when it ruptures. As blood collects in the subarachnoid space, it compresses and damages the surrounding brain tissue.
D. Subarachnoid hemorrhage may lead to neurologic compromise including seizures, stroke, permanent brain damage, and even death.
E. Often, symptoms do not appear until rupture has occurred.

Data Collection
A. Clinical manifestations.
  1. Rupture may be preceded by severe headache and nausea.
  2. Rupture frequently occurs without warning.
     a. Sudden severe headache, seizures.
     c. Nuchal rigidity, hemiparesis.
     d. Loss of consciousness.
     e. Symptoms of increasing ICP: nausea, vomiting, photophobia,
  3. Severity of symptoms depends on the site and amount of bleeding.
B. Diagnostics (see Appendix 15-1).

Treatment
A. Aminocaproic acid: inhibits fibrinolysis in life-threatening situations.
B. Osmotic diuretics, anticonvulsants.
C. Corticosteroids.
D. Calcium channel blockers: minimize vasospasm after hemorrhage.
E. Surgical intervention: ligation or “clipping” of the aneurysm to reduce the swelling and minimize the risk for re-bleeding.

Nursing Interventions

Goal: To prevent further increase in ICP and possible rupture.
A. Immediate bed rest; bathroom privileges may be permitted.
B. Prevent Valsalva maneuver.
C. Client should avoid straining, sneezing, pulling up in bed, and acute flexion of the neck.
D. Elevate head of the bed 30 degrees to 45 degrees to promote venous return.
E. Quiet, dim, nonstimulating environment: disconnect telephone; promote relaxation.
F. Constant monitoring of condition to identify occurrence of bleeding, as evidenced by symptoms of increasing ICP.
G. Administer analgesics cautiously; the client should continue to be easily aroused so that neurologic checks can be performed.
H. No hot or cold beverages or food, no caffeine, no smoking.
I. Maintain seizure precautions (see Appendix 15-5).

✔ **NURSING PRIORITY:** If the client survives the rupture of the aneurysm and re-bleeding occurs, it is most likely to occur within the next 24 to 48 hours.

- **Goal:** To assess for and implement nursing measures to decrease ICP (see nursing goals for increased ICP).
- **Goal:** To provide appropriate preoperative nursing interventions (see nursing goals for brain tumor).
- **Goal:** To maintain homeostasis and monitor changes in ICP after craniotomy (see nursing goals for craniotomy).

**Meningitis**

- **Meningitis is an acute viral or bacterial infection that causes inflammation of the meningeal tissue covering the brain and spinal cord.** Bacterial meningitis is less common but more severe than viral meningitis. Meningococcal meningitis is the only form that is readily contagious; transmitted by direct contact with droplets from the airway of an infected person.

**Data Collection**

A. Clinical manifestations: older child and adult.
   1. Rash, petechiae, purpura.
   2. Nuchal rigidity.
   3. Chills and high fever.
   4. Severe and persistent headache.
   5. Increasing irritability, malaise, changes in level of consciousness.
   6. Respiratory distress.
   8. Nausea and vomiting.
   9. Positive Kernig sign: resistance or pain at the knee and the hamstring muscles when client attempts to extend the leg after thigh flexion.
   10. Positive Brudzinski sign: reflex flexion of the hips when the neck is flexed.
   11. Photophobia.

B. Clinical manifestations: neonate and infant.
   1. Fever.
   2. Apneic episodes.
   4. Seizures.
   5. Crying with position change.
   7. Changes in sleep pattern, increasing irritability.
   8. Poor sucking; may refuse feedings.
   9. Poor muscle tone, diminished movement.
   10. Irritability.

D. Diagnostics (see Appendix 15-1).
   1. Lumbar puncture reveals increasing CSF pressure; if ICP is present, a CT scan may be done prior to procedure.
   2. Elevated WBCs.
   3. CSF and blood cultures positive for meningococcus bacteria.

**Treatment**

A. Droplet precautions until positive organism is identified.
B. IV antibiotics, steroids (see Appendices 5-9, 5-7).
C. Optimum hydration.
D. Anticonvulsant medications (see Appendix 15-2).
E. Antivirals.
F. Maintain ventilation.

**Complications**

A. Increasing ICP resulting in permanent brain damage.
B. Visual and hearing deficits, paralysis.
C. Subdural effusion; may be aspirated or allowed to absorb when meningitis treatment is started and protein leak stops.

**Nursing Interventions**

- **Goal:** To identify the causative organism, control spread, and initiate therapy.
A. Maintain respiratory droplet precautions until organism is identified; place client in a private room (Appendix 5-9).
B. Begin administration of IV antibiotics after lumbar puncture during which CSF sample was obtained.
C. Identify family members and close contacts who may require prophylactic treatment.
- **Goal:** To monitor course of infection and prevent complications.
A. Frequent nursing assessment for increased ICP (see Box 15-3).
B. Maintain adequate hydration; cerebral edema may requiring limiting fluid intake.
C. Monitor infusion site for complications of IV piggyback antibiotics.
D. Assess for side effects of high dosage of antibiotics.
E. Decrease stimuli in environment: dim lights, quiet environment, no loud noises.
F. Avoid movement or positioning that increases discomfort; client generally assumes a side-lying position.
G. Seizure precautions.
H. Prevent complications of immobility.
I. Good respiratory hygiene.
J. Measures to decrease fever.

**Encephalitis**

Encephalitis is an inflammatory process of the CNS, or “inflammation of the brain.”

**Data Collection**

A. Clinical manifestations.
   1. Severe headache, nuchal rigidity.
   2. Sudden fever.
   4. Changes in level of consciousness.
   6. Drowsiness, confusion, disorientation.
B. Diagnostics.
   1. Examination of the CSF.
   2. Viral studies to isolate the virus.
   3. EEG for seizure activity.

**Treatment**

A. Anticonvulsants.
B. Treatment to decrease ICP.
C. Hydration, bed rest, proper nutrition.

**Nursing Interventions**

Nursing interventions for encephalitis are the same as those for meningitis, with the exception of antibiotic therapy. Encephalitis is caused by a viral agent and is not responsive to antibiotic therapy; antibiotic therapy may be ordered to prevent bacterial infection.

**NURSING PRIORITY:** Identify changes in client’s mental status; treat client with seizures.

**Spinal Cord Injury**

Spinal cord injury (SCI) is damage to the spinal cord housed inside the spinal column. Most SCIs exist with the spinal cord intact yet compromised from injury or disease. SCI most often occurs as a result of direct trauma to the head or neck area.

A. Initially after the injury, the nerve fibers swell, and circulation to the spinal cord is decreased; hemorrhage and edema occur, causing an increase in the ischemic process, which progresses to necrotic destruction of the spinal cord.

B. Consequences of SCI depend on the extent of damage, as well as the level of cord injury (Figure 15-5).
   1. The higher the lesion, the more severe the injury.
   2. Complete transection (complete cord dissolution, complete lesion): immediate loss of all sensation and voluntary movement below the level of injury; minimal, if any, return of function.
   3. Cord edema peaks in about 2 to 3 days and subsides within about 7 days after the injury.

D. Spinal cord shock (areflexia): temporary loss or dysfunction of spinal reflex activity; occurs predominantly in complete cord lesions; loss of communication with the higher centers of control results in flaccidity and loss of functional control below the level of injury.
   1. Interruption of nerve impulses leads to vasodilation, hypotension, and shock-like symptoms.
   2. Condition may persist for several weeks and reverse spontaneously; resolution of spinal shock will be evident by return of reflexes.
   3. Hyperreflexia will occur as recovery progresses; spastic movements may be precipitated by emotion and cutaneous stimulation.

E. Autonomic dysreflexia occurs in clients with an injury at T6 or higher.
   1. A noxious stimulus below the level of injury triggers the sympathetic nervous system, which causes a release of catecholamines (epinephrine, norepinephrine).
   2. Most common stimuli causing the response are a full bladder or bowel, UTI, pressure ulcers, and skin stimulation.

![Spinal Cord Injury](image)

3. Rapidly occurring severe hypertension, nausea, pounding headache, bradycardia, restlessness, flushing, piloerection, and blurred vision are the most common body responses.

F. Bladder dysfunction will occur as a result of the injury; normal bladder control is dependent on the sensory and motor pathways and the lower motor neurons being intact.

G. Long-term rehabilitation potential depends on the amount of damage done to the cord, which may not be evident until several weeks after the injury.

Data Collection

A. Clinical manifestations: depend on level of SCI (see Figure 15-5).
   1. Injury at C3 through C5 will cause respiratory compromise.
   2. Depending on degree of injury, the degree of paralysis and amount of sensory loss below the level of injury will vary.
      a. Generally occurs within 72 hours and may last for several weeks.
      b. Flaccid paralysis.
      c. Loss of sensation and absence of reflexes.
      d. Bowel and bladder dysfunction.
      e. Hypotension and bradycardia.
      f. After spinal shock, reflexes and autonomic activity return, as evidenced by development of spasticity.
   4. Autonomic dysreflexia in clients with injuries at T6 or higher.
      a. Severe hypertension, bradycardia.
      b. Complaints of headache.
      c. Flushing and diaphoresis above level of injury.

B. Diagnostics (see Appendix 15-1).

C. Complications.
   1. Respiratory stasis; pulmonary edema and emboli.
   2. Cardiovascular compromise from neurogenic shock, or autonomic dysreflexia.
   3. Skin breakdown resulting in localized and systemic infections.
   4. Immobility issues causing renal and gastrointestinal compromise.
   5. Psychologic, social, and body image issues.

Treatment

A. Emergency intervention required.

B. Corticosteroids within 8 hours of injury (methylprednisolone).

C. Immobilization of the vertebral column in cervical fracture.
   1. Cervical tongs (Crutchfield, Gardner-Wells) for cervical immobility.
   2. Halo vest/jacket traction to promote mobility.
   3. Sterno-occipital mandibular immobilizer (SOMI) brace worn with cervical fusion.

D. Spinal surgery to remove bone fragments and assure spinal alignment.

E. Respiratory support as necessary.

Nursing Interventions

- **Goal:** To maintain stability of the vertebral column and prevent further cord damage.

   1. Suspect SCI if there is any evidence of direct trauma to the head or neck area (contact sports, diving accidents, motor vehicle accident).
   2. Immobilize client and place on spinal board with the head and neck in a neutral position; do not allow the neck to flex.
   3. Airway, status of breathing and circulation are the primary concerns initially after injury.
   4. Neurogenic shock may occur within first 24 hours, observe for decreased B/P, severe bradycardia.

- **NURSING PRIORITY:** Do not hyperextend the neck in a client with a suspected cervical injury. Airway should be opened by the jaw-lift method. Improper handling of the client often results in extension of the damaged area.

   - Maintain in extended position with no twisting or turning; do not remove cervical collar or spinal board until area of injury is identified.
   - Maintain patent airway during transportation.

B. Maintain stability of the vertebral column as indicated by the level of injury.
   1. Prescribe and maintain bed rest on firm mattress with supportive devices (sandbags, skin traction, etc.); maintain alignment in the supine position; logroll without any flexion or twisting.
   2. Maintain cervical traction: tongs are inserted into the skull with traction and weights applied; do not remove weights; logroll to maintain spinal immobility.
   3. Halo vest/jacket traction: maintains cervical immobility but allows client to be mobile.
      a. If bolts or screws come loose, keep the client immobilized and call the doctor.
      b. Clean pin sites according to facility policy, observe for infection.
      c. Roll client onto his or her side at the edge of the bed and allow client to push up from the mattress to a sitting position. Never use the halo vest frame to assist the client to turn or sit up.
      d. Correct size of wrench should be kept at bedside to remove the anterior bolts in case of emergency.
      e. Assist client to maintain balance when standing; the traction is heavy for a person who is weak, and the client is at increased risk for falling.
C. Perform appropriate nursing intervention when surgery is indicated to stabilize the injury.
   - **Goal:** To identify level of damage and changes in neurologic status.
   - A. Assess respiratory function: symmetrical chest expansion, bilateral breath sounds, presence of retractions or dyspnea.
   - B. Motor and sensory evaluation.
     1. Ability to move extremities; strength of extremities.
     2. Sensory examination, including touch and pain.
   - C. Ongoing assessment and status of:
     1. Bladder, gastric, bowel function.
     2. Psychologic adjustment to the injury.
   - D. Evaluate history of how injury occurred; obtain information regarding how client was transported.
   - E. Determine status of pain.
   - **Goal:** To maintain respiratory function.
     - A. Frequent assessment of respiratory function during the first 48 hours.
       1. Changes in breathing pattern.
       2. Observe breathing pattern for use of sternocleido-mastoid and intercostal muscles for respiration.
       3. Evaluate arterial blood gas values and pulse oximetry.
       4. Determine development of hypoxia.
     - B. Maintain adequate respiratory function, as indicated.
       2. Incentive spirometry.
       5. Nasopharyngeal or endotracheal suctioning based on airway and level of injury.
   - **Goal:** To maintain cardiovascular stability.
     - A. Spinal shock.
       1. Monitor vital signs and evaluate changes.
       2. Vagal stimulation, hypothermia, and hypoxia may precipitate spinal shock.
       3. Assess deep tendon reflexes and muscle strength as resolution of shock occurs.
     - B. Assess for development of autonomic dysreflexia; if it occurs:
       1. Elevate the head of the bed, and check the client’s blood pressure.
       2. Assess for sources of stimuli: distended bladder (check urinary tubing), fecal impaction, constipation, tight clothing.
       3. Relieve the stimuli, and dysreflexia will subside.
       4. Maintain cardiovascular support during period of hypertension.
   - 5. A hypertensive crisis from dysreflexia will require immediate intervention.
   - C. Evaluate cardiovascular responses when turning or suctioning client.
   - D. Apply antiembolism stockings or elastic wraps to the legs to facilitate venous return. (Lack of muscle tone and loss of sympathetic tone in the peripheral vessels result in decreases in both venous tone and venous return, which predispose client to deep vein thrombosis.)
   - E. Implement measures to promote venous return.
   - **Goal:** To maintain adequate fluid and nutritional status.
     - A. During the first 48 hours, evaluate gastrointestinal function frequently; decrease in function may necessitate use of a nasogastric tube to decrease distention.
     - B. Prevent complications of nausea and vomiting.
     - C. Evaluate bowel sounds and client’s ability to tolerate oral fluids.
     - D. Increase protein and calories in diet; may need to decrease calcium intake.
     - E. Evaluate for presence of paralytic ileus.
     - **Goal:** To promote bowel and bladder function.
     - A. Urine is retained as a result of the loss of autonomic and reflexive control of the bladder.
       1. Intermittent catheterization or indwelling catheter may be used initially to prevent bladder distention.
       2. Perform nursing interventions to prevent urinary tract infection; avoid urinary catheterization, if possible.
     - B. Determine type of bladder dysfunction based on level of injury.
     - C. Assess client’s awareness of bladder function.
     - D. Initiate measures to institute bladder control.
       1. Establish a schedule for voiding; have client attempt to void every 2 hours.
       2. Use the Credé method (in adults) for manual expression of urine.
       3. May be necessary to teach client self-catheterization.
       4. Record output and evaluate for presence of residual urine.
     - E. Evaluate bowel functioning.
       1. Incontinence and paralytic ileus frequently occur with spinal shock.
       2. Incontinence and impaction are common later.
F. Initiate measures to promote bowel control (after spinal shock is resolved).
1. Identify client’s bowel habits before injury.
2. Maintain sufficient fluid intake and adequate bulk in the diet.
3. Establish specific time each day for bowel evacuation.
4. Assess client’s awareness of need to defecate.
5. Teach client effective use of the Valsalva maneuver to induce defecation.
6. Induce defecation by digital stimulation, suppository, or as a last resort, enema.

**NURSING PRIORITY:** Assess and manage a client with alteration in elimination; initiate a toileting schedule; the client with SCI may need bowel and bladder retraining, depending on level of the injury.

- **Goal:** To maintain psychologic equilibrium.
  A. Provide simple explanations of all procedures.
  B. Anticipate outbursts of anger and hostility as client begins to work through the grieving process and adjusts to changes in body image.
  C. Anticipate and accept periods of depression in client.
  D. Encourage independence whenever possible; allow client to participate in decisions regarding care and to gain control over environment.

**TEST ALERT:** Plan measures to deal with client’s anxiety and promote client’s adjustment to changes in body image; assist client and significant others to adjust to role changes.

E. Encourage family involvement in identifying appropriate diversional activities.
F. Avoid sympathy and emphasize client’s potential.
G. Initiate frank, open discussion regarding sexual functioning.
H. Assist client and family to identify community resources.
I. Assist client to set realistic short-term goals.

**Myasthenia Gravis**

- **Myasthenia gravis** is a sporadic, progressive neuromuscular disease characterized by a decrease in the acetylcholine level at the receptor sites in the neuromuscular junction. This results in a disturbance in nerve impulse transmission, causing progressive weakness in skeletal muscles. Myasthenia gravis literally means “grave muscle weakness.”

**Data Collection**

- **A. Risk factors/etiology.**
  1. Autoimmune disease.
  2. More common in women younger than 40 and men older than 60 but may occur at any age.

- **B. Clinical manifestations.**
  1. Primary problem is skeletal muscle fatigue with sustained muscle contraction; symptoms are predominantly bilateral.
     a. Muscular fatigue increases with activity.
     b. Ptosis (drooping of the eyelids) and diplopia (double vision) are frequently the first symptoms.
  c. Impairment of facial mobility and expression.
     d. Impairment of chewing and swallowing.
     e. Speech impairment (dysarthria).
     f. No sensory deficit, loss of reflexes, or muscular atrophy.
     g. Poor bowel and bladder control.
  2. Course is variable.
     a. May be progressive.
     b. May stabilize.
     c. May be characterized by short remissions and exacerbations.
  3. Myasthenic crisis: an acute exacerbation of symptoms that may require intubation and mechanical ventilation to support respiratory effort; caused by major muscular weakness and inability to maintain respiratory function.
     a. Severe respiratory distress and hypoxia.
     b. Increased pulse and blood pressure.
     c. Decreased or absent cough or swallow reflex.
  4. Cholinergic crisis: a toxic response to the anticholinesterase medications; anticholinesterase medications must be withheld—this response is rare with proper dosing of *Mestinon*.
     a. Nausea, vomiting, and diarrhea.
     b. Weakness with difficulty in swallowing, chewing, and speaking.
     c. Increased secretions and saliva.
     d. Muscle fasciculation, constricted pupils.

- **C. Diagnostics (See Appendix 15-1).**
  1. Electromyography: shows a decreasing response of muscles to stimuli.
  2. Ice pack test: assess clients with ptosis; muscles improve with cold application; place pack on closed lids for 2 minutes to see whether ptosis improves.
  3. Tensilon test.
     a. Used for diagnosing myasthenia gravis.
     b. Used to differentiate cholinergic crisis from myasthenic crisis.
     c. IV injection of neostigmine or edrophonium causes immediate, although short-lived, relief of muscle weakness.
Treatment
A. Anticholinesterase (cholinergic) medications (see Appendix 15-3).
   1. Neostigmine (*Prostigmin*).
   2. Pyridostigmine (*Mestinon*).
B. Corticosteroids (see Appendix 5-7).
C. Plasma electrophoresis (plasmapheresis): separation of plasma to remove autoantibodies from the bloodstream.
D. Immunosuppressive therapy.
E. Surgical removal of the thymus (thymectomy).

Nursing Interventions
Client may be hospitalized for acute myasthenic crisis or for respiratory tract infection.

- **Goal:** To maintain respiratory function.
  A. Assess for increasing problems of difficulty breathing. Measure forced vital capacity frequently to assess respiratory status.
  B. Determine client’s medication schedule. When was medication last taken?
  C. Assess ability to swallow; prevent problems of aspiration.

- **NURSING PRIORITY:** Identify clients at high risk for aspiration: do not give the client experiencing a myasthenic crisis anything to eat or drink.

D. Evaluate effectiveness of cough reflex.
E. Be prepared to intubate or provide ventilatory assistance.
- **Goal:** To distinguish between a myasthenic crisis and a cholinergic crisis.
  A. Maintain adequate ventilatory support during crisis.
  B. Assist in administration of *Tensilon* test to differentiate crisis.
     1. Myasthenic crisis: client’s condition will improve.
     2. Cholinergic crisis: client’s condition will temporarily worsen.
  C. If myasthenic crisis occurs, neostigmine may be administered.
  D. If cholinergic crisis occurs, atropine may be administered, and cholinergic medications may be reevaluated.
  E. Avoid use of sedatives and tranquilizers, which cause respiratory depression.
  F. Provide psychologic support during crisis.

Multiple Sclerosis
- **Multiple sclerosis (MS) is characterized by multiple areas of demyelination from inflammatory scarring of the neurons in the brain and spinal cord (CNS).**
A. The progression of the disease results in total destruction of the myelin, and the nerve fibers become involved.
   1. Loss of myelin sheath causes decreased impulse conduction, destruction of the nerve axon, and a blockage of the impulse conduction.
   2. The demyelination occurs in irregular scattered patches throughout the CNS.
B. The condition is chronic with unpredictable remissions and exacerbations.

Data Collection
A. Risk factors/etiology: cause is unknown; possible autoimmune or exposure to viruses.
   1. More common in women.
   2. Problem of young adults.
   3. More common in cooler climates.
B. Clinical manifestations.
   1. Signs and symptoms vary from person to person, as well as within the same individual, depending on the area of involvement.
   2. Cerebellar dysfunction: nystagmus, ataxia, dysarthria, dysphagia.
   3. Motor dysfunction: weakness of eye muscles, weakness or spasticity of muscles in extremities.
   4. Sensory: vertigo, blurred vision, decreased hearing, tinnitus.
   5. Bowel and bladder dysfunction.
   7. Psychosocial.
      a. Intellectual functioning remains intact.
      b. Emotional lability: increased excitability and inappropriate euphoria.
      c. Emotional effects of the chronic illness and changes in body image.
C. Diagnostics: no definitive diagnostic test.

Treatment
A. No cure; medical treatment is directed toward slowing of the disease process and relief of symptoms.
B. Medications to decrease edema and inflammation of the nerve sites.
   1. Antiinflammatory agents.
   2. Immunosuppressive agents: interferons.
   3. Adrenocorticotropic hormone for acute exacerbations.

Home Care
A. Teach client importance of taking medication on a regular basis; peak effect of the medication should coincide with mealtimes.
B. If ptosis becomes severe, client may need to wear an eye patch to protect cornea (alternate eye patches if problem is bilateral).
Nursing Interventions

Client may be hospitalized for diagnostic workup or for treatment of acute exacerbation and complications.

Goal: To maintain homeostasis and prevent complications during an acute exacerbation of disease symptoms.

A. Maintain adequate respiratory function.
   1. Prevent respiratory tract infection.
   2. Good pulmonary hygiene.
   3. Prevent aspiration; sitting position for eating.
   4. Evaluate adequacy of cough reflex.

B. Maintain urinary tract function.
   1. Prevent urinary tract infection.
   2. Increase fluid intake, at least 3000 mL/24 hr.
   3. Evaluate voiding; assess for retention and incontinence.

Goal: To prevent complications of immobility (see Chapter 3).

Goal: To promote psychologic well-being.

A. Focus on remaining capabilities.
B. Encourage independence and assist client to gain control over environment.
C. If impotence is a problem, initiate sexual counseling.
D. Assist client to work through the grieving process.
E. Identify community resources available.

Home Care

A. Medical regimen and side effects of the medications.
B. Physical therapy to maintain muscle function and decrease spasticity.
C. Measures to maintain voiding; may need to perform self-catheterization.
D. Safety measures because of decreased sensation.
   1. Check bath water temperature.
   2. Wear protective clothing in the winter.
   3. Avoid heating pads and clothing that is constrictive.
E. Client should understand that relapses are frequently associated with an increase in physiologic and psychologic stress.

Guillain-Barré Syndrome

* Guillain-Barré syndrome is an acute, rapidly progressing motor neuropathy involving segmental demyelination of nerve roots in the spinal cord and medulla. This causes inflammation, decreased nerve conduction, and rapidly ascending paralysis. Both sensory and motor impairment occur.

Data Collection

A. Clinical manifestations.
   1. Progressive weakness and paralysis begin in the lower extremities and ascend bilaterally.
   2. Paralysis ascends the body symmetrically.
      a. Paralysis of respiratory muscles.
      b. Cranial nerve involvement, most often facial nerve (CN VII), produces difficulty talking and swallowing.
   3. Loss of sensation and function of bowel and bladder.
   4. Manifestations may progress rapidly over hours or may occur over 2 to 4 weeks.
   5. Muscle atrophy is minimal.
   6. Paralysis decreases as the client begins recovery; most often, there are no residual effects.

B. Diagnostics (see Appendix 15-1).
   1. Elevated protein concentration in CSF.

Treatment (Supportive)

A. Respiratory support, possibly mechanical ventilation.
B. Corticosteroids.
C. Immunosuppressives and immunoglobulins.
D. Plasmapheresis: plasma exchange.

Nursing Interventions

Goal: To evaluate progress of paralysis and initiate actions to prevent complications.

A. Evaluate rate of progress of paralysis; carefully assess changes in respiratory pattern and report to charge nurse.

B. Frequent evaluation of cough and swallow reflexes.
   1. Remain with client while client is eating; have suction equipment available.
   2. Maintain NPO (nothing by mouth) status if reflexes are involved.

C. If ascent of paralysis is rapid, prepare for endotracheal intubation and respiratory assistance.

D. Prevent complications of immobility during period of paralysis (see Chapter 3).

E. Assess for involvement of the autonomic nervous system.
   1. Orthostatic hypotension.
   2. Hypertension.
   3. Cardiac dysrhythmias.
   4. Urinary retention and paralytic ileus.
Goal: To prevent complications of hypoxia if respiratory muscles become involved (see Chapter 10).

Goal: To maintain psychologic homeostasis.
A. Simple explanation of procedures.
B. Complete recovery is anticipated.
C. Provide psychologic support during period of assisted ventilation.
D. Keep client and family aware of progress of disease.

Amyotrophic Lateral Sclerosis

Amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig’s disease, is a rapidly progressive, invariably fatal degeneration of nerves controlling voluntary muscles.

Data Collection
A. Clinical manifestations.
   1. Twitching, cramping, and muscle weakness.
   2. Dysarthria and dysphagia.
   3. Fatigue; asymmetrical muscle atrophy and weakness.
      a. Begins with upper extremities and progressively involves muscles of neck and throat.
      b. Trunk and lower extremities are involved late in course of disease.
   5. Most often fatal within 2 to 5 years after onset.
   6. Intellectual functioning and all five senses are usually unaffected.
B. Diagnostics: electromyography and nerve conduction studies.

Nursing Interventions

Goal: To provide ongoing assessment in assisting client to deal with progressive symptoms.
A. Promote independence in ADLs.
   1. Conserve energy; space activities.
   2. Avoid extremes of hot and cold.
   3. Use of appliances to prolong independence in ambulation and ADLs.
B. Promote nutrition.
   1. Small frequent feedings.
   2. Have client sit upright with head slightly flexed forward while eating.
C. Encourage family and client to talk about losses and the difficult choices they face.
D. Assist family and client to identify need for advanced directives and to complete them.

Muscular Dystrophy

Muscle dystrophy (MD) is a group of genetic diseases characterized by progressive weakness and skeletal muscle degeneration affecting a variety of muscle groups. The term pseudohypertrophy describes the characteristic muscle enlargement (caused by fatty infiltration) that occurs in muscular dystrophy.

A. Duchenne’s muscular dystrophy is the most common and most severe form of MD.
B. Condition is characterized by gradual degeneration of muscle fibers and progressive symmetrical weakness and wasting of skeletal muscle.

Data Collection
A. Risk factors/etiology.
   1. Genetic: sex-linked disorder primarily affecting males, females are carriers.
   2. Onset generally occurs between the ages of 3 and 5 years.
B. Clinical manifestations.
   1. History of delay in motor development, particularly a delay in walking.
   2. Abnormal waddling gait.
      a. Child falls frequently and develops characteristic manner of rising.
      b. Gower’s sign: from sitting or squatting position, the child assumes a kneeling position and pushes the torso up by “walking” his or her hands up the thighs.
   3. Progressive muscle weakness, atrophy, and contractures.
      a. Ambulation is frequently impossible by the age of 9 to 11 years.
      b. Ultimately destroys essential muscles of respiration; death occurs from respiratory tract infection or cardiac failure.
C. Diagnostics.
   1. Electromyography, muscle biopsy.
   2. Serum enzymes: creatinine phosphokinase level is increased in neonate, then gradually declines.

Treatment
A. Steroids administered to boys older than 5 years of age.

Nursing Interventions

Child is frequently cared for at home and hospitalized only when complications occur.

Goal: To maintain optimal motor function as long as possible.
A. Regular physical therapy for stretching and strengthening muscles; ROM exercises.
B. Maintain child’s independence in ADLs.
C. Assist family to identify resources, to adapt physiologic barriers within the home, and to promote mobility of the child in a wheelchair.
D. Assist family to identify methods of preventing respiratory tract infection; assess for respiratory problems.
E. Provide braces, splints, and assistive devices as needed.
Goal: To assist parents and child to maintain psychologic equilibrium and to adapt to chronic illness.
A. Assist parents to understand importance of independence and self-help skills; frequently, parents are overprotective of the child.
B. Counseling to assist parents and family members to identify family activities that can be modified to meet child’s needs.
C. Mother may feel particularly guilty because of transmission of disease to her son.
D. Identify available community resources.
E. Counseling to assist family and child with chronic illness and child’s eventual death.

Cerebral Palsy

Cerebral palsy is a nonprogressive, lifelong neuromuscular genetic disorder resulting from damaged motor centers of the brain that cause nerve impulses to be incorrectly sent and/or received. The overall result is impairment of muscle control with poor muscle coordination.

Data Collection
A. Risk factors/etiology.
   1. May result from existing prenatal brain abnormalities (kernicterus, hemolytic disease of newborn).
   2. Prematurity is single most important determinant of cerebral palsy.
B. Clinical manifestations.
   1. Delayed achievement of developmental milestones.
   2. Increased or decreased resistance to passive movement.
   3. Abnormal posture.
   4. Presence of infantile reflexes (tonic neck reflex, exaggerated Moro reflex).
   5. Associated disabilities.
      a. Mental retardation, seizures.
      b. Attention-deficit problems.
      c. Vision and hearing impairment.
C. Diagnostics.
   1. Frequently difficult to diagnose in early months; condition may not be evident until child attempts to sit alone or walk.
   2. Neurologic exam and contributing history.

Treatment
A. Maintain and promote mobility with orthopedic devices and physical therapy.
B. Skeletal muscle relaxants.
C. Anticonvulsants, as indicated.

Nursing Interventions
Child is frequently cared for at home and on an outpatient basis unless complications occur.

Goal: To assist child to become as independent and self-sufficient as possible.
A. Physical therapy program designed to assist individual child to gain maximum function.
B. Bowel and bladder training may be difficult because of poor control.

Goal: To maintain physiologic homeostasis.
A. Maintain adequate nutrition.
   1. May experience difficulty eating because of spasticity; may drool excessively; use of manual jaw control when feeding.
   2. Encourage independence in eating and use of self-help devices.
   3. Provide a balanced diet with increased caloric intake to meet extra energy demands.
B. Maintain safety precautions to prevent injury.
C. Increased susceptibility to infections, especially respiratory tract infections, because of poor control of intercostal muscles and diaphragm.
D. Increased incidence of dental problems; schedule frequent dental checkups.

Goal: To promote a positive self-image in the child and provide support to the family.
A. Assist parents to set realistic goals.
B. Encourage play activity.
C. Utilize principles in caring for chronically ill pediatric client (Chapter 2).

Parkinson’s Disease (Paralysis Agitans)

Parkinson’s disease is a progressive neurologic disorder with gradual onset that causes destruction and degeneration of nerve cells in the basal ganglia; results in damage to the extrapyramidal system, causing difficulty in control and regulation of movement.

Data Collection
A. Risk factors/etiology.
   1. In general, onset occurs after age 60.
   2. More common in males.
B. Clinical manifestations (Figure 15-6).
   1. Tremor.
      a. Affects the arms and hands bilaterally: often, the first sign.
      b. Tremors usually occur at rest; voluntary movement may decrease tremors; tremors during voluntary movement are not as common.
      c. Described as “pill-rolling” tremor.
      d. Exacerbated by emotional stress and increased concentration.
      a. Increased resistance to passive movement.
      b. Movement may be described as “cog-wheel rigidity” because of jerky movement of extremities.
      a. Decreased blinking of the eyelids.
b. Loss of ability to swallow saliva.
c. Facial expression is blank or “mask-like.”
d. Loss of normal arm swing while walking.
e. Difficulty initiating movement.
4. Stooped posture, shuffling propulsive gait.
5. May exhibit mental deterioration similar to that associated with Alzheimer’s disease.
6. Depression occurs in two-thirds of clients.

C. Diagnostics: no specific diagnostic test.

Treatment
A. Medications (see Appendix 15-4).
B. Surgical therapy: aim is to decrease symptoms.
   1. Ablation (destruction of tissue).
   2. Deep brain stimulation (DBS).

Nursing Interventions

Goal: To maintain homeostasis.
A. Encourage independence in ADLs with use of self-help devices.
B. Maintain nutrition.
   1. Increase calories and protein; provide more easily chewed foods.
   2. Frequent small meals.
   3. Allow ample time for eating.
   5. Provide pleasant atmosphere at mealtime; client frequently prefers to eat alone because of difficulty swallowing and inability to control saliva.
   6. Increase fluid intake with increased bulk in the diet to decrease problem with constipation.
C. Maintain muscle function.
   1. Full ROM to extremities to prevent contracture.
   2. Decrease effects of tremors.
   3. Exercise and stretch daily.
   4. Physical therapy, as indicated.
D. Closely monitor response to or changes in response to medications.

Goal: To promote a positive self-image.
A. Encourage diversional activities.
B. Assist client to set realistic goals.
C. Explore reasons for depression; encourage client to discuss changes occurring in lifestyle.
D. Assist client in gaining control of ADLs and environment.
E. Assist client to identify and avoid activities that increase frustration levels.
F. Encourage good personal hygiene.

Headache

Headache is a very common symptom of various underlying pathologic conditions in which pain-sensitive nerve fibers respond to unacceptable levels of stress and tension, muscular contraction in the upper body, pressure from a tumor, or increased ICP.

Headache

PARKINSON’S DISEASE

- Onset usually gradual, after age 50.
  (Slowly progressive)

- Mask-Like, Blank Expression
- Stooped Posture
- Pill Rolling Tremors
- Difficulty Initiating Movement
- Possible Mental Deterioration
- Depression

- Shuffling, Propulsive Gait
- Muscle Rigidity
- Bradykinesia

Figure 15-6 Parkinson’s disease. (From Zerwekh J, Claborn J, Miller CJ: Memory notebook of nursing, vol 1, ed 4, Ingram, 2008, Nursing Education Consultants.)

Data Collection
A. Types of headaches.
   1. Tension headache (muscle contraction headache): most common of all headaches; feeling of tightness like a band around the head; onset is gradual; may be accompanied by dizziness, tinnitus, or lacrimation; associated with stress and premenstrual syndrome.
   2. Migraine: constriction of intracranial vessels leading to an intense throbbing pain when vessels return to normal; prodromal or aura; crescendo quality; unilateral pain, often beginning in eye area; nausea, vomiting, photophobia—migraines are seriously debilitating and may require lifestyle and occupational changes.
   3. Cluster headache: rare headache that is more common in men; occurs in numerous episodes or clusters; no aura; unilateral pain often arising in nostril and spreading to forehead and eye; often occurs at same time of day.

Treatment
A. Migraine: sumatriptan (Imitrex); dihydroergotamine mesylate (Migranal).
B. Nonsteroidal antiinflammatory drugs.
C. Relaxation, yoga, stress management.
D. Cluster headaches treated with high flow oxygen.

Nursing Interventions

A. Prevention: recognize triggers, decrease stress, adjust medications during menstrual cycle.
B. Watch for signs of ominous headache: new-onset unilateral headache in person older than 35 years; vomiting not accompanied by nausea; pain that awakens client.
C. Encourage client to keep a “headache diary” for best management and treatment.

**Trigeminal Neuralgia**

* Trigeminal neuralgia is a fleeting unilateral sensory disturbance of cranial nerve V, causing brief, paroxysmal pain and facial spasm; also known as tic douloureux.

**Data Collection**

A. Risk factors/etiology.
   1. Onset generally occurs between 20 and 40 years of age.
   2. Increased frequency with aging.
B. Clinical manifestations.
   1. Abrupt onset of paroxysmal intense pain in the lower and upper jaw, cheek, and lips.
   a. Tearing of the eyes and frequent blinking.
   b. Facial twitching and grimacing.
   c. Pain is usually brief; ends as abruptly as it begins.
   d. Pain may be described as severe, stabbing, and shock-like.
   2. Recurrence of pain is unpredictable.
   3. Pain is initiated by cutaneous stimulation of the affected nerve area.
   a. Chewing.
   b. Washing the face.
   c. Extremes of temperature: either on the face or in food.
   d. Brushing teeth.

**Treatment**

A. Medical management of pain (see Appendix 15-2): carbamazepine (Tegretol) and gabapentin (Neurontin).
B. Surgical intervention.
   1. Local nerve block.
   2. Surgical intervention to interrupt nerve impulse transmission.

**Nursing Interventions**

- **Goal:** To control pain.
  A. Assess the nature of a painful attack.
  B. Identify triggering factors; adjust environment to decrease factors.
   1. Keep room at an even, comfortable temperature.
   2. Avoid touching client.
   3. Avoid jarring the bed.
   4. Allow client to carry out own ADLs as necessary.
  C. Administer analgesics to decrease pain.
- **Goal:** To maintain nutrition.
  A. Frequently, client does not eat because of reluctance to stimulate the pain.
  B. Provide lukewarm food that can be easily chewed.
  C. Increase protein and calories.

**Home Care**

A. Identify presence of corneal reflex; provide protective eye care if reflex is absent.
B. If there is loss of sensation to the side of the face, client should:
   1. Chew on the unaffected side.
   2. Avoid temperature extremes in foods.
   3. Check the mouth after eating to remove remaining particles of food.
   5. Have frequent dental checkups.

**Bell’s Palsy**

* Bell’s palsy is a transient cranial nerve disorder affecting the facial nerve (cranial nerve VII), characterized by a disruption of the motor branches on one side of the face, which results in muscle weakness or flaccidity on the affected side.

**Data Collection**

A. Clinical manifestations.
   1. Lag or inability to close eyelid on affected side.
   2. Drooping of the mouth.
   3. Decreased taste sensation.
   4. Upward movement of the eyeball when the eye is being closed.
B. Diagnostics (see Appendix 15-1).

**Treatment**

A. Corticosteroids: administration should be started immediately after symptoms arise.
B. Antivirals.
C. Moist heat may relieve pain, if present.

**Nursing Interventions**

- **Goal:** To assess nerve function and prevent complications.
  A. Analgesics to decrease pain.
  B. Evaluate ability of client to eat.
  C. Meticulous oral hygiene.
  D. Prevent drying of the cornea on the affected side.
   1. Instill methylcellulose drops frequently during the day.
   2. Ophthalmic ointment and eye patches may be required at night.
  E. As function returns, active facial exercises may be performed.
- **Goal:** To assist client to maintain a positive self-image.
  A. Changes in physical appearance may be dramatic.
  B. Tell client that the condition is usually self-limiting with minimal, if any, residual effects.
  C. Client may require counseling, if change in facial appearance is permanent.
Study Questions: Neurologic System

1. An older adult client, diagnosed with Parkinson’s disease, has been prescribed levodopa (l-dopa). What nursing observations would indicate the medication is working?
   1. Decrease in tremors in upper extremities.
   2. Blood pressure changes from 180/90 to 140/80 mm Hg.
   3. Urine output increases to 60 mL per hour.
   4. Increased strength on affected side.

2. The nurse is assisting a client with right-sided paralysis to get out of bed and into the wheelchair. What is an important safety principle for this transfer?
   1. Position client supine close to the edge of the bed.
   2. Position the wheelchair on the nonaffected side.
   3. Assist the client to stand and pivot to the wheelchair.
   4. Assist the client to sit, while two people move the client to the wheelchair.

3. The nurse is concerned about aspiration in a client who has had a stroke. What is the best nursing action to determine whether the client can begin oral intake of fluids safely?
   1. Touch the back of the client’s throat with a tongue depressor to determine if this elicits the gag reflex.
   2. Place a few drops of water in the client’s mouth and determine if this stimulates a swallowing reflex.
   3. Place the client in semi-Fowler’s position and suction the airway; if this causes gagging and coughing, the client can take PO fluids.
   4. Wait until the client is fully responsive, place the client in semi-Fowler’s position, and offer water through a straw.

4. The nurse is caring for a client who has just returned to his room from the recovery area after a craniotomy. What observation would the nurse report immediately to the RN or nursing supervisor?
   1. Confused and disoriented on awakening.
   2. Pupillary changes from equal and reactive to unequal and reactive only on right side.
   3. Urine output increased to 150 mL per hour for past 2 hours.
   4. Decreased breath sounds bilaterally and cough with no sputum production.

5. A client had a lumbar puncture, and the nurse is assessing the client after the procedure. What nursing observation would cause the nurse the most concern?
   1. Client complains of a headache.
   2. Clear fluid is observed to be oozing from the puncture site.
   3. Client complains of muscle weakness in upper extremities.
   4. Difficulty voiding from a supine position.

6. After a lumbar puncture, the client’s post-treatment care plan states to keep him in a flat position for 3 to 6 hours. What is the purpose of this position?
   1. To decrease effects of hypertension.
   2. To increase the rate of replacement of spinal fluid.
   3. To increase ventilation and lung expansion.
   4. To prevent a headache from withdrawal of the spinal fluid.

7. The nurse enters the client’s room as he begins to experience a generalized seizure. What is a priority nursing action?
   1. Hyperextend the neck to open the airway.
   2. Put a padded tongue depressor between the teeth.
   3. Record all events during seizure activity.
   4. Remain with the client and prevent injury.

8. A client is admitted to the nursing unit after a motor vehicle accident in which he sustained a head injury and now has a slow cerebrospinal fluid (CSF) leak. What would be important nursing interventions for this client?
   1. Frequent assessment and gentle cleaning of the nose and ears.
   2. Maintain client in a prone position to prevent aspiration.
   3. Maintain complete bed rest and low Fowler’s position.
   4. Gently suction the nasopharynx area to promote pulmonary hygiene.

9. The nurse is caring for a postoperative craniotomy client. What nursing assessment data would be most important for the nurse to report?
   1. A pulse rate decrease from 90 to 70 beats per minute.
   2. A decrease in blood pressure from 140/90 to 120/80.
   3. Orientation change from alert and oriented to lethargic and confused.
   4. Decrease in bilateral breath sounds at the base of the lungs.

10. How can the nurse reliably assess the mental status of a client?
    1. Determine sensory function.
    2. Assess level of consciousness.
    3. Evaluate vital signs.
    4. Perform reality checks every 2 hours.

11. A client is experiencing increased intracranial pressure. Which response would be a characteristic change in the client’s pupils?
    1. Reactive to light and pinpoint.
    2. Dilated and reactive to light.
    3. One is larger than the other.
    4. Fixed and pinpoint.
12. What is the best nursing measure to prevent constipation in clients after a stroke or a cerebrovascular accident?
   1. Encourage mobility and fluids.
   2. Offer an enema every other day.
   3. Administer laxatives three times a week.
   4. Use a glycerin suppository to stimulate defecation.

13. What nursing activities would assist in the prevention of complications in a client who is recovering from a stroke?
   1. Use a soft toothbrush and do not floss.
   2. Evaluate hourly urine output.
   3. Perform hourly neurological checks.
   4. Encourage mobility and deep breathing.

14. The nurse is caring for a client who has suffered a severe closed head injury from a motor vehicle accident. In report the nurse is told that the client has a Glasgow Coma Scale of 4. What would the nurse expect to find on the assessment of this client?
   1. Alert and responding appropriately to verbal commands.
   2. Lethargic, but arouses to verbal and physical stimulation.
   3. Responds to painful stimuli, no response to verbal stimuli.
   4. No intentional movement or response to stimuli.

15. In what position would the nurse place the stroke client to prevent tongue obstruction and/or aspiration in the airway?
   1. Side lying.
   2. Prone.
   3. Full-Fowler’s.
   4. Semi-Fowler’s.

16. What is the focus of nursing care immediately after a client has experienced a brain accident?
   1. Make sure there is adequate urinary output.
   2. Maintain a patent airway.
   3. Prevent contractures in arms and legs.
   4. Prevent skin breakdown on bony prominences.

17. The nurse is caring for a client who has had a stroke or brain accident affecting his right side. What activities will be important for the nurse to include in the care of this client?
   1. Passive range-of-motion exercises to the right side and active range-of-motion exercises on the left side.
   2. When assisting the client to eat, place the food on the affected side of the mouth.
   3. Turn every 2 hours and maintain position on the right side for 2 hours.
   4. Administer all intramuscular injections on the right side to decrease discomfort.

18. A client is scheduled for a computed tomography (CT) scan of the head. The nurse would explain to the client that:
   1. He will have to swallow a small amount of iodine for contrast studies.
   2. He will be asked to try to avoid moving during the test.
   3. After the test, he will have to remain on his back for 8 hours.
   4. He will have electrodes attached to his head.

19. The nurse is assigned a client who is described as being quadriplegic. What would the nurse expect to find on the evaluation of this client?
   1. One side of the client’s body is paralyzed.
   2. The client is paralyzed with no sensation from the waist down.
   3. The client experiences no sensation to pain below the waist.
   4. There is minimal voluntary muscle response from the client’s arms down.

20. Immobilization of a client with a spinal cord injury puts the client at increased risk for what complication?
   1. Bradycardia.
   2. Hypoglycemia.
   3. Peripheral edema.
   4. Skin breakdown.

Answers and rationales to these questions are in the section at the end of the book titled Chapter Study Questions: Answers and Rationales.
### Neurologic System Diagnostics

#### Skull and Spine X-Ray Studies:
Simple x-ray films are obtained to determine fractures, calcifications, etc.

#### Electroencephalography (EEG):
A recording of the electrical activity of the brain to physiologically assess cerebral activity; useful for diagnosing seizure disorders; used as a screening procedure for coma; also serves as an indicator for brain death. May also be used to assess sleep disorders, metabolic disorders, and encephalitis.

**Nursing Implications**
1. Explain to client that procedure is painless and there is no danger of electrical shock.
2. Determine from physician if any medications should be withheld before test, especially tranquilizers and sedatives.
3. Frequently, coffee, tea, cola, and other stimulants are prohibited before examination.
4. Client’s hair should be clean before the examination; after the exam, assist client to wash electrode paste out of hair.

#### Carotid Doppler Ultrasonography:
A noninvasive ultrasound scan to estimate blood flow in carotid.

#### Magnetic Resonance Imaging (MRI):
Cell nuclei have magnetic properties; the MRI machine records the signals from the cells in a manner that provides information to evaluate soft tissue structures (tumors, blood vessels).

**Nursing Implications**
1. Procedure will take approximately 1 hour.
2. All metal objects should be removed from the client (hearing aids, hair clips, jewelry, buckles, etc.).
3. The client will be placed in a long magnetic tunnel for the procedure.
4. Poor candidates for MRI include the following.
   a. Clients with pacemakers (the magnetic field interferes with the function of the pacemaker and interferes with the test as well).
   b. Clients with implanted insulin pumps, or joint replacements.
   c. Pregnant clients, obese clients.
   d. Any client who requires life-support equipment (the equipment will malfunction in a magnetic field).

#### Computerized Axial Tomography (CAT) Scan:
Computer-assisted x-ray examination of thin cross-sections of the brain to identify hemorrhage, tumor, edema, infarctions, and hydrocephalus. Machine is large donut-shaped tube with table through the middle.

**Nursing Implications**
1. Explain appearance of scanner to client and explain importance of remaining absolutely still during the procedure.
2. Remove all objects from client’s hair; for 4 to 6 hours before test, client receives fluids only.
3. Dye will be injected via venipuncture; assess for iodine allergy and advise the client that he/she may experience a flushing or warm sensation when the dye is injected.
4. Contrast dye may discolor urine for about 24 hours.
5. Dye may be injected into spinal cord for assessment of intervertebral disks and bone density.

#### Brain Scan:
A scanner traces the uptake of radioactive dye in the brain tissue. The dye is concentrated in the damaged tissue; it will take approximately 2 hours after dye is injected for the scan to be completed.

**Nursing Implications**
1. Determine whether medications need to be withheld before procedure.
2. Client will be asked to change positions during the test in order to visualize the brain from different angles.
3. The client should not experience any pain.

#### Caloric Testing:
Test is performed at bedside by introducing cold water into the external auditory canal. It is contraindicated in the client with a ruptured tympanic membrane and is not done on the client who is awake. If the 8th cranial nerve is stimulated, nystagmus rotates toward the irrigated ear. If no nystagmus occurs, a pathologic condition is present.
Lumbar Puncture: A needle is inserted into the lumbar area at the L4-L5 level; spinal fluid is withdrawn, and spinal fluid pressure is measured; contraindicated in presence of increased intracranial pressure. Normal spinal fluid values: opening pressure, 60 to 150 mm water; specific gravity, 1.007; pH, 7.35; clear fluid; protein concentration, 15 to 45 mg/dL; glucose concentration, 45 to 75 mg/dL; no microorganisms present.

Nursing Implications
Before test
1. Have client empty bladder.
2. Explain position (lateral recumbent with knees flexed) to client (Figure 15-7).
3. Advise physician if there is a change in the client’s neurologic status before the test; increased intracranial pressure is a contraindication to a lumbar puncture.

After test
1. Keep client flat at least 3 hours, and sometimes up to 12 hours, to decrease occurrence of headache.
2. Encourage high fluid intake.
3. Observe for spinal fluid leak from puncture site; if leakage occurs, it may precipitate a severe headache.
4. Wear a surgical mask when placing a catheter or injecting material into the spinal column or subdural space (myelogram, lumbar puncture, spinal or epidural anesthesia).

Myelogram: An outpatient procedure in which dye is injected into the subarachnoid space and x-ray films of the spinal cord and vertebral column are obtained to identify spinal lesions.

Nursing Implications
Before test
1. Same as for lumbar puncture.
2. Check whether client has any allergies to dye.

After test
1. Keep the head of the bed elevated 30 to 50 degrees to decrease dispersion of the dye in the CSF and to the brain
2. Headache may occur as a result of irritation of the central nervous system
3. Client should not receive any of the phenothiazines before or immediately after the examination.

Cerebral Angiogram: Injection of contrast material into the cerebral circulation; series of x-ray films is taken to study the cerebral blood flow; dye is usually injected via a soft catheter that is inserted and threaded through the femoral artery.

Nursing Implications
Before test
1. Client should be well-hydrated, but should receive nothing by mouth for 6 to 8 hours before the test; client should void before procedure.
2. Determine if client has any allergies to iodine or to shell fish.
3. Inform client that he or she should remain very still during the procedure.
4. A feeling of warmth in the face and mouth and a metallic taste in the mouth are common when dye is injected.

After test
1. Evaluate client’s neurologic status; complications involve occlusion of cerebral arteries.
2. Observe injection site for hematoma formation.
3. Posttest complications include continuous bleeding at injection site, rash, dizziness, and tingling in an extremity.
4. Check circulation distal to area of puncture.

Electromyography (EMG): Measures electrical discharge from a muscle. Flat electrodes or small needles are placed in the muscle. The client may be asked to move and perform simple activities; the electrical stimulus for the muscle will be recorded. Useful for diagnosis in spinal cord deformity, muscular dystrophy, myasthenia gravis or amyotrophic lateral sclerosis.

Nursing Implications
Before test
1. May determine pretest serum muscle determinations.
2. Explain to the client that small needles will be inserted into the skin.

After test
1. Client may need something for pain because of muscle stimulation.
2. Assess needle sites for areas of hematomas; apply ice pack to prevent and/or relieve.
# ANTIEPILEPTICS

<table>
<thead>
<tr>
<th>Medications</th>
<th>Side Effects</th>
<th>Nursing Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antiepileptics (AEDs):</strong> Suppress discharge of neurons within a seizure focus to reduce seizure activity.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Phenobarbital (Sodium Luminal): IM, PO, rectal, IV | Drowsiness, ataxia, excitation in children and the older adult | 1. Client should avoid potential hazardous activities requiring mental alertness.  
2. Sudden withdrawal from chronic use may precipitate symptoms.  
4. Used to treat grand mal and focal seizures.  
5. See Appendix 15-5 for care of client with seizures. |
| Primidone (Mysoline): PO | | |
| Phenytoin (Dilantin): PO, IV | Gingival hyperplasia, skin rash, hypoglycemia, hypotension  
Visual changes: nystagmus, diplopia, blurred vision | 1. Administer PO preparations with meals or milk to decrease gastric irritation.  
2. Frequently used with phenobarbital for control of grand mal seizures.  
3. IM injection is not recommended.  
4. Do not mix with any other medications when administering IV solution.  
5. Promote good oral hygiene; gum hyperplasia is a problem with long-term use.  
6. See Appendix 15-5 for care of client with seizures.  
7. AEDs should be withdrawn slowly over 6 weeks to several months when medication therapy is discontinued. |
| Divalproex sodium (Depakote): PO | GI disturbances, rash, weight gain, hair loss, tremor, blood dyscrasias  
GI, dermatologic effects, blood dyscrasias | 1. Should not be given to clients with severe liver dysfunction.  
2. Potentiates action of phenobarbital, phenytoin, diazepam.  
3. **Uses:** seizures, bipolar disorder, migraine. |
| Carbamazepine (Tegretol): PO, suspension | Drowsiness, dizziness, headache; visual disturbances common during first few weeks of treatment | 1. Wean client from medication as soon as seizures are controlled.  
2. Antimanic properties as well. |
| Clonazepam (Klonopin): PO | CNS depression, ataxia | 1. Antianxiety effects may assist with seizure control.  
2. Monitor results of liver function tests. |

*CNS, Central nervous system; GI, gastrointestinal; IM, intramuscular; IV, intravenous; PO, by mouth (orally).*
### Appendix 15-3  CHOLINERGIC (ANTICHOLINESTERASE) MEDICATIONS

<table>
<thead>
<tr>
<th>Medications</th>
<th>Side Effects</th>
<th>Nursing Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cholinergic:</strong> Intensify transmission of impulses throughout the CNS, where acetylcholine is necessary for transmission.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neostigmine bromide</td>
<td>Excessive salivation, increased GI motility, urinary urgency, bradycardia, visual problems</td>
<td>1. Primary group of medications used for treatment of myasthenia gravis.</td>
</tr>
<tr>
<td><em>(Prostigmin)</em>; PO, subQ, IM</td>
<td></td>
<td>2. Atropine is the antidote for overdose.</td>
</tr>
<tr>
<td>Pyridostigmine bromide</td>
<td></td>
<td>3. In treatment of myasthenia gravis, medication is frequently administered 30 to 45 minutes before meals.</td>
</tr>
<tr>
<td><em>(Mestinon)</em>; PO, IM, IV</td>
<td></td>
<td>4. Mestinon is given as maintenance therapy for the client with myasthenia gravis.</td>
</tr>
<tr>
<td>Edrophonium chloride</td>
<td></td>
<td>5. Tensilon is used for diagnostic purposes; not recommended for maintenance therapy.</td>
</tr>
<tr>
<td><em>(Tension)</em>; IV, IM</td>
<td></td>
<td>6. Teach client symptoms of side effects and advise client to call the doctor if they are present.</td>
</tr>
</tbody>
</table>

* CNS, Central nervous system; GI, gastrointestinal; IM, intramuscular; IV, intravenous; PO, by mouth (orally); subQ, subcutaneous.*

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### Appendix 15-4  ANTIPARKINSONISM AGENTS

<table>
<thead>
<tr>
<th>Medications</th>
<th>Side Effects</th>
<th>Nursing Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anticholinergics:</strong> Inhibit action of acetylcholine at sites throughout the body and CNS. Decrease synaptic transmissions in the CNS.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benztropine mesylate</td>
<td>Paralytic ileus, urinary retention, cardiac palpitations, blurred vision, nausea and vomiting, sedation, dizziness</td>
<td>1. Administer PO preparations with meals to decrease gastric irritation.</td>
</tr>
<tr>
<td><em>(Cogentin)</em>; PO, IM, IV</td>
<td>Minor side effects such as dry mouth, jitteriness, and nausea</td>
<td>2. Medications have cumulative effect.</td>
</tr>
<tr>
<td>Trihexyphenidyl hydrochloride</td>
<td></td>
<td>3. Should not be used in clients with glaucoma, myasthenia gravis, GU or GI tract obstruction or in children younger than 3 years.</td>
</tr>
<tr>
<td>Procyclidine (Kemadrin)</td>
<td></td>
<td>5. May be used to treat side effects of Thorazine.</td>
</tr>
<tr>
<td>PO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Early:** Anorexia, nausea and vomiting, abdominal discomfort, postural hypotension  
**Long-term:** Abnormal, involuntary movements, especially involving the face, mouth, and neck; behavioral disturbances involving confusion, agitation, and euphoria

1. Administer PO preparations with meals to decrease GI distress.  
2. Almost all clients will experience some side effects, which are dose related; dosage gradually increased according to client’s tolerance and response.  
3. Onset of action is slow; therapeutic response may require several weeks to months.  
4. Vitamin B₆ (pyridoxine) is antagonistic to the effects of the medication; decrease client’s intake of multiple vitamins and fortified cereals.

- Same as for levodopa  
- Use of carbidopa significantly decreases the amount of levodopa required for therapy.  
- Prevents inhibitory effects of levodopa on vitamin B₆.

1. Orthostatic hypotension, dyspnea, dizziness, drowsiness, blurred vision, constipation, urinary retention (side effects are dose related)  
1. Less effective than levodopa; produces a more rapid clinical response.

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*CNS, Central nervous system; GI, gastrointestinal; GU, genitourinary; IM, intramuscular; IV, intravenous; PO, by mouth (orally).*
A seizure disorder is the interruption of normal brain functioning by uncontrolled paroxysmal discharge of electrical stimuli from the neurons.

**Classification of Seizures**

**Simple Partial Seizures** *(remains conscious throughout seizure)*
- Rarely last longer than 1 minute; an aura may occur before the seizure.
  1. Confined to a specific area (hand, arm, leg), client may experience unusual sensations.
  2. One-sided movement of an extremity.
  3. Autonomic changes – skin flushing, change in heart rate, epigastric discomfort.

**Complex Partial Seizures** *(may have impairment of consciousness)*
- May lose consciousness for 1-3 minutes.
  1. May produce automatisms (lip smacking, grimacing, repetitive hand movements).
  2. Client may be unaware of environment and wonder at the beginning of the seizure.
  3. In the period after the seizure, client may experience amnesia and confusion.
  4. Also called temporal lobe seizures or psychomotor.

**Generalized Seizures** *(bilaterally symmetric and without local onset)*
- No warning or aura, as client loses consciousness for a few seconds to several minutes.
  1. Absence (petit mal): Characterized by a short period of time when the client is in an altered level of consciousness. Staring, blinking period (followed by resumption of normal activity) is characteristic. May occur more than 100 times per day; may go unnoticed; in general, onset is in childhood between the ages of 4 and 12 years.
  2. Tonic-clonic seizures: May last 2-5 minutes. Full recovery may take several hours; client may be confused, amnesic, and irritable during this recovery period.
    - **Tonic phase**: Loss of consciousness with stiffening and rigidity of muscles. Apnea and cyanosis are common during this period; phase generally lasts for about 1 minute.
    - **Clonic phase**: Hyperventilation, with rapid jerking movements. Tongue biting, incontinence, and heavy salivation may occur during this period.

**Seizure Etiology**

**Acute Disorders**
- Rarely last longer than 1 minute; an aura may occur before the seizure.
  - Increased intracranial pressure, metabolic alterations
  - Infections, febrile episodes in children (generally between 6 months and 3 years)

**Chronic (Recurrent, Epilepsy)**
- Brain injury at birth, trauma, vascular disease
- Brain tumors, genetic factors, idiopathic

**Nursing Assessment**
- Identify any activities that occurred immediately before the seizure.
- Was the client aware a seizure was going to occur? If so, how did client know?
- Describe type of movements that occurred and the body area affected (e.g., jaw clenched, tongue biting).
- Presence of incontinence.
- Period of apnea and cyanosis.
- Presence of automatisms (lip smacking, grimacing, chewing).
- Duration of seizure: time the seizure.
- Changes in level of consciousness.
- Condition of client after seizure: oriented, level of activity, any residual paralysis or muscle weakness.

**NURSING PRIORITY:** Airway management and ventilation cannot be performed on a client who is experiencing a tonic-clonic seizure. After the seizure is over, evaluate the airway and initiate ventilations as necessary.
### Nursing Management

1. Remain with the client who is having a seizure; note the time the seizure began and how long it lasted.
2. Do not attempt to force anything into the client’s mouth if the jaws are clenched shut.
3. If the jaws are not clenched, place an airway in the client’s mouth. This protects the tongue and also provides a method of suctioning the airway, should the client vomit.
4. Protect the client from injury (risk for falling out of bed or striking self on bedrails, etc).
5. Loosen any constrictive clothing.
6. Do not restrain client during seizure activity; allow seizure movements to occur, but protect client from injury.
7. Evaluate respiratory status; if vomiting occurs, be prepared to suction the client to clear the airway and prevent aspiration.
8. Maintain calm atmosphere and provide for privacy after the seizure activity.

### Client Education

1. Identify activities/events that precipitate the seizure activity.
2. Avoid alcohol intake, fatigue, and loss of sleep.
3. Take medications as directed.
4. Counseling for the family and for the client to assist them in maintaining positive coping mechanisms.
5. Wear medical alert bracelet or have identification card.

### Appendix 15-6 APHASIA

Aphasia is a total loss of comprehension and use of language. The most common cause of aphasia is a vascular. The speech center is located in the dominant side of the cerebral hemisphere. A stroke affected the left cerebral hemisphere of the brain commonly affects the area of language. Clients with aphasia are often frustrated and irritable. Emotional lability is common. Accept the behavior in a manner that prevents embarrassment for the client.

#### Types of Aphasia

- **Sensory aphasia (receptive or fluent, Wernicke’s area):** Cannot understand oral or written communication. Client cannot interpret or comprehend speech or read.
- **Motor aphasia (expressive, Broca’s aphasia):** Inability to speak or to write. However, the client can comprehend incoming speech and can read.
- **Mixed:** Most aphasia involves both the sensory and motor aspects of speech. Rarely is aphasia only sensory or only motor.
- **Global aphasia:** All communication and receptive function is lost.
- **Dysarthria:** A disturbance in the muscular control of speech. Does not affect the meaning of communication or comprehension, just the mechanics of speech—pronunciation, articulation, and phonation.

#### Nursing Implications

1. Stand in front of the client; speak clearly and slowly.
2. Do not shout or speak loudly; the client can hear.
3. Be patient; give the client time to respond; do not press him or her for immediate answers.
4. Use nonverbal communications such as touch, smiles, and gestures.
5. Assist the client with motor aphasia to practice repeating simple words such as yes, no, and please.
6. Listen carefully, try to understand, and try to communicate; this conveys to the client that you care.
7. Involve family members in practice and assist them to identify ways they can support the client.

**TEST ALERT:** Assist client to communicate effectively.