**NUN 3102 Neurological nursing**

The module will enable the learner to promote health, prevent t illness, manage and rehabilitate patients suffering from neurological conditions

**Module Objectives**

The learners should be able to

1. Assess patients with neurological conditions
2. Manage patients with acute neurological conditions using the nursing process
3. Manage patients with chronic conditions using the nursing process

**Neurological assessment**

This is aimed at finding out changes in mood, attention, or speech; changes in orientation, memory, insight, or judgment; headache, dizziness, vertigo; fainting, blackouts, weakness, paralysis, numbness or loss of sensation, tingling or “pins and needles,” tremors or other involuntary movements; seizures.

**History**

**History of the present illness**

* Explore the patient’s current condition and related events while simultaneously observing overall appearance, mental status, posture, movement, and affect.
* Depending on the patient’s condition, yes-or-no answers may apply, review medical record, input from witnesses or the family, or a combination of these.
* Onset, character, severity, location, duration, and frequency of symptoms and signs; associated complaints; precipitating, aggravating, and relieving factors; progression, remission, and exacerbation; and the presence or absence of similar symptoms among family members.

**Common symptoms of neurologic disorders:**

***Pain***

* Pain is an unpleasant sensory perception and emotional experience associated with actual or potential tissue damage
* Acute pain may be associated with brain hemorrhage, spinal disk disease or trigeminal neuralgia.
* Chronic pain can occur with degenerative and chronic conditions (e.g. multiple sclerosis).

***Seizures***

* Result from abnormal uncontrollable discharges in the cerebral cortex, which then manifest as an alteration in sensation, behavior, movement, perception, or consciousness.
* May manifest as a blank stare that lasts only a second, or tonic–clonic grand mal seizure lasting several minutes
* Can also occur due to high fever, alcohol or drug withdrawal, or hypoglycemia
* It may also be the first obvious sign of a brain lesion

***Dizziness, Vertigo and syncope***

* Dizziness: an abnormal sensation of imbalance or movement common in the elderly

Causes: viral syndromes, hot weather, roller coaster rides, and middle ear infections.

* Vertigo**:** an illusion of movement, sensation that the surroundings are spinning around (objective vertigo) or that the person is spinning around (subjective vertigo) is a manifestation ofvestibular dysfunction.

If severe can result indisorientation in space, lightheadedness, loss of equilibrium(staggering), and nausea and vomiting

* Syncope is a temporary loss of consciousness. The patient may say that he or she “blacked out” or “had a spell.”

***Visual Disturbances***

* Lesions of the eye itself (e.g. cataract), lesions along the pathway (e.g. tumor), or lesions in the visual cortex (e.g. stroke) interfere with normal visual acuity.
* Abnormalities of eye movement can cause diplopia or double vision

***Muscle Weakness***

* Weakness can be sudden and permanent, as in stroke, or progressive, as in neuromuscular diseases such as amyotrophic lateral sclerosis.

***Abnormal Sensation***

* Can affect small or large areas of the body
* Often accompanies weakness or pain,
* Lack of sensation predisposes to falls and injury

**Past Health, Family, and Social History**

* Family history of genetic diseases
* A review of the past medical history
* History of trauma or falls that may have involved the head or spinal cord
* Use of alcohol, medications, and illicit drugs
* Childhood Illnesses Neurologic problems in childhood may have permanent effects
* SurgeryProvides baseline information for physical assessment and explains physical findings
* Hospitalizations/Diagnostic Procedures Helps identify potential or recurring neurologic problem.
* Serious Injuries; Information on past injuries provides baseline data for physical Assessment, postconcussion syndrome can present 1 to 2 weeks postinjury and persist up to a year
* Minor head injury in older adults can cause a subdural hematoma that may be asymptomatic for weeks to months.
* Spine and back injuries may explain peripheral neurologic problems
* Serious/Chronic Illnesses Diabetes, stroke, hypertension, syphilis, meningitis, seizures, epilepsy
* Immunizations *Haemophilus influenzae* type B (HiB) vaccine prevents bacterial meningitis
* Allergies Iodine allergy may prohibit use of invasive studies that require contrast dyes
* Medications Anticoagulants or products that affect bleeding may increase risk for intracranial bleeding.

**Physical examination**

***Equipment***

* Safety pin
* Cotton
* Tuning fork
* Reflex hammer
* Flashlight
* Tongue blade
* Ophthalmoscope
* Vision screener
* Cloves, coffee, or other scented items

**Components of neurological examination**

1. Mental status (cerebral function)
2. Cranial nerve function
3. Cerebellar function
4. Motor function
5. Sensory function
6. Deep tendon reflexes (DTRs)

**Basic principles**

|  |  |
| --- | --- |
| 1. Symmetry of function: always compare one side of the body with the other side (for example degree of motor strength of the right biceps with that of the left biceps). |  |
| 1. Integrate the neurologic examination into the examination of the various body regions |  |

**A. Mental status examination**

* State of consciousness (alert, somnolent, stuporous, comatose)
* Memory (short-term, long-term, intermediate)
* Affect (mood)
* Ideation (hallucinations)

State of consciousness is tested using Glasgow coma scale, AVPU scale and ACDU scale.

**Glasgow Coma Scale**

Glasgow Coma Scale (GCS) is a neurological assessment tool that was developed in 1974 at the University of Glasgow in Scotland, United Kingdom by Teasdale and Jennet. It enables continuous monitoring of level of consciousness.

GCS is based on three domains: Eye Opening which is associated with wakefulness, a function that is controlled by cerebral cortex while, Verbal Response which shows higher coordination between cerebral cortex and brainstem and Motor Response which indicates coordination between cerebral cortex and spinal cord.

|  |  |
| --- | --- |
| **Parameter** | **Finding Score** |
| **Eye opening** |  |
| Spontaneously | 4 |
| To speech | 3 |
| To pain 2 | 2 |
| Do not open | 1 |
| **Best verbal response** |  |
| Is oriented and converses | 5 |
| Confused/ Is disoriented, but converses | 4 |
| Inappropriate speech | 3 |
| Incomprehensible sounds | 2 |
| No verbalization | 1 |
| **Best motor response** |  |
| Reacts to verbal command | 6 |
| Localizes pain | 5 |
| Flexes and withdraws from pain | 4 |
| Abnormal flexion | 3 |
| Abnormal extension | 2 |
| No motor response | 1 |
| **Interpretation:** Best score = 15, worst score = 3, 7 or less generally indicates coma, changes from baseline are most important. | |

**AVPU-**Alert Verbal Pain Unresponsive**,**

**ACDU-**alert and oriented confused drowsy unresponsive

**Orientation:** Ask the patient to spell his name, where he lives and what the date is; orientation to time, place, and person.

**Memory:** Elderly people often have much better long-term memory than recent memory

*Test immediate recall:* Ask patient to repeat three numbers, such as “4, 9, 1.” If patient can do so, ask her or him to repeat a series of five digits.

*Test recent memory:* Ask what patient had for breakfast.

*Test long-term memory:* Ask patient to state his or her birthplace

**Cognition and ideational content:** during history taking evaluate what he says, how he articulates, consistency and reliability in reporting events.

**Affect or mood:** observe verbal and nonverbal behavior, sudden noises, and interruptions.

Mood should be appropriate to the content of the conversation; does the patient laugh or smile when talking about sad events?

**B. Cranial nerves**

***First (olfactory) nerve***



Not usually tested unless the patient complains of a disturbance in sense of smell.

The airway must be patent.

Occlude one nostril; ask the patient to close his eyes and then present various substances to smell (coffee, tobacco), repeat with the other nose. The patient should be able to identify common smells

***Second (optic) nerve***

*Visual acuity*

**

Tested with the use of a Snellen chart (patient uses glasses if required)

The patient to cover one eye at a time and read the smallest print possible on the chart from a distance of 20 feet (6 m)

*Visual Fields*

The patient to cover his right eye with the right hand, (You cover your left eye with your left hand.) Stand approximately 2 feet (60 cm) from the patient and have him fix his gaze on your nose.

Bring two wagging fingers in from the periphery in all quadrants of the visual field and ask the patient to tell you when he sees your wagging fingers

Assuming your visual fields are normal, the patient and you should see the wagging fingers simultaneously.

*Optic Disc*

The optic disc is visualized using a funduscope

* ***Third (oculomotor), fourth (trochlear), Sixth (abducens) nerves***

******

The nerves are tested together. They control the movements of the extraocular muscles of the eye the superior and inferior oblique and the medial and lateral rectus muscles. The oculomotor nerve also controls pupillary constriction.

Hold your index finger approximately 1 foot (30 cm) from the patient's nose. Ask the patient to hold his head steady and to follow your finger with his eyes, move your finger to the right as far as the patient's eye moves. Before bringing your finger back to the center, move it up and then down, so that the patient glances up and peripherally and then down and peripherally.

Repeat the test, moving your finger to the left.

* ***Fifth (trigeminal) nerve***

The trigeminal nerve controls muscles of mastication and has a sensory component that controls sensations of the face.

*Motor*

**

The patient to clench his teeth, palpate the temporal and masseter muscles of the jaws with both hands.

Ask the patient to bite down on a tongue blade.

Muscle strength in the face should be present and symmetric.

*Sensory*

  
Have the patient close eyes.

|  |
| --- |
| Touch first one side of the patient's face and then the other (forehead, cheek, and chin), asking the patient if the sensation is present and feels the same on both sides.  Use cotton wool for sensation to light touch and pinprick for sensation to pain |

* ***Seventh (facial) nerve***

******

Motor function is tested by observing facial expression and symmetry of facial movement  
Ask the patient to frown, close his eyes, and smile.

The facial muscles and nasolabial folds should look symmetric.

* ***Eighth (acoustic) nerve***

******

The acoustic nerve has two branches.

1. Cochlear (mediates hearing); perform watch-tick test by holding watch close to patient’s ear.
2. Vestibular (helps control equilibrium).

*Romberg test:* Have the patient stand erect with his eyes closed and feet close together.

Slight swaying may occur, but the patient should not fall. (Stand close to the patient so you can assist if he begins to fall.)

* ***Ninth (glossopharyngeal) and tenth (vagus) nerves***

******

These nerves are tested together because they both have a motor portion innervating the pharynx.

*Ninth:* Observe ability to cough, swallow, and talk. Test the presence of the gag reflex, there should be no difficulty in swallowing

*Tenth:* Ask patient to open mouth and say “ah” while you depress the tongue with a tongue blade. Observe soft palate and uvula. Soft palate and uvula should rise medially.

* ***Eleventh (spinal accessory) nerve***

******

The spinal nerve facilitates the sternocleidomastoid and upper portion of the trapezius muscles

The patient to turn his head to the side against resistance while you apply pressure to the jaw,

Palpate the sternocleidomastoid muscle on the opposite side

Have the patient shrug his shoulders while you place your hands on his shoulders and apply slight pressure. Neck and shoulder muscle strength should be symmetric

* ***Twelfth (hypoglossal) nerve***

******

It innervates muscles of the tongue, tested by observing articulation and by having the patient stick out his tongue, noting any deviation or asymmetry.

**C. Cerebellar function**

Observe posture and gait.

The patient walks forward (and then backward) in a straight line. There should be smooth, uniform movement without losing balance

To test for muscle coordination in the lower extremities, have the patient run his right heel down his left shin and vice versa.

For upper extremities, have the patient close his eyes and touch his nose with his index finger (arms outstretched) first left, then right, in rapid succession.

Movements should be rapid and smooth without undershooting or overshooting the target.

**D. Motor function**

Tested in conjunction with the skeletal system, evaluate muscle mass, tone, strength, and any abnormal movements (spasms, fasciculation, twitching)

Note symmetry and distribution distally and proximally, consider sex and body build and use of various muscle groups (sports persons).

Note flaccidity (no resistance) or rigidity (increased muscle tone).

Have the patient do deep knee bends; walk on his toes and then his heels; hop on one foot and then the other.

Have the patient squeeze your fingers with both hands. Also, apply resistance to the patient's outstretched arms and when the patient flexes the wrist and elbow; compare sides.

Tremors, tics, or fasciculations should not be present at rest or with movement

**E. Sensory function**

**   **

Sensitivity to light touch [cotton], pain [pinprick], vibration [tuning fork], and position. Compare both sides of the body.

Ask the patient to close eyes. Brush skin with a piece of cotton (on the back of hands, forearms, upper arms, dorsal portion of foot laterally and medially; and along the tibia and thigh laterally and medially). Ask the patient to indicate when he or she feels the cotton and to compare the sensation bilaterally.

Use a safety pin; touch the skin as lightly as possible to elicit a sharp sensation.

Test vibration sense by placing a vibrating tuning fork on a bony prominence (wrist, medial and lateral malleoli). Ask the patient to tell you when he no longer feels the vibration. Stop the vibration with your hand.

Test position sense by having the patient close his eyes:

   
Move the patient's digit (finger, great toe) up or down and ask the patient to identify direction his finger or toe is pointing.  
Place your thumb and index finger on either side of the digit being moved so the patient will not sense any pressure from your finger in the direction in which you are moving the digit.

**F. Deep tendon reflexes**

Have the patient relax; provide support for the extremity being tested.

Compare reflex amplitude of the same tendons on either side of the body.

***Upper extremities***

*Biceps*



Rest patient’s elbow in your nondominant hand

Place your right thumb on the patient's right biceps tendon (located in the antecubital fossa) with the patient's arm slightly flexed

Strike your thumb with the pointed end of the hammer head with the least amount of pressure needed to elicit the reflex

The forearm may move, and your thumb should feel the tendon jerk.

*Triceps tendon*

**

Abduct patient’s arm and flex it at the elbow.

Support the arm with your non-dominant hand.

Strike triceps tendon about 1 to 2 inches above olecranon process, approaching it from directly behind; the forearm should move slightly

*Brachioradialis tendon*



Strike the forearm with the hammer about 1 inch (2.5 cm) above the wrist over the radius

The thumb moves downward

Be sure the forearm is supported and relaxed

***Lower extremities***

*Quadriceps reflex*

**

Have the patient sit with his legs hanging over the edge of the table or lay down while you support the legs at the knee (slightly bent).

Strike the tendon just below the patella

*Achilles reflex*

**

Support the foot in dorsiflexed position

Tap the Achilles tendon with the hammer

The foot should move downward into your hand

*Plantar reflex*

**

Stroke the sole of the patient's foot with a flat object such as a tongue blade

Toes normally flex. Dorsiflexion of the great toe and fanning of the other toes is known as a positive Babinski response and indicates a central nervous system problem

**Diagnostic Evaluation**

**Computed tomography (CT) scanning:** a narrow x-ray beam is used to scan body parts in successive layers, the images provide cross-sectional views of the brain; an intravenous (IV) contrast agent may be used to highlight differences in tissue densities

**Magnetic Resonance Imaging (MRI):** uses a powerful magnetic field to obtain images of different areas of the body. An MRI scan can be performed with or without a contrast agent and can identify a cerebral abnormality earlier and more clearly than other diagnostic tests

**Positron Emission Tomography PET:** is a computer-based nuclear imaging technique that produces images of actual organ functioning. The patient either inhales a radioactive gas or is injected with a radioactive substance that emits positively charged particles. When these positrons combine with negatively charged electrons (normally found in the body’s cells), the resultant gamma rays can be scanned to produce two-dimensional views at various levels of the brain, this information is integrated by a computer giving a picture of brain at work.

**Single Photon Emission Computed Tomography-SPECT:** is a three-dimensional imaging technique. It isa perfusion study that captures a moment of cerebral bloodflow at the time of injection of a radionuclide; useful in detecting the extent and location of abnormally perfused areas of the brain, thus allowing detection, localization, and sizing of stroke (before it is visible by CT scan)

**Cerebral angiography:** is an x-ray study of the cerebral circulation with a contrast agent injected into a selected artery.

**Myelogram:** an x-ray of the spinal subarachnoid space taken after the injection of a contrast agent into the spinal subarachnoid space through a lumbar puncture to outline the spinal subarachnoid space and any distortion of the spinal cord or spinal dural sac caused by tumors, cysts, herniated vertebral disks, or other lesions.

**Noninvasive carotid flow studies:** ultrasound imagery and Doppler measurements of arterial blood flow to evaluate carotid and deep orbital circulation.

**Transcranial Doppler:** uses the same noninvasive techniques as carotid flow studies except that it records the blood flow velocities of the intracranial vessels.

**An electroencephalogram (EEG):** a record of the electrical activity generated in the brain through electrodes applied on the scalp or through microelectrodes placed within the brain tissue, useful for evaluating seizure disorders, coma, or organic brain syndrome and in determination of brain death.

**An electromyogram (EMG):** is obtained by inserting needle electrodes into the skeletal muscles to measure changes in the electrical potential of the muscles

**Nerve conduction studies**: performed by stimulating a peripheral nerve at several points along its course and recording the muscle action potential or the sensory action potential that results

**Evoked potential studies:** application of an external stimulus to specific peripheral sensory receptors then taking measurement of the electrical potential generated.

**A lumbar puncture (spinal tap):** inserting a needle into the lumbar subarachnoid space to obtain CSF for examination, to measure and reduce CSF pressure, to determine the presence or absence of blood in the CSF, and to administer medications intrathecally (into the spinal canal).

**ACUTE NEUROLOGICAL CONDITIONS**

**VASCULAR DISORDERS**

**Transient ischemic attack**

A transient ischemic attack (TIA) is a focal ischemic cerebral neurologic deficit that lasts less than 24 hours. A TIA or “ministroke” is a temporary disturbance in focal cerebral blood flow which reverses before infarction occurs.

TIAs provide warning of impending stroke.

**Pathophysiology**

1. Low blood flow due to atherosclerotic narrowing of cerebral arteries,
2. Increased PCO2, decreased PO2, decreased blood viscosity, hyperthermia/hypothermia, increased ICP.
3. Emboli

Cardiac causes of emboli include atrial fibrillation, mitral valve prolapse, infectious endocarditis, and prosthetic heart valve.

**Risk Factors:**

***Medical Conditions***

* Hypertension
* Cardiac disorders; congenital heart disease, valvular conditions, endocarditis
* Atrial fibrillation
* Diabetes mellitus
* Hyperlipidemia
* Carotid stenosis
* Prior history of TIA or stroke
* Elevated homocysteine level in blood

***Behavioral***

* Cigarette smoking
* Alcohol abuse
* Physical inactivity
* Cocaine use (hemorrhagic stroke)

***Non-modifiable factors***

* Increasing age: risk doubles for each decade over age 50
* Gender: men are at greater risk than women
* Heredity: increased risk with family history of stroke
* Ethnic background: Blacks and Hispanics at higher risk than Whites

***Others***

Childbirth, hormone replacement therapy or contraceptive use, chiropractic manipulation, migraine headaches, and positioning for shampoos in the beauty shop.

**Clinical Manifestations of Transient Ischemic Attacks**

* History of intermittent neurologic deficit, sudden in onset, lasting less than 24 hours.
* Most common is unilateral weakness of the face, arm or less commonly of the leg.
* vision loss in one eye or to one side (hemianopia)
* language disturbance (aphasia) or slurred speech (dysarthria),
* Sudden loss of balance (ataxia).
* Unilateral numbness or paresthesias,
* Vertigo, diplopia, weakness that is bilateral or alternates sides, dysphagia, perioral numbness.
* Carotid bruit.
* History of headaches of duration of days before ischemia.

**Diagnostic Evaluation**

* Cerebral angiography, CT angiography, Doppler ultrasound to evaluate carotid and intracranial circulation.
* Partial prothrombin time (PTT) or International Normalized Ratio (INR).
* Transesophageal echocardiography to rule out emboli from heart.

**Medical-Surgical management**

* Platelet aggregation inhibitors, such as aspirin and clopidogrel to reduce risk of stroke.
* Surgical or endovascular intervention to increase blood flow to brain
* Reduction of risk factors: hypertension, diabetes, hyperlipidemia, smoking cessation.
* Treatment of arrhythmias.
* Treatment of isolated systolic hypertension.
* Anticoagulation agents to treat cardiac emboli.
* NB: PTT is used to monitor for heparin therapy and INR is for oral warfarin therapy.

**Complications**

* Complete ischemic stroke
* Hemorrhagic conversion of ischemic stroke
* Cerebral edema

**Nursing Assessment**

* History of headache and its duration
* History of possible TIA; hypertension; diabetes; hyperlipidemia; cardiovascular disease, such as atrial fibrillation; smoking
* Physical examination: neurologic, circulatory system, be sure to listen for carotid bruit.

**Nursing Diagnoses**

* IneffectiveTissue Perfusion (cerebral) related to underlying arteriosclerosis
* Risk for Injury related to surgical procedure
* Readiness for Enhanced Knowledge of risk factors and therapeutic lifestyle changes

**Planning**

**Goals:**

* To improve cerebral perfusion
* Encourage Lifestyle Changes to Reduce Risk
* Provide Patient Education

**Nursing Interventions/Rationale**

**Improving Cerebral Perfusion**

* Teach signs and symptoms of TIA and the need to notify health care provider urgently.
* Administer or teach self-administration of anticoagulants, antiplatelet agents, antihypertensives, monitoring for adverse effects and therapeutic effect.
* Prepare patient for surgical or endovascular intervention as indicated
* After surgery, closely monitor vital signs; avoid hypotension (which can cause cerebral ischemia) or hypertension (which may precipitate cerebral hemorrhage).
* Frequent neurologic checks; pupil size, equality, and reaction; handgrip and plantar flexion strength; sensation; mental status; and speech.
* Observe operative area closely for swelling, watch for hematoma
* Manage pain; avoid agitation or sudden changes in position, which could affect BP.
* Elevate head of bed when vital signs are stable.
* Following carotid endarterectomy: Monitor for hoarseness, gag reflex, or difficulty swallowing and facial weakness, to rule out cranial nerve injury.
* Keep head in neutral position to relieve stress on surgical site; monitor drainage.
* Keep tracheostomy tube at bedside, assess for stridor; hematoma can cause airway obstruction.

**Encouraging Lifestyle Changes to Reduce Risk**

* Help patient to plan for smoking cessation
* Teach patient and family members to follow a low-fat, low-sodium diet
* Refer to a nutritionist for weight management
* Encourage daily activity for 30 minutes, refer to physiotherapist for endurance training

**Patient Education and Health Maintenance**

* Long-term oral anticoagulants require monitoring of INR and to report bleeding.
* Patients on antiplatelet agents to report any signs of bleeding.
* Encourage the use of electric razors and toothbrushes to prevent bleeding.
* Patient to activate emergency medical system when symptoms first occur.
* Refer appropriately to neurological support centers

**Evaluation: Expected Outcomes**

* Alert without neurologic deficits
* Respirations unlabored, vital signs stable, no swelling of neck; reports relief of pain
* Expresses readiness to quit smoking and adhere to a low-fat diet menu

**Cerebrovascular accident**

Cerebrovascular accident (CVA), Stroke or brain attack is the onset and persistence of neurologic dysfunction lasting longer than 24 hours as a result of disruption of blood supply to the brain and indicates infarction rather than ischemia.

**Risk Factors**

***Nonmodifiable***

* Advanced age (older than 55 years), Gender (Male), Race (African American)

***Modifiable***

* Hypertension, Atrial fibrillation, Hyperlipidemia, Obesity, Smoking, Diabetes, Asymptomatic carotid stenosis and valvular heart disease (endocarditis, prosthetic heart valves), Periodontal disease

**Classification**

1. Ischemic stroke (more than 70% of strokes)
2. Hemorrhagic stroke (associated with greater morbidity and mortality).

**1. Ischemic Stroke**

Partial or complete occlusion of a cerebral blood flow to an area of the brain due to:

***Thrombus***- caused by arteriosclerotic plaque in a cerebral artery,

***Embolus***-a moving clot of cardiac origin (mostly atrial fibrillation) or from a carotid artery

Occlusion of vessels cause ischemia followed by infarction, edema, tissue breakdown, and damage to small arteries. The small arterial vessel damage poses a risk of hemorrhage.

* Ischemic strokes do not depend on activity, they may occur at rest.

**2. Hemorrhagic Stroke**

Leakage of blood from a blood vessel into brain tissue causing edema, compression of brain tissue, and spasm of adjacent blood vessels.

Bleeding may be extradural, subdural, subarachnoid or intracerebral.

Subarachnoid hemorrhage or hemorrhage into a ventricle may block normal CSF flow, leading to hydrocephalus.

**Causes of hemorrhagic stroke**

* About 60% of hemorrhagic strokes are the result of hypertension.
* Head trauma causing dissection or rupture or vessel.
* Deterioration of vessel wall from chronic hypertension, diabetes mellitus, or cocaine use.
* Congenital weakening of blood vessel wall with aneurysm or arteriovenous malformation
* Hemorrhagic stroke commonly occurs suddenly while a person is active.

**Clinical Manifestations**

Sudden severe headache together with the following:

1. **Motor Loss**

* Hemiplegia, hemiparesis
* Flaccid paralysis and loss/ decrease in the deep tendon reflexes (initial clinical feature) followed by (after 48 hours) reappearance of deep reflexes and spasticity
* Loss of balance; difficulty walking, dizziness

1. **Impaired Communication**

* Dysarthria (difficulty speaking)
* Dysphasia (impaired speech) or aphasia (loss of speech)
* Apraxia (inability to perform a previously learned action)

1. **Perceptual Disturbances and Sensory Loss**

* Visual neglect (lack of acknowledgment of one side of the body, loss of half of a visual field (hemianopsia), double vision, photophobia.
* Disturbances in perceiving the relation of two or more objects in space
* Sensory losses: loss of proprioception; visual, tactile, and auditory impairment
* Numbness or weakness of face, arm, or leg (especially on one side of body)

1. **Impaired Cognitive and Psychological Effects**

* Frontal lobe: Learning, memory, attention, comprehension, motivation are impaired.
* Depression, emotional lability, hostility, frustration, resentment, and lack of cooperation.
* Confusion or change in mental status

**Diagnostic Evaluation**

* History and complete physical and neurologic examination
* Noncontrast CT scan
* 12-lead ECG and carotid ultrasound
* CT angiography or MRI and angiography
* Transcranial Doppler flow studies
* Transthoracic or transesophageal echocardiography
* Xenon-enhanced CT scan
* Single photon emission CT (SPECT) scan
* Carotid ultrasound to detect carotid stenosis.

**Medical-Surgical management**

Acute Treatment

* Maintain airway, breathing, oxygenation, circulation.
* Reperfusion and hemodilution with colloids and volume expanders (albumin)
* Anticoagulation after hemorrhage is ruled out: tissue plasminogen activator (t-PA), within 3 hours of onset of symptoms; monitor for bleeding
* Management of increased intracranial pressure (ICP):
* osmotic diuretics-mannitol
* maintain PaCO2 at 30 to 35 mm Hg,
* elevate the head of bed to promote venous drainage and to lower increased ICP and to avoid hypoxia
* Hemicraniectomy for increased ICP
* Clot retrieval
* Balloon angioplasty to treat acute spasm
* Maintain Systolic BP (SBP) less than 200 mm Hg to prevent bleeding in hemorrhagic stroke but promotes adequate cerebral perfusion preventing further ischemia.
* Manage systemic hypertension with nitroprusside or alternative antihypertensive
* Vasopressor agents to maintain SBP
* Calcium channel blockers: reduce BP, help vasodilatation, prevent cerebral vasospasm.
* Antiplatelet agents: clopidogrel, or aspirin.
* Antispasmodic agents for spastic paralysis.
* Rehabilitation: physical therapy, occupational therapy, speech therapy and counseling
* Treat post stroke depression with antidepressants e.g. selective serotonin reuptake inhibitors.

**Complications**

* Aspiration pneumonia
* Dysphagia in 25% to 50% of patients after stroke
* Spasticity, contractures
* Deep vein thrombosis, pulmonary embolism
* Brain stem herniation
* Poststroke depression

**Nursing Assessment**

***During Acute Phase (1 to 3 days)***

Weigh patient (to determine medication dosages), and maintain a neurologic flow sheet to reflect the following:

* Level of consciousness, ability to speak, orientation, mental status, cranial nerve function, and sensation/proprioception
* Voluntary or involuntary movements of the extremities: muscle tone, posture,head position, deep tendon reflexes
* Stiffness or flaccidity of the neck
* Eye opening, size of pupils and reactions to light, and ocular position
* Color of face and extremities; temperature and moisture of skin
* Pulse and respiration; ABGs, body temperature, and blood pressure
* Fluid intake and output for 24 hours
* Signs of bleeding
* Bowel and bladder functions/control

***Postacute Phase***

Assess the following functions:

* Mental status (memory, attention span, perception, orientation, affect, speech/language).
* Sensation and perception -may have decreased awareness of pain and temperature
* Motor control (upper and lower extremity); swallowing, nutritional and hydration, skin integrity, activity tolerance, bowel/bladder function.
* Complications of immobility: skin breakdown, contractures, etc.
* Assess effectiveness of anticoagulation therapy.

**Nursing Diagnoses**

* Risk for Injury related to neurologic deficits
* Impaired Physical Mobility related to motor deficits
* Disturbed Thought Processes related to brain injury
* Impaired Verbal Communication related to brain injury
* Self-Care Deficit: Bathing, Dressing, Toileting related to hemiparesis/paralysis
* Imbalanced Nutrition: Less Than Body Requirements related to impaired self-feeding, chewing, swallowing
* Impaired Urinary Elimination related to motor/sensory deficits
* Sexual dysfunction related to neurologic deficits or fear of failure
* Disabled Family Coping related to catastrophic illness, cognitive and behavioral sequelae of stroke, and caregiving burden

**Planning**

**Goal:**

* Prevent Injury/complications
* Improve physical mobility
* Optimize Cognitive Abilities
* Facilitate Communication
* Foster Independence
* Promote Adequate Oral Intake
* Attain Bladder Control
* Help to Cope with Sexual Dysfunction
* Strengthen Family Coping

**Nursing Interventions/Rationale**

**Preventing fall and Other Injuries**

* Bed rest during acute phase (24 to 48 hours; head of bed elevated, side rails in place).
* Administer oxygen during acute phase to maximize cerebral oxygenation.
* Frequently assess vital signs and urine output to maintain and support vital functions.
* When more alert, maintain frequent interactions to orientate, and meet other needs
* Allay confusion and agitation with calm reassurance
* Assess patient for risk for fall.

**Preventing Complications of Immobility**

* Position to prevent contractures; relieve pressure, maintain good body alignment, and prevent compressive neuropathies
* Apply a splint at night to prevent flexion of flaccid extremities.
* Place a pillow in the axilla of the affected side to keep arm away from chest and prevent adduction of the affected shoulder.
* Place the hand in slight supination with fingers slightly flexion.
* Flaccid arm on a table or pillows when patient is seated, use of sling when ambulating.
* Range-of-motion exercises but avoid over strenuous arm movements.
* Elevate arm and hand to prevent dependent edema and fibrosis of the hand
* Do not allow top bedding to pull affected foot into plantar flexion
* Place in a prone position for 15 to 30 minutes daily, and avoid sitting up in chair for long periods to prevent knee and hip flexion contractures.
* Encourage neutral positioning of affected limbs to promote relaxation and to limit abnormal increases in muscular tone
* Teach patient to use unaffected extremity to move affected one.

**Assist with ambulation as needed with help of physical therapy**

* Check for orthostatic hypotension when dangling and standing.
* Graduate from a reclining position to head elevated, and dangle legs at the bedside, before transferring out of bed or ambulating; assess sitting balance in bed.
* Assess the patient for excessive exertion.
* Assess standing balance, and have patient practice standing.
* Help patient begin ambulating as soon as standing balance is achieved; ensure safety
* Provide rest periods as patient will tire easily.

**Optimizing Cognitive Abilities**

* Adjust interaction and environment accordingly.
* Participate in cognitive retraining program reality orientation, visual imagery, cueing
* When awareness increases, use pictures of family members, clock, calendar;
* Focus on patient's strengths, and give positive feedback.
* Depression is common; use psychotherapy and pharmacological agents.

**Facilitating Communication**

* Speak slowly, using visual cues and gestures; be consistent, and repeat as necessary.
* Speak directly to the patient while facing him.
* Give plenty of time for response, and appreciate attempts as well as correct responses.
* Minimize distractions.
* Use alternative methods of communication such as written words, gestures, or pictures.

**Fostering Independence**

* Patient to use non affected side for activities but not to neglect affected side.
* Place call light and tray to side of awareness if spatial neglect or visual field cuts are present; approach patient from uninvolved side.
* Teach the patient to scan environment if visual deficits are present.
* Clothing size larger, with front closures, patient to dress while sitting to maintain balance.
* Place personal care items, urinal and commode nearby
* Help the patient set realistic short- and long-term goals.

**Promoting Adequate Oral Intake**

* Refer to a speech therapist to evaluate swallowing before initiation of oral diet.
* Help patient relearn swallowing:
  + Place ice on tongue and encourage sucking.
  + Progress to ice pops and soft foods.
  + Soft or pureed diet based on ability to chew.
* Encourage small, frequent meals, and allow plenty of time to chew and swallow.
* Remind patient to chew on unaffected side.
* Encourage small sips from a straw with chin tucked to the chest,
* Inspect mouth for food collection and pocketing before entry of each new bolus of food.
* Inspect oral cavity for injury from biting tongue or cheek.
* Reduce environmental distractions to improve concentration.
* Provide oral care before eating to improve aesthetics and to remove food debris.
* Position at 90 degrees of flexion at the hips and 45 degrees of flexion at the neck, maintain position for 30 to 45 minutes after meals to prevent regurgitation and aspiration.

**Attaining Bladder Control**

* Insert indwelling catheter during acute stage, remove as soon as stable
* Schedule voiding every 2 to 3 hours. Intermittent catheterization can be practiced.
* Assist with standing or sitting during voiding (especially males).

**Helping the Patient Cope with Sexual Dysfunction**

* Perform in-depth assessment to determine sexual history before and after the stroke.
* Provide education, reassurance, adjustment of medications, counseling on coping skills, suggestions for alternative sexual positions, means of sexual expression and satisfaction.

**Strengthening Family Coping**

* Teach stress management techniques, such as relaxation exercises
* Encourage family participation in community and faith-based support networks.
* Involve as many family and friends in care as possible.
* Provide information about stroke and expected outcome.
* Teach family that stroke survivors will show depression in the first 3 months of recovery.

**Community and Home Care Considerations**

Hemiplegic complications: frozen shoulder; adduction and internal rotation of arm with flexion of elbow, wrist, and fingers; external rotation of the hip with flexion of the knee and plantar flexion of the ankle.

* Perform ROM exercises, and instruct the patient and family on proper positioning.
* Reinforce prevention of deformities with daily stretching and strengthening exercises.
* Monitor depression: difficulty sleeping, frequent crying, anorexia, guilt or sadness.
* The family should notify health care provider for possible medication therapy.
* Continue to support family who may be caring for a hemiplegic or aphasic person at home or in long-term care for a long time.

**Patient Education and Health Maintenance**

* Teach the patient and family to adapt home environment for safety and ease of use.
* Instruct the patient of the need for rest periods throughout day.
* Inform family about emotional lability and depression post stroke
* Encourage consistency in the environment without distraction.
* Assist family to obtain self-help aids for the patient.
* Instruct the family in management of aphasia
* Educate those at risk about lifestyle modifications and medication that can lower risk
* Refer the patient/family for social support

**Evaluation: Expected Outcomes**

* No falls, vital signs stable
* Maintains body alignment, no contractures
* Oriented to person, place, and time
* Communicates appropriately
* Brushing teeth, putting on shirt and pants independently
* Feeds self two-thirds of meal
* Voids on commode at 2-hour intervals
* Family seeks help and assistance from others

**Aneurisms**

An aneurysm is a distention of an artery brought by weakening or destruction of the arterial wall. An aneurysm is a balloon-like bulge in an artery.

**Types of aneurysms**

***Fusiform***or spindle-shaped distensions occur mainly in the abdominal aorta and less commonly in the iliac arteries.

***Saccular***aneurysms bulge out on one side of the artery. When they occur on the circulus arteriosus (circle of Willis) in the brain they are called 'berry' aneurysms. They are due to defective collagen production, atheromatous changes or congenital.

***Dissecting***aneurysms occur mainly in the arch of the aorta due to infiltration of blood between the endothelium and tunica media, beginning at a site of endothelial damage.

***Micro aneurysms***are fusiform or saccular aneurysms, occurring in small arteries and arterioles in the brain often associated with hypertension. Recurring small strokes (transient ischemic attacks) are commonly due to thrombosis or to hemorrhage when an aneurysm ruptures.

**Intracranial aneurysm**

Abnormal localized dilatation of the wall of a cerebral artery due to congenital absence of the muscle layer of the vessel. Cerebral aneurysm occurs in an artery in the brain, also are called berry aneurysms because they're often the size of a small berry.

Constant blood flow against the weakened area results in growth of the aneurysm and thinning of the vessel wall.

**Location:**

Bifurcation of an artery or major branches of the circle of Willis

**Types**

Saccular, fusiform and berry

|  |
| --- |
|  |
|  |

**Grading**

Hunt-Hess Scale

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | 0 | Unruptured; asymptomatic discovery | | I | Asymptomatic or minimal headache with slight nuchal rigidity | | II | Moderate to severe headache, nuchal rigidity; no neurologic deficit other than cranial nerve deficit | | III | Drowsiness, confusion, or mild focal deficit (eg, hemiparesis), or combination of these findings | | IV | Stupor, moderate to severe deficit, possibly early decerebrate rigidity and vegetative disturbances | | V | Deep coma, decerebrate rigidity, moribund appearance | |

**Pathophysiology and Etiology**

* Cause unknown: related to congenital abnormality, atherosclerosis, intracranial arteriovenous malformation, hypertension, infection, or head trauma.
* Rupture and subarachnoid hemorrhage may cause increased ICP and ischemia.
* Vasospasm may occur 4 to 12 days after rupture, causing ischemia and infarction.
* Due to lysis of clot rebleeding may occur in the first 4 to 14 days after initial bleed.

**Clinical Manifestations**

* Sudden onset of severe headache, nausea, vomiting, but no neurologic deficits
* Sudden, severe headache, meningeal signs (nuchal  rigidity, photophobia, irritability) and neurologic dysfunction secondary to ruptured intracranial aneurysm
* Neurologic deficit related to vascular territory; progressive Cranial nerve III, IV, VI deficits due to mass effect e.g. seizures (fits), loss of consciousness, confusion, drooping eyelid, stiff neck, light sensitivity
* If the cerebral aneurism bursts it will cause bleeding in the brain and a hemorrhagic stroke - it can also cause intracranial hematoma

**Diagnostic Evaluation**

* History and physical examination.
* CT scan for presence of blood in subarachnoid space and to evaluate mass effect.
* Lumbar puncture (if no mass effect on CT) shows bloody CSF
* MRI and CT angiogram to evaluate cerebral vascular structures.
* Cerebral angiogram gold standard test; provides definitive evaluation of aneurysm etiology, presence, location, and configuration. Will also reveal presence of vasospasm, extent of vasospasm, and collateral circulation.

**Management:**

**Goals:**

* Preventing the aneurysm from growing
* Preventing or reversing damage to other body structures
* Preventing or treating a rupture or dissection
* Allowing the patient to continue doing their normal daily activities

**Unruptured**

* surgical clipping
* endovascular embolization,
* Normalize BP if hypertensive.
* Smoking cessation.

**After Rupture**

* bed rest, head elevation, decreased environmental stimuli, avoid Valsalva maneuver and neck flexion, no caffeine,
* Manage hypertension with nitroprusside or alternative, closely monitor BP to prevent quick drop which may worsen ischemia.
* Prevent vasospasm with calcium channel blockers such as nimodipine
* Promotion of cerebral blood flow
* Management of acute hydrocephalus related to intraventricular hemorrhage
* Phenytoin, fosphenytoin, and phenobarbital to control seizures.

**Medical Surgical management(general):**

* Analgesics - usually for headaches
* Calcium channel blockers - reduce widening and narrowing of blood vessels
* Vasopressor - raises blood pressure; widens narrow blood vessels; prevents stroke.
* Anti-seizure drugs - examples include phenytoin and valproic acid
* A ventricular catheter - reduce the pressure on the brain
* A shunt system - a shunt (flexible silicone rubber tube) and a valve, a drainage channel that starts in the brain and ends in the patient's abdominal cavity
* Rehabilitation therapy - brain damage, resulting in impaired speech and movements.
* Surgical clipping - the aneurysm is closed off. A tiny metal clip is placed on the neck of the aneurysm to block off the blood flow to it; evacuation of clot via craniotomy
* Strengthening the wall by wrapping if inaccessible to clipping, ligation, or coiling
* Endovascular Repair:
* Transarterial embolization
* Balloon angioplasty: dilation of vessel using transarterial balloon to treat vasospasm
* Insertion of a stent

**Prevention**

A large percentage of aneurysms are caused by arteriosclerosis.

The following steps will help prevent the development of arteriosclerosis and aneurysms:

* Quit smoking
* Keep blood pressure under control
* Keep blood cholesterol levels under control
* Eat a healthy, well balanced diet, rich in fruit and vegetables, unrefined carbohydrate, dietary fiber, good quality fats, and lean protein
* Keep bodyweight within the ideal limits for height
* Get at least 7 hours of good quality sleep each night
* Keep physically active

**Complications**

* Aneurysm rebleed
* Hydrocephalus
* Cerebral vasospasm causing ischemia and potential infarction.
* Seizures; permanent neurologic deficit.
* Hyponatremia or hypernatremia related to alterations in ADH
* Abnormal catecholamine release.
* Cardiovascular changes: atrial fibrillation, bradycardia, ventricular dysfunction and myocardial injury in severe cases.
* Neurogenic pulmonary edema
* Neurologic deterioration and death.

**Nursing Management**

**Nursing Assessment**

* Perform and document neurologic assessment with vital signs
* Assess LOC, cranial nerve dysfunction, pupillary abnormality, and motor deficit, which signify increased ICP or expanding lesion.
* Assess for increasing headache, which could signal rebleeding.
* Monitor for focal neurologic deficits, which may indicate vasospasm.

**Nursing Diagnoses**

* Risk for Injury related to potential rebleeding, vasospasm, hydrocephalus, and seizures
* Ineffective Tissue Perfusion (cerebral) related to edema and vasospasm
* Acute Pain secondary to cerebral hemorrhage, meningeal irritation, surgical procedure
* Anxiety of patient/family related to treatment, intracranial surgery or endovascular treatment, and uncertainty of patient outcome

**Planning**

**Goal:**

* Prevent Injury/complications
* Maintaining perfusion of cerebral tissue
* Pain relief
* Relieve anxiety

**Nursing Interventions/Rationale**

**Preventing Complications**

* Complete bed rest with head elevated 30 degrees to reduce cerebral edema, maintain and neck alignment to avoid jugular vein compression, keep procedures less than 15 seconds
* Quiet environment: low lighting, noise control, limited activity to prevent agitation/pain
* Patient to avoid straining, sneezing, acute flexion/rotation of the neck, cigarette smoking;
* Administer stool softeners, avoid rectal temperatures, enemas, and suppositories
* Avoid caffeinated beverages and extremes of temperatures.
* Seizure precautions: padded side rails, suction equipment, and oral airway at the bedside.
* Assess for increased ICP: bradycardia, widening pulse pressure, changes in respiration
* Monitor arterial blood gas (ABG) for hypoxia and hypercapnia, which aggravate ICP.
* Monitor ventriculostomy, if present, for patency, amount and character of drainage 4hrly
* CSF sample for routine cultures, white blood cell (WBC) count, chloride, and protein.
* Maintain BP: treated aneurysm: SBP 160 to180; untreated aneurysm: SBP 120 to 140.

**Maintaining Cerebral Perfusion**

* Monitor LOC, pupillary reaction, motor/ sensory, cranial nerve, speech, and headache.
* Administer hypertensive therapy with colloid, crystalloid to increase cerebral perfusion.
* Monitor fluid and electrolytes; monitor hematocrit and hemoglobin
* Assess BP, input and output status at least every hour,
* Assess complaints specific to decreased perfusion (diplopia, headache, blurred vision)
* Assess s/s of vasospasm: confusion, disorientation, and decreased LOC,
* Report changes; LOC, drowsiness, speech slurring, pronator drift (unable to maintain unsupported outstretched pronated forearm), may be first sign of deterioration.

**Reducing Pain**

* Assess level of pain, report any increase in headache.
* Administer analgesics; for opioid with sedative, monitor for CNS depression, decreased respirations, decreased BP. Explain same to patients and relatives
* Distraction and relaxation techniques that will promote calm.
* Elevate head of bed to minimize cerebral swelling
* Provide cool compresses to head
* Provide quiet, dark environment
* Assess for unrelieved or increased pain, changes in neurologic signs, nuchal rigidity, photophobia, and/or changes in vision, which could signal hemorrhage, hydrocephalus, or meningeal irritation.

**Reducing Anxiety**

* Assess psychosocial issues (sexuality, anxiety, fear, depression, frustration, emotions).
* Recognize verbal and nonverbal cues from the patient/family that signal poor coping.
* Inform the patient about all treatment modalities e.g. surgery or endovascular treatment
* Encourage discussion of risks/benefits with the surgeon/interventional neuroradiologist.
* Support the patient/family in dealing with the stress and uncertainty of hospitalization.
* Consult Social Services to assist with patient/family support and long-term treatment

**Community and Home Care Considerations**

* Assess ongoing home care needs.
* Assess need for nursing home placement or rehab center, obtain social service referral.
* Act as liaison between health care team and family.
* Educate on permanent neurologic deficits, link to needed supplies and services.

**Patient Education and Health Maintenance**

* Instruct patient/family on purpose and frequency of neurologic radiologic procedures.
* Explain what an aneurysm is, signs/symptoms of rupture, and possible threats of rupture.
* Educate the patient about the risk of rebleed
* Educate to avoid sudden increased pressure, such as heavy lifting and straining.
* Lifelong medical follow-up and immediate attention if severe headache develops.
* Instruct patient/family on need for and use of invasive monitoring and drainage systems.
* Reinforce the need for head of bed not to be adjusted.
* Explain aneurysm precautions and rationale.
* Provide educational material for procedures.
* Set mutual goals for discharge, embrace multidisciplinary approach to care.
* Explain medications to patient/significant other and potential adverse effects
* Have patient verbalize discharge instructions

**Evaluation: Expected Outcomes**

* No signs of rebleeding, increased ICP, decreased cerebral perfusion, or seizures; quiet environment maintained; vital signs stable; neurologic parameters stable
* SBP goals maintained
* Verbalizes decreased pain or control of pain to an intensity that is acceptable
* Patient and family able to state reason for surgery/endovascular intervention, possible risks; openly discuss fears and uncertainties

**Infections of the nervous system**

**Meningitis**

Meningitis is an inflammation of the lining around the brain and spinal cord caused by bacteria or viruses.

**Classification**

**1. Septic**

Caused by bacteria such as *Streptococcus pneumoniae* and *Neisseria eningitides*

**2. Aseptic**

Viral or secondary to lymphoma, leukemia, or human immunodeficiency virus (HIV)

**Pathophysiology**

The causative organism enters the bloodstream, crosses the blood–brain barrier, and triggers an inflammatory reaction in the meninges the subarachnoid and pia mater.

Most bacteria that cause meningitis colonize the nasopharynx, sinuses (sphenoid sinus most common), then invade the circulation and CSF, causing an inflammatory response mediated by cytokines.

Bacterial meningitis can result in brain damage, damaged neurons.

Purulent exudates may cause vasculitis and vasospasm, and increased ICP that causes cerebral edema.

**Portal of entry**

1. Through the bloodstream from other infections (cellulitis)
2. Direct entry (after a traumatic injury to the facial bones).
3. Opportunistic infection in patients with acquired immunodeficiency syndrome (AIDS)

Bacterial meningitis causes damage to the CNS from the inflammatory process rather than the pathogen.

**Causes:**

* Bacterial meningitis: Streptococcus pneumoniae (pneumococcal meningitis), Neisseria meningitidis (meningococcal meningitis).
* Fungal meningitis: Cryptococcus neoformans in HIV positive- found in droppings of pigeons and chickens
* Tuberculous meningitis in HIV-positive patients,
* Parasitic meningitis: flukes, worms, or amoeba.
* Hospital-acquired postcraniotomy meningitis, caused by gram-negative bacilli
* Neoplastic meningitis: in systemic cancers e.g. Breast/ lung cancer, malignant melanoma, non-Hodgkin's lymphoma, and acute leukemia.
* Listeria monocytogenes, a gram-positive bacillus, through contaminated hot dogs, cold meats, and unpasteurized dairy products.
* Haemophilus influenzae meningitis: has decreased due to the haemophilus vaccine.

**Clinical Manifestations**

* Classic symptoms are fever, very severe headache steady or throbbing as a result of meningeal irritation
* Nuchal rigidity, neck tenderness, or bulging of the anterior fontanelle in infants
* Altered mental status; confusion in older patients.
* Petechial or purpuric rash from coagulopathy, especially with N. meningitidis.
* Children may exhibit behavioral changes, arching of the back and neck, a blank stare, refusal to feed, and seizures. Viral meningitis can cause a red, maculopapular
* Photophobia (extreme sensitivity to light)
* Disorientation and memory impairment; behavioral manifestations
* lethargy, unresponsiveness, and coma
* Seizures
* ICP increases secondary to diffuse brain swelling or hydrocephalus;
* Decreased level of consciousness and focal motor deficits.

Brudzinski's sign: place the patient supine and flex the head upward, flexion of both hips, knees, and ankles with neck flexion indicates meningeal irritation.

Kernig's sign, place the patient supine. Keeping the bottom leg straight, flex the other hip and knee to form a 90-degree angle, slowly extend the upper leg. This places a stretch on the meninges, resulting in pain and spasm of the hamstring muscle.

**Diagnostic Evaluation**

* CT scan or MRI to detect a shift in brain contents (which may lead to herniation) prior to a lumbar puncture
* Complete blood count (CBC)
* Blood cultures
* Gram staining of CSF
* CSF evaluation for pressure, leukocytes, protein, glucose; all are elevated in acute bacterial meningitis,
* MRI/CT scans with and without contrast. With contrast to detect abscesses.
* Low CD4+ counts indicate immunosuppression in HIV-positive patients and other patients with immunosuppressive disorders.
* In patients with acquired immunodeficiency syndrome (AIDS), MRI is used to detect meningeal irritation, evidence of a sinus infection, or brain abscess.

**Medical Management**

Collaborative: nursing, infectious diseases specialists, neurology, internal medicine, otolaryngology specialists, laboratory and diagnostic staff.

* Take samples for culture, Initiate I.V. antibiotics while waiting for the laboratory findings
* IV Dexamethasone
* Vancomycin, cephalosporins (eg, ceftriaxone sodium, cefotaxime sodium)
* Dehydration and shock are treated with IV fluids
* Phenytoin to treat seizures,
* Treatment of neoplastic meningitis by chemotherapy or radiotherapy
* Cochlear implantation due to deafness caused by meningitis
* For meningitis due to surgical procedures, treat for S. aureus and gram-negative bacilli
* Antifungal agents, such as amphotericin B, fluconazole to treat cryptococcal meningitis.
* Antituberculosis drugs to treat TB menengitis

**Prevention**

* Meningococcal vaccine to adolescents in high school and college living in dormitories.
* vaccination against *H. influenzae* and *S. pneumoniae* for children and at-risk adults
* Antibiotic prophylaxis within 24 hours to contacts of a person who develops meningococcal infection

**Complications**

* Bacterial meningitis in children: deafness, learning difficulties, spasticity, paresis, or cranial nerve disorders.
* Increased ICP in AIDS patients with cryptococcal meningitis leads to visual losses.
* Seizures
* Increased ICP may result in cerebral edema, decreased perfusion, and tissue damage.
* Severe brain edema may result in herniation or compression of the brain stem.
* Purpura and disseminated intravascular coagulation.

**Nursing Assessment**

* History of recent upper respiratory infection, exposure to causative agents.
* Assess neurologic status and vital signs.
* Evaluate for signs of meningeal irritation.
* Assess sensorineural loss (vision and hearing), cranial nerve damage (eg, facial nerve palsy), and diminished cognitive function.

**Nursing Diagnoses**

* Hyperthermia related to the infectious process and cerebral edema
* Risk for Imbalanced Fluid Volume related to fever and decreased intake
* Ineffective Tissue Perfusion (cerebral) related to infectious process and cerebral edema
* Acute Pain related to meningeal irritation
* Impaired Physical Mobility related to prolonged bed rest

**Planning**

**Goals:**

* To reduce fever
* To maintain Fluid Balance
* To enhance Cerebral Perfusion
* To reduce pain
* To promote Return to Optimal Level of Functioning

**Nursing Interventions**

**Reducing Fever**

* Administer antimicrobial agents on time to maintain optimal blood levels.
* Monitor temperature frequently or continuously, administer antipyretics as ordered.
* Institute other cooling measures, such as a hypothermia blanket, as indicated.

**Maintaining Fluid Balance**

* Prevent I.V. fluid overload, which may worsen cerebral edema.
* Monitor intake and output closely.
* Monitor CVP frequently.

**Enhancing Cerebral Perfusion**

* Observe for elevated ICP (decreased LOC, dilated pupils, widening pulse pressure).
* Maintain a calm environment to prevent agitation, which may cause an increased ICP.
* Prepare patient for a lumbar puncture for CSF evaluation, and therapeutic spinal tap
* Report deterioration (raised temperature, decreased LOC, seizure, altered respirations)

**Reducing Pain**

* Administer analgesics, avoid opioids because they may mask a decreasing LOC
* Darken the room if photophobia is present.
* Due to neck stiffness, turn patient slowly and carefully with head and neck in alignment
* Elevate the head of the bed to decrease ICP and reduce pain.

**Promoting Return to Optimal Level of Functioning**

* Rehabilitation interventions after admission (eg, turning, positioning).
* Progress from passive to active exercises based on the patient's neurologic status.

**Community and Home Care Considerations**

* Administer vaccines against H. influenzae type B for children;
* N. meningitidis vaccine to high risk (college students, those without spleens, immunodeficient, travelers and household contacts of meningitis patients)
* S. pneumoniae vaccine for patients with chronic illnesses and the elderly
* Chemoprophylaxis to health care workers, household contacts, day care centers, and other highly susceptible populations
* Maintenance antifungal prophylaxis for AIDS patients with low CD4+ counts

**Patient Education and Health Maintenance**

* Advise close contacts of the patient with meningitis on prophylactic treatment
* Encourage the patient to follow medication regimen fully.
* Encourage follow-up

**Evaluation: Expected Outcomes**

* Afebrile
* Adequate urine output; CVP in normal range
* Alert LOC; normal vital signs
* Pain controlled
* Optimal level of functioning after resolution

**Encephalitis**

Encephalitis is inflammation of cerebral tissue accompanied by meningeal inflammation. Meningoencephalitis is most commonly caused by a viral infection.

**Pathophysiology**

1. Primary encephalitis: toxin or pathogen affect brain or spinal cord
2. Secondary encephalitis: infection is spread from another part of the body.

Infection of the gray matter leads to inflammation and neuronal destruction, commonly caused by the herpes simplex virus and, to a lesser degree, by the arboviruses. Brainstem encephalitis targets the basal ganglia or cranial nerves. Post ischemic inflammatory encephalitis occurs following a CVA. Microvascular occlusion can be caused by a thrombus. Edema then results in increased ICP, compromised cerebral perfusion and secondary brain injury.

**Etiology**

* West Nile Virus (WNV), mosquito is the primary vector, birds are the primary hosts.
* Herpes simplex encephalitis.
* Post infectious encephalomyelitis follows a viral or bacterial infectious process,
* Cytomegalovirus encephalitis in patients who have advanced HIV infection
* Toxoplasma encephalitis is also common in patients with AIDS.

**Clinical Manifestations**

* Fever, headache, and brain aberration (eg, disorientation, neurologic deficits, seizures).
* Increased ICP cause alteration in consciousness, nausea, and vomiting.
* Motor weakness e.g. hemiparesis.
* Increased deep tendon reflexes and extensor plantar responses
* Bizarre behavior and personality changes
* Hypothalamic-pituitary involvement: hypothermia, diabetes insipidus, SIADH
* Superior quadrant visual field defects, aphasia, dysphagia, ataxia, and paresthesias.
* Brainstem encephalitis: nystagmus decreased extraocular movements, hearing loss, dysphagia, dysarthria, respiratory abnormalities, and motor involvement.
* Limbic encephalitis: mood and personality changes, severe memory loss and delirium.
* In WNV: fever, vomiting, headache, nuchal rigidity, decreased LOC, cranial nerve dysfunction, and an erythematous rash.

**Diagnostic Evaluation**

* Lumbar puncture, with evaluation of CSF,
* Polymerase chain reaction analysis of the virus' deoxyribonucleic acid (DNA),
* Arbovirus-specific immunoglobulin (IgM) in CSF
* EEG may demonstrate slow brain wave complexes in encephalitis.
* MRI
* Brain tissue biopsy
* WNV ELISA can be done from blood or CSF; a cell culture can also be diagnostic.

**Management**

* Patients with cytomegalovirus may be treated with ganciclovir
* Pyrimethamine and sulfadoxine (Fansidar) to treat Toxoplasma encephalitis.
* Supportive care with corticosteroids
* acyclovir for herpes simplex virus and genital herpes
* Anticonvulsants to manage seizures.

**Complications**

* Herpes simplex virus may cause temporal lobe swelling and compression of the brain stem, aphasia, motor and sensory deficits, and Korsakoff's psychosis (amnesia).
* Relapse of encephalitis may be seen after initial improvement
* Mortality and morbidity depend on the infectious agent, host status

**Nursing Assessment**

* History: recent infection, animal exposure, tick/mosquito bite, travel, exposure to the ill
* Before delivery, history of congenital herpes simplex virus; consider cesarean delivery
* Assess for drainage from herpetic lesions.
* Vesicular lesions or rashes on neonates

**Nursing Diagnoses**

* Risk for Injury related to seizures and cerebral edema
* Ineffective Tissue Perfusion (cerebral) related to disease process
* Hyperthermia related to infectious process
* Disturbed Thought Processes due to personality changes
* Risk of Infection related to transmission

**Planning**

**Goals:**

* Preventing Injury
* Promoting Cerebral Perfusion
* Relieving Fever
* Managing Aberrations in Thought Processes
* Avoiding Infectious Disease Transmission

**Nursing Interventions**

**Preventing Injury**

* Quiet environment, avoiding overactivity and agitation, which may increase ICP
* Seizure precautions with side rails padded, airway, and suction equipment at bedside.
* Administer medications as ordered; monitor response and adverse reactions.

**Promoting Cerebral Perfusion**

* Monitor for behavior or personality changes, weakness, or cranial nerve involvement.
* In arbovirus encephalitis, restrict fluids to passively dehydrate the brain.
* Reorient patient frequently.
* Provide supportive care if coma develops; may last several weeks.
* Encourage family to participate in the patient's rehabilitation even it in coma.

**Relieving Fever**

* Monitor temperature and vital signs frequently.
* Administer antipyretics and other cooling measures as indicated.
* Monitor fluid intake and output, and provide fluid replacement through
* Be alert to signs of other coexisting infections, such as UTI or pneumonia,

**Managing Aberrations in Thought Processes**

* Orient to person, place and time.
* Maintain memory book, and provide cues to perform required activities.

**Avoiding Infectious Disease Transmission**

* Maintain strict standard precautions.
* Initiate and maintain isolation per your facility's policy.

**Community and Home Care Considerations**

* Vaccination of patient, family, and significant others for measles, mumps, and rubella.
* Pregnant women with genital herpes simplex or their partners, to inform physician.
* Contacts of rabies-infected patients should be offered rabies prophylaxis.

**Patient Education and Health Maintenance**

* Explain the effects of the disease process and the rationale for care.
* Encourage follow-up for evaluation of deficits and rehabilitation
* Educate about the signs and symptoms of encephalitis if epidemic is suspected.
* To prevent WNV, advise the use of repellants when outdoors and removal of standing water that acts as a breeding ground for mosquitoes.

**Evaluation: Expected Outcomes**

* No seizures or signs of increased ICP
* Alert with no neurologic deficits
* Afebrile
* Oriented, memory intact
* No transmission of infection

**Brain abscess**

A brain abscess is a free or encapsulated collection of infectious material of brain parenchyma, between the dura and the arachnoid linings (subdural abscess) or between the dura and the skull (epidural abscess). Spinal abscesses typically occur in the epidural region.

**Pathophysiology and Etiology**

* Intracranial subdural abscesses: purulent drainage between the dura and arachnoid; Pus is from the meninges, middle ear or mastoid, sinuses, septicemia, or skull fracture. It occurs most frequently in children and young adults.
* Intracranial epidural abscesses: due to chronic mastoiditis or sinusitis, head trauma, or craniotomy. Abscesses may originate from nasal sinuses, meninges, middle ear, or skull osteomyelitis, meningitis, or intraparenchymal abscess.
* Spinal epidural abscesses occur in the spinal canal external to the dura. Epidural penetration occurs from infected adjacent tissue (eg, infected pressure ulcer), infected site (eg, skin), or from spinal surgery or spinal instrumentation (eg, lumbar puncture).
* Fungal brain abscesses occur mostly in HIV-positive/ immunosuppressed patients
* M. tuberculosis abscesses mostly in patients who are HIV-positive/ immunosuppression

**Clinical Manifestations**

* Headache is poorly localized with a dull ache.
* Increased ICP may result in nausea, vomiting, decreased LOC.
* Neurologic: hemisensory and paresis deficits, aphasia, ataxia
* Seizures
* Dental abscess, sinusitis, and otitis media
* subdural empyema: severe headache, fever, nuchal rigidity, and Kernig's sign
* Epidural abscess: with fever, lethargy, and severe headache.
* Spinal epidural abscesses: severe back pain, fever, headache, lower extremity weakness or paralysis, nuchal rigidity, Kernig's sign, and local tenderness.

**Diagnostic Evaluation**

* CT scan, MRI with contrast locate the sites of abscess,
* Blood cultures are obtained to identify the organism, positive Gram's stain, leukocytosis, and elevated erythrocyte sedimentation rate (ESR).
* EEG detects seizure disorders.
* Increased WBC and increased pressure of the CSF.
* CSF may be cloudy. Myelography is typically abnormal.

**Management**

* Cerebral subdural empyema or intracranial epidural abscesses: trephining (drilling through skull to evacuate purulent material), systemic antibiotics and treatment of cerebral edema.
* Spinal epidural abscesses: laminectomy and surgical drainage, with antibiotics before and after the procedure. The abscess site is thoroughly irrigated with antibiotic solution and cultures are taken.
* Radical surgical debridement, especially with fungal infections, may be indicated with antimicrobial therapy.
* Antimicrobial therapy is based on Gram's stain, is directed toward the most common etiologic agents: streptococci, anaerobic bacteria (eg, Bacteroides species).
* A 6- to 8-week course of parenteral antibiotics is typical, followed by a 2- to 3-month course of orals ;Penicillin G, metronidazole, and third-generation cephalosporins
* Antifungal therapy, such as amphotericin B,
* Antituberculosis treatment for abscesses containing AFB
* Corticosteroids and osmotic diuretics to reduce cerebral edema, and anticonvulsants to manage seizures.

**Complications**

* Abscess ruptures into the ventricular space, causing sudden severe headache, often fatal.
* Papilledema may occur indicating intracranial hypertension.
* Lumbar puncture may cause brain stem herniation and in spinal epidural abscess pus may be transferred into the subarachnoid space.
* seizure disorders, visual defects, hemiparesis, and cranial nerve palsies
* Mortality, severe mental status changes and rapid neurologic impairment.
* Spinal epidural abscess may cause paraplegia with sensory loss
* In chronic otitis media bone erosion may expose the dura, labyrinth, and facial nerves.

**Nursing Assessment**

* Obtain history of previous infection, immunosuppression, headache,
* Neurologic assessment: cranial nerve evaluation, motor, and cognitive status.

**Nursing Diagnoses**

* Acute Pain related to cerebral mass
* Disturbed Thought Processes related to disease process
* Risk for Injury related to neurologic deficits
* Anxiety related to surgery, prognosis, and relapse

**Planning**

**Goals:**

* Relieving Pain
* Promoting Thought Processes
* Minimizing Neurologic Deficits
* Reducing Anxiety

**Nursing Interventions**

**Relieving Pain**

* Administer pain medications as ordered.
* Provide a quiet environment, head slightly elevated, and assistance with hygiene needs.
* Provide passive relaxation techniques, such as soft music and backrubs.

**Promoting Thought Processes**

* Frequently monitor vital signs, LOC, orientation, and seizure activity.
* Report changes which can signal increased ICP,
* Administer medications as ordered, noting response and adverse reactions.
* Prepare patient for repeated diagnostic tests to evaluate response to therapy and surgery.

**Minimizing Neurologic Deficits**

* Safe environment with side rails up, call light within reach, and frequent observation.
* Evaluate cranial nerve function, and report changes.
* Refer to occupational therapy, speech therapist, or other rehabilitation specialist

**Reducing Anxiety**

* Prepare patient and family for surgery, ensure they understand risks and benefits
* Explain postoperative progression and nursing care

**Community and Home Care Considerations**

* Treat sinusitis, otitis media, respiratory infections that may result in a brain abscess.
* Rehabilitation to regain or compensate for neurologic deficits.
* Continue with pharmacologic regimen in community setting.
* Observe for recurrence of brain and spinal abscesses.

**Patient Education and Health Maintenance**

* Vaccinations, immunizations, and overall health.
* Reinforce need for dental procedure prophylaxis to avoid dental abscesses.
* Need for immediate assessment of wounds on the head.

**Evaluation: Expected Outcomes**

* Verbalizes reduced pain
* Oriented to person, place, and time; follows simple commands
* No injury related to neurologic deficits
* Reduced anxiety regarding disease process and procedures

**Head injuries**

Injuries to the head involve trauma to the scalp, skull, and brain. The most serious form is known as a traumatic brain injury (TBI). The most common causes of TBIs are falls, motor vehicle crashes, being struck by objects, and assaults. Groups at highest risk for TBI are persons 15 to 19 years of age, with a 2:1 male-to-female ratio. Adults 75 years of age or older have the highest TBI-related hospitalization and death rates, the goal of treatment is to prevent **secondary brain injury**

**Types of Traumatic Brain Injury**

* Concussion: transient interruption in brain activity, no injury noted on radiographics.
* Cerebral contusion: bruising of the brain with swelling.
* Coup injury is the site of initial trauma; the contra coup is the site opposite.
* Intracerebral hematoma with edema.
* Epidural hematoma due to injury or laceration of the middle meningeal artery
* Subdural hematoma caused by venous bleeding
* Diffuse axonal injury- axonal tears within the white matter of the brain.

**Pathophysiology**

* Acceleration and deceleration of the brain within the skull against sharply edged internal surface. May also be caused by blunt or penetrating injury.
* The initial trauma is the primary injury (contusion, hematoma, diffuse axonal injury or shearing of white matter)
* Secondary injury involves cellular changes (release of oxygen-free radicals and neurotransmitters, calcium loss, and increase in lactate acid)
* Uncontrolled release of sympathetic hormones results in tachycardia, tachypnea, hyperthermia, diaphoresis, agitation, and dystonia.
* Edema or compression of the pituitary/hypothalamic region may cause reduced secretion of ADH leading to Diabetes Insipidus with excessive fluid and electrolyte loss
* Hypotension, anemia, hypoxia, hypercarbia, hypovolemia worsen secondary injury

**Classification**

* Mild (GCS 13 to 15, with loss of consciousness to 15 minutes)
* Moderate (GCS 9 to 12, with loss of consciousness for up to 6 hours)
* Severe (GCS 3 to 8, with loss of consciousness greater than 6 hours)

**Associated Injuries:**

* Linear fracture through entire thickness of bone that runs in straight line
* Basilar skull fracture results in contusions around the eyes (raccoon eyes) and rhinorrhea
* Basilar skull fracture results in contusions around the ears (Battle sign) and otorrhea
* Depressed fracture; risk of dural tear, CSF leak, intracranial injury,may be closed or open
* Facial fractures: orbital, mandible, zygoma, maxillary, nasal fractures
* Vascular injuries vertebral or carotid artery dissection
* Spine fracture
* Soft tissue injuries

**Clinical Manifestations**

* Disturbances in consciousness: confusion to coma
* Headache, vertigo
* Agitation, restlessness
* Respiratory irregularities- tachypnea
* Cognitive deficits: (confusion, aphasia, reading/writing difficulties, memory deficits, acalculia(difficulties with calculations), amnesia and difficulty learning new information)
* Abnormalities of pupils
* Sudden onset of neurologic deficit
* Coma; persistent vegetative state
* Otorrhea: leakage of CSF from ear due to posterior fossa skull fracture;
* Rhinorrhea: leakage of CSF from nose due to anterior fossa skull fracture
* Raccoon eyes and Battle sign indicate skull fractures
* Altered LOC, hyperthermia, agitation due to sympathetic storming
* Abnormal bleeding due to coagulopathy
* Cardiac arrhythmias due to increased release of catecholamines in stress response

**Diagnostic Evaluation**

* CT scan to identify and localize lesions, edema, bleeding.
* Skull and cervical spine films to identify fracture, displacement.
* Neuropsychological tests during rehabilitation phase to determine cognitive deficits.
* MRI to identify and diagnosis Diffuse Axonal Injury
* CBC, coagulation profile, electrolyte levels, serum osmolarity, ABG values

**Management**

* Airway: patent, intubate for GCS less than 8, NG tube to prevent aspiration
* Breathing: administer oxygen, avoid hyperventilation
* Circulation: prevent hypotension, Maintain SBP above 90 mm Hg using vasopressors and albumin, treat anemia, treat symptomatic arrhythmias
* Manage increased ICP and cerebral edema: adequate oxygenation, mannitol, ventilatory support, elevation of the head of the bed, maintenance of fluid and electrolyte balance, nutritional support, pain and anxiety management, or neurosurgery.
* Manage sympathetic storming with opiates, propranolol (beta-adrenergic blocker), clonidine (alpha-adrenergic antagonist), dantrolene (muscle relaxant), gabapentin (antiepileptic), and bromocriptine (dopamine-receptor agonist)
* Supportive care: nutritional, rehabilitation services, skin care
* Antibiotics to prevent infection with open skull fractures or penetrating wounds
* Surgery to evacuate intracranial hematomas, debridement of penetrating wounds, elevation of skull fractures, or repair of CSF leaks
* Treatment of hypernatremia (due to DI, dehydration, diaphoresis) with fluid replacement,
* Treatment of hyponatremia (due to cerebral salt wasting or SIADH) by fluid restriction, oral salt replacement, and I.V. saline 0.9% or 3% (250 to 500 cc over 3 to 5 hours)

**Complications**

* Infections: systemic (respiratory, urinary), neurologic (meningitis, ventriculitis)
* Increased ICP, hydrocephalus, brain herniation
* Posttraumatic seizure disorder
* Permanent neurologic deficits: cognitive, motor, sensory, speech
* Neurobehavioral alterations: impulsivity, uninhibited aggression, and emotional lability
* Persistent sympathetic storming
* Disseminated intravascular coagulation
* Diabetes insipidus(DI), syndrome of inappropriate antidiuretic hormone (SIADH) secretion
* Death

**Nursing Assessment**

* Assess for increased ICP, altered LOC, abnormal pupil responses, vomiting, increased pulse pressure, bradycardia, and hyperthermia.
* Assess for sympathetic storming: altered LOC, diaphoresis, tachycardia, tachypnea, hypertension, hyperthermia, agitation, and dystonia.
* Assess for hypotension and arrhythmias or blood loss.
* Be alert for DI: excessive urine output, dilute urine, hypernatremia.
* Be alert for SIADH: decreased urine output, concentrated urine, hyponatremia, increased weight, decreased serum osmolarity, slight increase in urinary Na+.
* Monitor laboratory findings: PTT, PT, and fibrinogen levels indicating coagulopathy. Electrolyte imbalance, Anemia due to bleeding or dilution, elevated WBC indicating infection related to trauma or invasive procedures.
* Assess for hypoxia or hypercarbia.
* Perform cranial nerve, motor, sensory, and reflex assessment.
* Assess for behavior that warrants potential for injury to self or others

**NB:** Every patient who has a brain injury is at risk of spinal cord injury. Cervical collar and spine precautions should be maintained until spinal fractured has been ruled out. A significant number of patients are under the influence of alcohol at the time of injury, which may mask the nature and severity of the injury.

**Nursing Diagnoses**

* Ineffective Tissue Perfusion (cerebral) related to increased ICP
* Ineffective Breathing Pattern related to increased ICP or brain stem injury
* Imbalanced Nutrition: Less Than Body Requirements related to compromised neurologic function and stress of injury
* Disturbed Thought Processes related to physiology of brain injury
* Risk for Injury related to altered thought processes
* Compromised Family Coping related to unpredictability of outcome

**Planning**

**Goals:**

* Maintaining Adequate Cerebral Perfusion
* Maintaining Respiration
* Meeting Nutritional Needs
* Promoting Cognitive Function
* Preventing Injury
* Strengthening Family Coping

**Nursing Interventions**

**Maintaining Adequate Cerebral Perfusion**

* Maintain a patent airway
* Monitor ICP,
* Monitor cerebral oxygenation, temperature, or neurochemicals, provide oxygen therapy to maintain PaO2 above 100 and carbon dioxide within normal range.
* Maintain SBP above 90 to enhance cerebral perfusion and administer treatment for arrhythmias if patient is symptomatic, evaluate for blood loss
* Monitor LOC, cranial nerve function, and motor and sensory function as per GCS or neurologic flow sheet and identify emerging trends in neurologic function
* Monitor for sympathetic storming (abnormal stress response). Manage by maintaining normothermia, cool compress to forehead, and relaxing music.
* Monitor response to pharmacologic therapy
* Monitor laboratory data, CSF cultures and Gram stains-prompt antibiotic therapy
* Monitor for hypernatremia and administer fluid replacement
* Monitor for hyponatremia and administer oral or I.V. salt replacement
* Monitor coagulation and replace clotting factors
* Assess dressings and drainage tubes for patency, security, and characteristics of drainage.
* Institute measures to minimize increased ICP, ischemic changes, cerebral edema, seizures, or neurovascular compromise- positioning to avoid flexing head, reducing hip flexion, and spreading out care evenly over 24-hour period.

Sympathetic storming leads to risk for secondary brain injury, cardiac abnormalities, weight loss, skin breakdown, and infection. It is trigged by suctioning, turning, hyperthermia, infection, auditory stimuli.

Severe states of hypernatremia and hyponatremia can cause seizures, nausea, confusion, irritability/agitation and coma. Hypernatremia and hyponatremia should not be reversed quickly, as the rapid change can create rebound cerebral edema.

**Maintaining Respiration**

* Monitor respiratory rate, depth, and pattern of respirations;
* Assist with intubation and ventilatory assistance, if needed.
* Obtain frequent ABG values to maintain PaO2 greater than 100 mm Hg and PaCO2 35 to 45 mm Hg.
* Turn patient every 2 hours, and assist with coughing and deep breathing.
* Suction patient as needed; however, hyperventilate the patient before suctioning to prevent hypoxia.

**Meeting Nutritional Needs**

* Begin nutritional support as soon as possible after a head injury
* Administer H2-blocking agents to prevent gastric ulceration and hemorrhage
* Enteric feedings can be initiated once bowel sounds have returned
* Elevate the head of the bed after feedings
* Check residuals to prevent aspiration, monitor for diarrhea
* I.V. hyperalimentation for patients unable to tolerate nasogastric feedings
* Consult with dietitian to provide the increased calories and nitrogen
* Insulin may be required to regulate serum glucose levels to avoid hyperglycemia which worsens secondary brain injury.
* Consult speech therapist for radiographic swallow study before initiation of oral foods.

**NB:** Caloric needs of the head-injured patient increase by 100% to 200%. Consult dietitian to institute nutritional support within the first 2 to 3 days after injury

**Promoting Cognitive Function**

* Periodically, assess patient's LOC, and compare to baseline.
* Provide stimulation using all senses: visual, olfactory, gustatory, acoustic, and tactile.
* Observe patient for fatigue or restlessness from overstimulation.
* Involve family in sensory stimulation program to maximize its effectiveness.
* Decrease environmental stimuli when patient is in agitated state.
* Reorient to surroundings using repetition, verbal and visual cues, and memory aids;
* Use pictures of family members, clock, calendar involve occupational/ speech therapist.
* Encourage family to provide items from home to increase sense of identity and security.
* Break down ADLs into simple steps that patient can progressively take part in.
* Minimize distraction and provide consistency.
* Maintain usual patterns of behavior: sleep, medication, elimination, feeding, and self-care
* Refer patient for cognitive retraining, if appropriate.

**Preventing Injury**

* Inform the family on behavioral phases of recovery e.g. restlessness and combativeness.
* Investigate for sources of restlessness: uncomfortable position, UTI, pressure ulcer
* Reassure patient and family during periods of agitation and irrational behavior.
* Pad side rails, and wrap hands if agitated. Be vigilant, and avoid restraints if possible.
* Keep environmental stimuli to a minimum to avoid confusion and agitation.
* Provide adequate light if patient is hallucinating.
* Avoid sedatives to avoid medication-induced confusion and altered states of cognition.

**Strengthening Family Coping**

* Refer family to community support services,
* Assist the family members to establish stress management techniques
* Consult with social worker or psychologist to assist in adjusting to patient's permanent neurologic deficits.
* Family and the patient should recognize current progress and not focus on limitations.

**Community and Home Care Considerations**

* Observe for signs of postconcussion syndrome (PCS), which include headache, decreased concentration, irritability, dizziness, insomnia, restlessness, diminished memory, anxiety, easy fatigability, and alcohol intolerance.
* Persistent symptoms interfere with relationships and employability of the patient.
* Patient and family to report these symptoms and obtain additional support and counseling
* Act as liaison between the family and neurologist, and neurosurgeon.
* Educate caregivers on tube feedings, positioning, ROM exercises
* Ensure coaches, parents and schools are familiar with guidelines for sports-related concussion

**Patient Education and Health Maintenance**

* Review the signs of increased ICP with the family.
* Reinforce the lability of cognitive, language, and physical functioning of the person with brain injury and the lengthy recovery period.
* Teach the family techniques to calm the agitated patient.
  + Therapeutic use of touch, massage, and music
  + Elimination of distractions (television, radio, alarms, crowds)
  + Provide one-on-one communication
  + Distract patients

**Evaluation: Expected Outcomes**

* No signs of increased ICP
* Respirations 24 breaths/minute, regular
* Tube feedings tolerated well without residual
* Oriented to person, place, and time
* Less agitated; side rails maintained
* Family reports using respite care

**Spinal injuries**

Spinal cord injury (SCI) is a traumatic injury to the spinal cord. Injury varies from mild cord concussion with transient numbness to immediate and complete tetraplegia. The most common sites are the cervical areas C5, C6, and C7, and the junction of the thoracic and lumbar vertebrae, T12 and L1. There may be loss of function below the level of cord injury.

**Pathophysiology and Etiology**

* Motor vehicle accidents, violence, gunshot, falls, and sports injuries. Most injuries result in tetraplegia, complete SCI is absence of motor and sensory function at the lowest sacral segment affected.
* SCI may result from vascular disorders, infectious conditions, tumor
* Upper motor neurons lesions at T12 and above result in spasticity. Lower motor neurons lesions at L1 and below result in flaccidity and reflex loss.
* Older patients are at greater risk for altered glucose metabolism, loss of bone minerals leading to fractures, musculoskeletal pain and weakness,

**Clinical Manifestations**

The consequences of SCI depend on the type and level of injury of the cord.

**Neurologic Level**

The neurologic level refers to the lowest level at which sensory and motor functions are normal, signs and symptoms include the following:

* Total sensory and motor paralysis below the neurologic level
* Loss of bladder and bowel control (usually with urinary retention and bladder distention)
* Loss of sweating and vasomotor tone
* Tetraplegia (formerly called quadriplegia) due to damage to the cervical nerves (C1-C8): impaired function in the upper extremities, trunk, pelvic organs, and lower extremities.
* Paraplegia due to damage to the thoracic, lumbar, or sacral segments. Arms are unaffected, function may be impaired in the trunk, pelvic organs, and lower extremities.
* Marked reduction of BP from loss of peripheral vascular resistance.
* If conscious, patient reports acute pain in back or neck

**Respiratory Problems**

* Compromised respiratory function; severity depends on level of injury.
* Acute respiratory failure is the leading cause of death in high cervical cord injury.

**Diagnostic Evaluation**

* X-ray of spinal column to visualize C1 and C2.
* MRI of spine to detect soft tissue injury, hemorrhage, edema, bony injury
* Electrophysiologic monitoring to determine function of neural pathways.
* Urodynamic studies: urine flow to detect bladder outlet obstruction and/or impaired bladder contractility;
* Ultrasound of the lower extremity or ventilation/perfusion scan to rule out DVT or pulmonary emboli
* Alkaline phosphatase and ESR are elevated.
* Assess nutritional status using nutritional history, anthropometric measurements,
* Total lymphocyte count and creatinine are also used to establish nutritional risk.

**Management**

Requires a multidisciplinary approach

Immediately After Trauma (Less Than 1 Hour)

* Immobilize with rigid cervical collar, sandbags, and rigid spine board to transport from the field to acute care facility.

Acute Phase (1 to 24 Hours)

* Maintenance of pulmonary and cardiovascular stability.
* Intubation and mechanical ventilation, if needed.
* Vasopressors to maintain adequate perfusion
* Spinal cord immobilization using skeletal tongs and traction to ensure vertebral alignment.
* Rigid kinetic turning bed to immobilize patients with thoracic and lumbar injuries.
* Surgery to remove bony and soft tissues that are compressing the spinal cord,
* Methylprednisolone administered within 8 hours of injury.
* Management of neurogenic bladder: Foley catheter
* Pressure ulcer prevention: pressure reduction mattress or kinetic turning frame.

Subacute Phase (Within 1 Week)

* Halo traction is the primary treatment for cervical injuries
* H2-receptor blockers to prevent gastric irritation and hemorrhage.
* Early mobilization and passive exercise as soon as surgically and medically stable.
* Prevent thromboembolism by use of compression boots, heparin

Chronic Phase (Beyond 1 Week)

* Harrington rods with a body jackets for patients with thoracolumbar injuries.
* Compression boots should be continued for 2 weeks;
* treatment of infections, respiratory compromise, pressure ulcers,
* Spinal cord stimulation; and management of central neuropathic pain with anticonvulsants, minor sedatives, antidepressants, nerve block,
* Spasms managed by: calm, stress-free environment, ample time for activities such as positioning and transferring, joint ROM exercises with slow, smooth movements, avoiding temperature extremes, muscle relaxants such as diazepam
* External sphincterotomy may be used for detrusor-sphincter ,
* Inspiratory muscles training to promote respiratory muscle strength
* Rehabilitation: medical and psychosocial support, physical therapy, urologic evaluation, occupational therapy

**Complications**

* Spinal shock: short term loss of all reflex, motor, sensory, and autonomic activity below the level of the lesion.
* Respiratory arrest, pneumonia, atelectasis
* Cardiac arrest from initial trauma or worsening of initial injury from edema,
* Thromboembolic complications
* Infections: respiratory, urinary, pressure ulcers, sepsis.
* Autonomic dysreflexia: exaggerated autonomic response to stimuli below the level of the lesions at or above T6 resulting in dangerous elevation of BP.
* Autonomic dysfunction leading to orthostatic hypotension, impaired thermoregulation, and vasomotor abnormalities.
* Neurogenic bladder may result in renal deterioration; indwelling urinary catheter increases risk of bladder cancer.
* Paralytic ileus
* Bony overgrowth that occurs below the level of injury.
* Syringomyelia: cystic formation in the spinal cord
* Depression.
* Pressure ulcers
* Spasticity may result in contractures.
* Amenorrhea
* Neuropathic pain
* Complications from the surgical apparatus e.g. infection and trauma

**Nursing Assessment**

* Assess cardiopulmonary status and vital signs to help determine degree of autonomic dysfunction, especially in patients with tetraplegia.
* Determine LOC and cognitive function
* Assess motor and sensory of trunk and extremities, increasing neurologic deficits and pain may indicate development of syringomyelia.
* Note manifestation of spinal shock: flaccid paralysis, urine retention, absent reflexes.
* Assess bowel and bladder function.
* Assess quality, location, severity of pain.
* Psychosocial assessment for motivation, support network, financial or other problems.
* Assess for powerlessness: verbal expression of no control over situation, depression, nonparticipation, dependence on others, passivity.

**Nursing Diagnoses**

* Ineffective Breathing Pattern related to paralysis of respiratory muscles or diaphragm
* Impaired Physical Mobility related to motor dysfunction
* Risk for Impaired Skin Integrity related to immobility and sensory deficit
* Urinary Retention related to neurogenic bladder
* Constipation or Bowel Incontinence related to neurogenic bowel
* Risk for Injury: autonomic dysreflexia and orthostatic hypotension
* Powerlessness related to loss of function, long rehabilitation, depression
* Sexual Dysfunction related to erectile dysfunction and fertility changes
* Chronic Pain related to neurogenic changes

**Planning**

**Goals:**

* Attaining an Adequate Breathing Pattern
* Protecting Skin Integrity
* Promoting Urinary Elimination
* Promoting Bowel Elimination
* Preventing Autonomic Dysfunction and Orthostatic Hypotension
* Empowering the Patient
* Minimizing Alteration in Sexuality and Fertility
* Minimizing pain

**Nursing Interventions**

**Attaining an Adequate Breathing Pattern**

* For patients with high-level lesions, monitor respirations, maintain a patent airway, prepare to intubate if respiratory fatigue or arrest occurs.
* Frequently assess cough and vital capacity. Teach effective coughing, if patient is able
* Adequate fluids and humidification of inspired air to loosen secretions.
* Suction as needed; observe vagal response (bradycardia).
* Chest physiotherapy to assist pulmonary drainage and prevent infection.
* Monitor results of ABG values, chest X-ray, and sputum cultures.
* Place the patient in supine, low semi-Fowler's position.
* Place patient on firm kinetic turning bed until spinal cord stabilization. After stabilization, turn every 2 hours on a pressure reduction surface
* Logroll patient with unstable SCI.
* Perform ROM exercises to prevent contractures.
* Monitor BP with position change: lesions above midthoracic cause orthostatic hypotension.
* Encourage physical therapy and exercises as tolerated, electrical stimulation
* Encourage weight-bearing activity to prevent osteoporosis and risk of kidney stones.
* Repositioning by grasping stabilization device may damage the brain, head, or vertebra.

**Protecting Skin Integrity**

* Pay special attention to pressure points when repositioning patient.
* Obtain pressure relief mattress and appropriate wheelchair and cushion.
* Inspect bony prominences: the back of head, ears, trunk, heels, elbows for pressure ulcers
* Keep skin clean, dry, and well-lubricated.
* Turn every 2 hours, patient to perform wheelchair weight shifts every 15 minutes. Place the patient in prone position at intervals, unless contraindicated.
* Treat pressure ulcers immediately, and relieve pressure to promote healing.

**Promoting Urinary Elimination**

* Intermittent catheterization every 4 hours, as an alternative to an indwelling catheter.
* Upper motor neuron lesion (above L1) and no indwelling catheter, promote reflex voiding: tap the bladder, gently pull the pubic hair, or stroke the patient's inner thigh.
* Lower motor neuron lesion (L1 or below) and no indwelling catheter: gently compressing the suprapubic area
* Fluid intake of 3,000 to 4,000 mL per day to prevent infection and urinary calculi. Avoid bladder over distention. Juices decrease urinary pH (inhibiting stone production) and bacterial adherence to a catheter.
* Monitor for urine retention by percussing the suprapubic area for dullness, catheterizing for residual urine after voiding, or using noninvasive devices such as the BladderScan.

**Promoting Bowel Elimination**

* Assess bowel sounds, and note abdominal distention. Paralytic ileus is common
* Encourage high-calorie, high-protein, and high-fiber diet when bowel sounds return
* Schedule bowel care same time of day to develop a predictable outcome.
* Stimulate the gastrocolic reflex 30 minutes before bowel care with food or liquid intake.
* Perform bowel care with patient in bowel chair or in left side-lying position
* Use abdominal massage, deep breathing, warm fluids, and leaning forward in the chair
* Insert a glycerin or bisacodyl suppository or enema
* Use digital stimulation with gloved, lubricated finger, perform manual stool removal
* Encourage Valsalva maneuver (after urinary elimination to prevent vesicoureteral reflux).
* For chronic constipation consider laxative 8 hours before bowel care.

**Preventing Autonomic Dysfunction and Orthostatic Hypotension**

* Be alert to signs of autonomic dysreflexia try to avoid triggers, and treat as directed.
* Prevent, and manage orthostatic hypotension, especially in patients with cervical SCI.
* Use tilt table to gradually increase the patient's ability to tolerate sitting after acute SCI.
* Administer a sympathomimetic, such as ephedrine or pseudoephedrine,

**Empowering the Patient**

* Explain all procedures to the patient
* Make sure that the patient plays part in decision making about care plan.
* Allow the patient to make modifications to treatment plan when possible.
* Schedule procedures and planning sessions when the patient is rested
* Praise the patient for gains in function or participation.
* Discuss stress management techniques: relaxation therapy, counseling, problem solving
* Refer to vocational training program if the patient expresses an interest.
* Peer counseling sessions to gain support from others with SCI.
* Depression (problems with sleep, loss of interest, guilt, loss of energy, lack of concentration, change in appetite, feeling sad) or risk for suicide, refer to mental health counselor. Administer antidepressant medications as directed.
* Explore the use of hands-free environmental control units e.g. remote control gargets

**Autonomic Dysreflexia**

Autonomic dysreflexia occurs after spinal cord injury at the level of T6 or above and may result in dangerously elevated blood pressure (BP).

**Causes:**

* Bladder distention, UTI, bladder or kidney stones
* Cystoscopy, detrusor sphincter dysynergia, urodynamic testing
* Bowel distention, bowel impaction
* Constrictive clothing, shoes, or apparatus
* Noxious stimuli such as pain, strong smells, pressure

**Signs and symptoms of autonomic dysreflexia:**

* Sudden increase in systolic and diastolic BP 20 to 40 mm Hg above the patient's baseline. (Normal systolic BP for a person with tetraplegia is 90 to 110 mm Hg.) In children and adolescents, a systolic increase of > 15 to 20 mm Hg above baseline is significant.
* Pounding headache
* Bradycardia and/or cardiac arrhythmias
* Profuse sweating, piloerection, and flushing above the level of injury
* Blurred vision and spots in visual field
* Nasal congestion
* Apprehension and anxiety

**Take the following actions if autonomic dysreflexia occurs:**

* Check BP; if elevated, call for help immediately.
* Immediately sit the patient up.
* Loosen clothing and other constrictive apparatus.
* Monitor BP every 2 to 5 minutes.
* Check the urinary system; catheterize patient
* If the BP is < 150 mm Hg systolic, check for impaction and remove stool.
* If BP remains > 150 mm Hg systolic, administer immediate release nifedipine 10 mg, nitroglycerin ointment 2.5 cm above the level of injury or another antihypertensive agent.
* If autonomic dysreflexia is unresolved, check for additional causes (eg, pressure ulcer, ingrown toenail).
* Monitor BP for at least 2 hours for recurrent hypertension or symptomatic hypotension.
* Provide patient teaching for prevention and treatment of complication
* Ensure all caregivers understand autonomic dysreflexia and that the patient carries identification card

**Minimizing Alteration in Sexuality and Fertility**

* Encourage patient to discuss alternate expression of feelings with partner.
* Advise bowel care and urinary elimination before intercourse.
* 90% regain regular menstrual cycles by 1 year. Pregnancy can occur, autonomic dysreflexia may occur as a complication of delivery
* Refer patient to urologist to explore sexuality options.
* Women with spinal cord injuries experience little sensation during sexual intercourse; fertility and ability to bear children are usually not affected.
* Men with spinal cord injuries may consider implantation of a penile prosthesis or an assistive device to obtain an erection, Sildenafil (Viagra) to manage erectile dysfunction

**Reducing Pain**

* Assess pain using consistent pain scale.
* Manage neurogenic pain with pharmacological agents as directed.
* Help with nonpharmacologic treatment of pain

**Community and Home Care Considerations**

**Promoting Optimal Function**

* Short- and long-term goals: motor recovery, functional independence, social integration,
* Monitor neurologic status
* Respiratory, bowel, bladder, and skin.
* Bed/wheelchair mobility, transfers, positioning.
* Standing and ambulation.
* Independent ADLs, such as eating, grooming, bathing, and dressing.
* Communication, including speech, computer skills, handwriting, telephone.
* Transportation, including driving, adapted vehicle use, public transportation.
* Homemaking, including meal planning and preparation and chores.
* Assist the patient in arranging modifications necessary to his home environment.
* Coordinate rehabilitation, social support, pharmacologic treatment, and monitor for long-term complications such as depression
* Teach care of traction and immobilization devices.
* involve occupational, physical, vocationa and recreational therapists, and other specialists
* Alert caregivers about autonomic dysreflexia and emergency treatment measures.

**Patient Education and Health Maintenance**

* Educate on physiology of nerve transmission and how the SCI has affected normal function, mobility, sensation, bowel and bladder function.
* Reinforce that rehabilitation is lengthy and involves compliance with therapy.
* Spasms may develop 2 weeks to 3 months after injury interfering with routine ADLs.
* Teach irevention of pressure ulcer: frequent repositioning, weight-shifting and liftoffs every 15 minutes while in a wheelchair, and avoiding shear forces and friction.
* Teach inspection of skin for pressure ulcers, using a mirror if necessary.
* Encourage sexual counseling to promote satisfaction in personal relationships.
* Teach importance of seat belts.

**Evaluation: Expected Outcomes**

* Respirations adequate, ABG values within normal limits
* Repositioning hourly, no orthostatic changes
* No evidence of pressure ulcers
* Reflex (or areflexic) voiding without retention
* Bowel evacuation controlled
* No episodes of autonomic dysreflexia
* Verbalizes feeling of control over condition
* Patient and partner exploring sexuality and sexual options
* Reports pain at or lower than 2 to 3 level on a scale of 1 to 10

**Spinal Disc Problems**

**Degenerative disc disease**

Acute low back pain has duration of less than 3 months; chronic or degenerative disease has duration of 3 months or longer. Most back problems are related to disk disease.

**Herniated intervertebral disk (ruptured disk)**

**Pathophysiology**

The intervertebral disk is a cartilaginous plate that forms a cushion between the vertebral bodies

A ball-like cushion in the center of the disk is called the nucleus pulposus.

In herniation of the intervertebral disk (ruptured disk), the nucleus of the disk protrudes into the annulus (the fibrous ring around the disk), pressure on spinal nerve roots or the spinal cord causes severe, chronic, or recurrent back and leg pain and changes in sensation and deep tendon reflexes.

About 90% of herniated disks involve the lumbar and lumbosacral spine. The most common site is the L4-L5 disk space. The cause of a herniated lumbar disk is usually a flexion injury, cervical herniation is less common; but occurs, is usually in individuals age 45 or older.

**Predisposing factors**

* Degenerative changes that occur with aging
* Trauma (falls and repeated minor stresses such as lifting)
* congenital predisposition
* Biomechanical factors, such as twisting and repetitive motions in occupational settings
* Sedentary occupations
* Obesity
* Smoking

**Clinical Manifestations**

**General Considerations**

* An intervertebral disk may herniate without causing symptoms.
* Symptoms depend on location, size, rate of development, and effect on surrounding structures.
* Pain, sensory changes, loss of reflex, and muscle weakness that resolve without surgery.

**Cervical**

* Pain and stiffness in the neck, top of shoulders, and region of the scapula
* Pain in upper extremities and head
* Paresthesias and numbness of upper extremities
* Weakness of upper extremities

**Lumbar**

* Lower back pain with varying degrees of sensory and motor dysfunction.
* Sciatica: Pain radiating from the lower back into the buttocks and down the leg
* A stiff or unnatural posture
* Some combination of paresthesias, weakness, and reflex impairment
* Positive straight-leg raise test: pain occurs in leg below the knee when leg is raised from a supine position.

**Assessment and Diagnostic Findings**

* History
* Physical examination: low back pain, fracture, tumor, infection, or cauda equina syndrome
* Neurologic examination for reflexes, sensory, or motor impairment
* Electromyography (EMG)
* Myelogram: demonstrates herniation and pressure on spinal cord or nerve roots
* CT scan or MRI: demonstrates herniation; MRI has greater sensitivity
* Electromyography: localizes specific spinal nerve involvement

**Medical Management**

Herniations of the cervical and the lumbar disks are managed conservatively with bed rest and medication.

***Nonpharmacologic Measures***

* Complete bed rest on a firm mattress (2 days usually sufficient).
* Heat or ice massage to affected area.
* Cervical collar or possibly cervical traction
* Physical therapy.
* Nonpharmacologic and pharmacologic measures may be used together for 4 to 6 weeks as conservative management if there is no progressive neurologic deficit.

***Pharmacotherapy***

* Anti-inflammatory drugs, such as ibuprofen or prednisone.
* Muscle relaxants, such as diazepam (Valium)
* Analgesics; opioids may be necessary for several days during acute phase.

**Surgical Management**

Indications: progressing neurologic deficit (muscle weakness and atrophy, loss of sensory and motor function, loss of sphincter control) and continuing pain unresponsive to conservative management

* diskectomy (decompression of nerve root), laminectomy, spinal fusion, microdiskectomy, and percutaneous diskectomy.
* Hemilaminectomy with excision of the involved disk is the surgical procedure most often indicated for lumbar disk disease
* Partial laminectomy or laminotomy: creation of a hole in the lamina of a vertebra
* Discectomy with fusion: a bone graft (from iliac crest or bone bank) is used to fuse the vertebral spinous process to stabilize the spine
* Foraminotomy: removal of the intervertebral foramen to increase the space for exit of a spinal nerve, resulting in reduced pain, compression, and edema

**Alternative and Complementary Measures**

* Acupuncture
* Manipulative therapy
* Massage therapy for adjunct pain relief
* Homeopathic remedies
* Various nutritional supplements

**Complications**

* Permanent neurologic dysfunction (weakness, numbness)
* Chronic pain with
* Cauda equina syndrome

**Nursing Assessment**

* Repeated assessment of motor function, sensation, and reflexes to determine progression
* Assess pain level on scale of 1 to 10.

**Nursing Diagnoses**

* Acute Pain related to area of compression
* Impaired Physical Mobility related to pain and disease physiology
* Deficient Knowledge related to impending surgery
* Risk for Injury related to surgical procedure

**Planning**

**Goals:**

* Minimizing Pain
* Maintaining Mobility
* Preparing the Patient for Surgery
* Preventing Complications Postoperatively

**Nursing Interventions**

**Minimizing Pain**

* Administration of anti-inflammatory drugs food or antacid to prevent GI upset
* Administer muscle relaxant; observe safety because drowsiness may result.
* Administer analgesics, be prepared for sedation.
* Use bed boards under mattress and maintain bed rest
* Maintain supine or low-Fowler's position or side-lying position with slight knee flexion and pillow between knees.
* Apply dry or moist heat to affected area of back
* Encourage relaxation techniques, such as imagery and progressive muscle relaxation.

**Maintaining Mobility**

* Encourage ROM exercises while in bed.
* Properly fit and use a cervical collar (if appropriate to level of injury).
* Apply a back brace or cervical skin traction, if ordered.
* Inspect skin under stabilization devices, for redness and pressure ulcer.
* Provide massage and good skin care to pressure-prone areas.
* Assist patient with activities at bedside, and discourage lifting or straining
* Encourage physical therapy and activity restrictions

**Preparing the Patient for Surgery**

* Educate patient about surgical procedure.
* Document baseline neurologic assessment to compare with after surgery.
* Explain your actions to patient, administer preoperative medications

**Preventing Complications Postoperatively**

* Monitor vital signs and surgical dressing frequently for hemorrhage
* Check blood drainage system for patency and secure vacuum seal.
* Assess movement and sensation of extremities, report new deficit.
* Administer analgesics and steroid medications to control pain from incision and swelling
* Maintain cervical collar if ordered.
* Logroll patient to reposition frequently and encourage coughing and deep breathing.
* Pillow under head (avoid neck flexion) and pillow under knees to take pressure off lower back.
* Provide fluids as soon as gag reflex and bowel sounds are noted.
* Assess for hoarseness: indicates recurrent laryngeal nerve injury; and ineffective cough.
* Watch for dysphagia due to edema of the esophagus, and provide a blenderized diet.
* Make sure that the patient voids after surgery; report urine retention.
* Encourage ambulation as soon as possible
* Report any sudden of radicular pain (may indicate nerve root compression)
* Burning back pain radiating to buttocks (may indicate arachnoiditis).

**Community and Home Care Considerations**

* Encourage back strengthening, aerobic exercise, and endurance exercises.
* Ensure the patient avoids heavy lifting and uses proper body mechanics
* Discourage prolonged bed rest and inactivity.
* Refer for vocational counseling, if indicated.
* In cervical skin traction ensure the patient maintains proper alignment of the neck

**Patient Education and Health Maintenance**

* Educate on lifestyle changes: smoking cessation, increased activity, loss of weight.
* Provide instructions regarding back care to reduce symptoms.
* Teach patient on bed rest, cervical collar to reduce inflammation and heal disk herniation.
* To avoid extreme flexion, extension, or rotation of the neck and to keep the head in neutral position during sleep.
* Bed rest until inflammation and pain are reduced; then ambulation can be increased, but lifting and sitting are discouraged.
* stretching and strengthening exercises of extremities and abdomen once acute symptoms subside
* Teach the use of leg and abdominal muscles rather than the back. Knees should be bent on lifting, and load should be carried close to midtrunk.
* Encourage physical therapy as indicated for reconditioning and work hardening.
* Tell patient to avoid the prone position, long car rides, and sitting in a soft chair.
* Patient to report any changes in neurologic function or recurrence of radicular pain.
* Good nutrition, avoidance of obesity, and proper rest to reduce risk of recurrence.

**Evaluation: Expected Outcomes**

* Verbalizes reduced pain
* Maintains mobility with active lifestyle
* Expresses understanding of preoperative preparation and postoperative care
* Incision healing without signs of infection; patient ambulating with minimal pain

**Chronic neurological conditions**

**Space Occupying Lesions**

**Brain tumors**

Brain tumor refers to abnormal proliferation of cells within the CNS, a mass of cancerous cells within the brain. Tumors require blood to grow and to support its metabolic needs.

**Classification of brain tumors**

**1. Primary tumors**

Tumors of the brain itself, the skull or meninges, the pituitary gland, and the blood vessels

Etiology is unknown.

**Predisposing factors:**

Environmental agents, genetic mutation, and growth factors

Primary CNS tumors rarely metastasize outside the CNS.

**2. Metastatic tumors**

Spread from the primary site of cancer (breast, lung, prostate, kidney) through the vascular supply and lymphatic systems to the brain

**Pathophysiology and Etiology**

* May originate in the CNS or metastasize from tumors elsewhere in the body.
* May be benign or malignant;
* May arise from any tissue of the CNS.

**Common tumor types:**

* Gliomas: tumors of glial cells (supportive tissue of the brain;
* Astrocytoma: tumors of the astrocyte cells (connective tissue) of the brain.
* Oligodendrogliomas: tumors of oligodendroglial cells
* Ependymoma: tumors of the ependymal cells commonly in the floor of the 4th ventricle; increased ICP and hydrocephalus
* Mixed gliomas: tumors of two or more cell types
* Medulloblastoma: commonly located in the 4th ventricle
* Hemangioblastoma: benign tumor commonly located in the posterior fossa.
* Colloid cyst: rare cyst that contains neuroepithelial cells; occurs in the 3rd ventricle.
* Tumors of the meninges
* Peripheral nerve tumors: neuroma/schwannoma, neurofibromatosis
* Pituitary tumors secreting: prolactin, which causes amenorrhea/galactorhhea in women, impotence in men, and infertility in both genders; adrenocorticotrophic hormone causes Cushing's syndrome; or growth hormone causes acromegaly)
* Hematopoietic tumors: secondary lymphoma associated with AIDS.
* Secondary CNS tumors commonly from lung cancer, breast cancer , melanoma, renal,

**Clinical Manifestations**

Manifestations depend on the location of the tumor.

Generalized symptoms (due to increased ICP)

* headache (especially in the morning),
* vomiting,
* papilledema,
* malaise,
* Altered cognition and consciousness.

**Focal neurologic deficits (related to region of tumor):**

* Parietal area: sensory alterations, speech and memory disturbances, neglect, visuospatial deficits, right-left confusion, depression
* Frontal lobe: personality, behavior, and memory changes; contralateral motor weakness; Broca's aphasia
* Temporal area: memory disturbances, auditory hallucinations, Wernicke's aphasia, complex partial seizures, visual field deficits
* Occipital area: visual agnosia and visual field deficits
* Cerebellar area: coordination, gait, and balance disturbances, dysarthria
* Brain stem: dysphagia, incontinence, cardiovascular instability, respiratory depression, coma, cranial nerve dysfunction
* Hypothalamus: loss of temperature control, diabetes insipidus, SIADH
* Pituitary/sella turcica: visual field deficits, amenorrhea, galactorrhea, impotence, cushingoid symptoms, elevated growth hormone, panhypopituitarism
* Referred symptoms (related to the vasogenic [extracellular] edema of the tumor presence) usually present symptoms of ischemia of region distal to the actual lesion.
* Seizures.

**Diagnostic Evaluation**

* Skull radiographs to determine bone involvement
* CT scan with and without contrast
* EEG to detect locus of irritability
* Lumbar puncture for elevated CSF protein, cytology; risk of herniation if increased ICP
* Angiogram to evaluate the vascular supply of the tumor
* MRI to visualize tumor; more useful than CT in posterior fossa evaluation
* Functional MRI evaluates the functions of the brain tissue affected by the tumor
* Biopsy/surgery needed for definitive diagnosis, cell type

**Management**

Treatment is usually by multiple approaches

* Surgery: removal/debulking through craniotomy, laser resection, or ultrasonic aspiration.
* Endovascular treatment: embolization of the arterial feeders to the tumor
* Radiation therapy
* Chemotherapy (limited agents cross blood-brain barrier)
* Shunting procedure to manage hydrocephalus,

**Supportive therapy and medications**

Dexamethasone to reduce swelling and reduce radiation edema; also given during end stage to enhance quality of life.

**Complications**

* Increased ICP and brain herniation; death
* Neurologic deficits from expanding tumor or treatment

**Nursing Assessment**

* Assess vital signs and signs of increased ICP
* Assess cranial nerve function, LOC, mental status, affect, and behavior.
* Monitor for seizures.
* Assess level of pain using visual analogue scale (0 to 10) or face scale
* Assess level of anxiety.
* Assess patient and family patterns of coping, support systems, and resources.

**Nursing Diagnoses**

* Acute Pain related to brain mass, surgical intervention
* Risk for Injury related to altered LOC, possible seizures, IICP, and sensory and motor deficits
* Anxiety related to diagnosis, surgery, radiation, and/or chemotherapy
* Imbalanced Nutrition: Less Than Body Requirements related to compromised neurologic function and stress of injury
* Disabled Family Coping related to changes in roles and structure

**Planning**

**Goals:**

* Relieving Pain
* Preventing Injury
* Minimizing Anxiety
* Optimizing Nutrition
* Strengthening Family Coping

**Nursing Interventions**

**Relieving Pain**

* Provide analgesics
* Elevate the head of the bed at 15 to 30 degrees to reduce cerebral venous congestion.
* Provide a darkened room or sunglasses if the patient is photophobic.
* Maintain a quiet environment to increase patient's pain tolerance.
* Provide scheduled rest periods to help patient recuperate from stress of pain.
* Instruct the patient to lie with the operative side up.
* Alter diet as tolerated if patient has pain on chewing.
* Collaborate with patient on alternative ways to reduce pain such as use of music therapy.

**Preventing Injury**

* Report any signs of increased ICP or worsening neurologic condition immediately.
* Avoid flexion of head; reduce hip flexion to allow ICP to return to baseline.
* Monitor laboratory data, CSF cultures and Gram stains, and communicate results
* Monitor intake/output, osmolality, electrolytes; avoid hydration to prevent cerebral edema.
* Monitor response to pharmacologic therapy including drug levels.
* Seizure precautions; pad the side rails of the bed; oxygen and suction equipment ready
* Avail medications for management of status epilepticus
* Gradual ambulation assisted by physical/occupational therapists to prevent falls.
* If unconscious: elevate head of the bed 30 degrees, head to the side to prevent aspiration.
* If dysphagic, position upright and instruct in sequenced swallowing
* For the patient with visual field deficits, place materials in visual field.
* care and teaching for patient receiving chemotherapy, radiation or craniotomy

**Minimizing Anxiety**

* Help patient to express feelings related to fear and anxiety.
* Include the patient/family in all treatment options and scheduling.
* Introduce stress management techniques.
* Assess the patient's usual coping behaviors, and provide support in these areas.
* Consult with social worker for community resources.

**Optimizing Nutrition**

* Medicate for nausea before position changes, radiation, or chemotherapy, and as needed.
* Maintain adequate hydration, avoid cerebral edema.
* Offer small, frequent meals as tolerated.
* Engage dietitian to evaluate food choices, caloric needs through enteral or parenteral nourishment if unable to take oral nutrition.

**Strengthening Family Coping**

* Recognize stages of grief.
* Foster a trusting relationship.
* Provide clear, consistent explanations of procedures and treatments.
* Encourage family involvement in care from the beginning.
* Establish means of communication when verbal responses are not possible.
* Engage social worker and mental health provider when need arises
* Assist family to use stress management techniques and community resources
* Encourage discussion about prognosis and functional outcome.

**Patient Education and Health Maintenance**

* Explain the adverse effects of treatment.
* Encourage close follow-up after diagnosis and treatment.
* Continued corticosteroids, manage adverse effects (weight gain and hyperglycemia)
* Use of community resources for physical and psychological support,
* Refer the patient/family for more information and support

**Evaluation: Expected Outcomes**

* Reports satisfactory comfort level
* No new neurologic deficits, seizures, falls, or other injuries
* Expresses decreased anxiety
* Nutritional intake meeting metabolic demands
* Patient and family verbalize understanding of treatment and available resources

**Tumors of the spinal cord and canal**

Tumors of the spinal cord and canal may be extradural (chordoma and osteoblastoma); intradural (meningiomas, neurofibromas, and schwannomas); or intramedullary (within the spinal cord), including astrocytomas, ependymomas, and neurofibromatosis.

Vascular tumors can affect any part of the spinal cord or canal.

**Pathophysiology and Etiology**

* Astrocytomas, are more common in children, ependymomas are common in adults. These tumors are central in the spinal cord.
* Vascular tumors: Hemangioblastomas often cause edema, syrinx formation.
* Approximately 85% of all patients develop bony metastasis,
* Cause for abnormal cell growth is unknown.
* Extradural tumors spread to the vertebral bodies.
* Spinal cord and/or nerve compression and paraplegia results.

**Clinical Manifestations**

Depends on location and type of tumor and extent of spinal cord compression

* Back pain that is localized or radiates
* Weakness of extremity with abnormal reflexes
* Sensory changes
* Bladder, bowel, or sexual dysfunction

**Diagnostic Evaluation**

* A plain X-ray or CT scan can detect a pathologic fracture, collapse, or destruction resulting from a mass.
* MRI is sensitive to tumor detection.
* CT myelography with lumbar puncture is sensitive but may be uncomfortable and result in complications from lumbar puncture.

**Management**

* Surgical decompression
* Corticosteroids are administered before and after surgery.
* Radiation therapy may be used over 2 to 4 weeks

**Complications**

* Spinal cord infarction secondary to compression
* Nerve or spinal compression from tumor expansion
* Tetraplegia or paraplegia due to spinal cord compression

**Nursing Assessment**

* Perform motor and sensory components of the neurologic examination.
* Assess pain using scale of 0 to 10 as indicated.
* Assess autonomic nervous system relative to level of lesion pupillary responses, vital signs, bowel, and bladder function.
* Assess for progressive increase in pain, paralysis or paresis, sensory loss, loss of rectal sphincter tone, and sexual dysfunction.

**Nursing Diagnoses**

* Anxiety related to surgery and outcome
* Pain related to nerve compression
* Disturbed Sensory Perception (tactile, kinesthetic) related to nerve compression
* Impaired Urinary Elimination related to spinal cord compression
* Risk for Injury related to surgery

**Planning**

**Goals:**

* Relieving Anxiety
* Relieving Pain
* Compensating for Sensory Alterations
* Achieving Urinary Continence
* Providing Additional Postoperative Care

**Nursing Interventions**

**Relieving Anxiety**

* Provide a safe environment for patient to verbalize anxieties.
* Explain all procedures
* Refer to cancer and SCI support groups as needed.
* Information patient/family regarding disease process and medical interventions.
* Reduce environmental stimulation. Promote periods of rest to enhance coping skills.
* Involve the family in distraction techniques.

**Relieving Pain**

* Administer analgesics as indicated and evaluate for pain control.
* Instruct the patient in the use of patient control analgesia, if available.
* Instruct the patient in relaxation techniques, such as deep breathing, distraction, imagery.
* Position patient off surgical site postoperatively.

**Compensating for Sensory Alterations**

* Reassure patient that sensory/motor impairment may decrease during the postoperative recovery period as surgical edema decreases.
* Sensory loss: to visually scan the extremity to avoid injury related to lack of tactile input.
* Instruct the patient with painful paresthesias in appropriate use of ice, exercise, and rest.
* Sensory and motor alterations: refer to physical therapy for assistance with ADLs, ambulation.

**Achieving Urinary Continence**

* Assess the urinary elimination pattern of the patient.
* Instruct on therapeutic intake of fluid volume and relationship to elimination.
* Instruct on appropriate means of urinary elimination and bowel management

**Providing Additional Postoperative Care**

* Monitor surgical site for bleeding, CSF drainage and signs of infection.
* Keep surgical dressing clean and dry.
* Pad the bed rails and chair if numbness or paresthesias exist, to prevent injury.
* Support the weak/paralytic extremity in a functional position.

**Patient Education and Health Maintenance**

* Encourage the patient with motor impairment to use adaptive devices.
* Demonstrate proper positioning and transfer techniques.
* Sensory loss: educate on dangers of extreme temperatures and adequate foot protection
* For neurofibromatosis, refer to genetic counselor, follow-up for MRI every 12 months to monitor disease progression.
* Refer to cancer and SCI support groups

**Evaluation: Expected Outcomes**

* Asks questions and discusses care options
* Reports that pain is relieved
* Reports decreased paresthesias; ambulatory postoperatively
* Voids at intervals without residual urine
* Incision healing, skin intact

**Degenerative diseases**

**Dementia**

Progressive global impairment of cognition which interferes with performance, due to loss of function, memory deficits, impaired judgment/abstraction, fundamental skills and activities of daily living may be lost.

Clouding of orientation and consciousness may be seen at terminal stage.

**Types of dementia**

* Alcoholic dementia: Delirium tremens
* Apoplectic dementia: that following cerebral tremors/vascular accidents
* Post febrile dementia: that which may follow a severe infective illness, fever.
* Presenile dementia: middle age, cerebral arteriosclerosis: presents with apathy, gait/speech disturbances, memory deficits
* Primary dementia: that associated with Alzheimer's disease
* Pseudo dementia: masked indifference to the environment despite normal cognition
* Senile dementia: geriatric mental deterioration; excitation and short-term memory deficits. Some patients may become assaultive.
* Toxic dementia: caused by poisoning of the central nervous system by drugs in abuse, "over the counter", or prescribed.
* Dementia paralytica: neurosyphilis; irritation, deterioration of concentration and memory, emotional instability
* Dementia praecox: early loss of cognition and skills.
* Vascular or multi-infarct dementia
* Parkinson’s disease,
* AIDS-related dementia,
* Pick’s disease

The two most common types of dementia are Alzheimer’s disease (AD), which accounts for over 50% of cases, vascular or multi-infarct dementia, which accounts for 10% to 20% of cases.

**Alzheimer’s disease**

Alzheimer’s disease (AD) is a progressive, irreversible, degenerative neurologic disease that begins insidiously and is characterized by gradual losses of cognitive function and disturbances in behavior and affect.

NOTE: it is not a normal part of aging.

**Causes**

* genetics,
* neurotransmitter changes,
* vascular abnormalities,
* stress hormones,
* circadian changes,
* head trauma,
* Seizure disorders.

**Risk factor for AD**

* increasing age is the greatest
* environmental,
* dietary,
* inflammatory factors

Classification

1. familial or early-onset AD (which is rare, and accounts for less than 10% of cases)
2. Sporadic or late-onset AD.

**Clinical Manifestations**

Symptoms are highly variable;

* In early disease: forgetfulness and memory loss, social skills and behavioral patterns remain intact (the patient gets lost in a familiar environment or repeats the same stories).
* Conversation becomes difficult with word-finding difficulties.
* Inability to formulate concepts and think abstractly
* Inappropriate impulsive behavior.
* Personality changes: depression, suspicion, paranoia, hostility, and combativeness.
* Speaking skills deteriorate to nonsense syllables;
* Increased agitation and physical activity
* Voracious appetite may develop from high activity level;
* dysphagia as the disease progresses
* Eventually requires help with ADLs including toileting because incontinence occurs.
* Terminal stage may last for months or years.

**Assessment and Diagnostic Findings**

* Health history, physical examination, Mental Status Examination
* Electroencephalography (EEG)
* Computed tomography (CT) scan
* Magnetic resonance imaging (MRI)
* Laboratory tests (complete blood cell count, chemistry profile, and vitamin B12 and thyroid hormone levels) and cerebrospinal fluid (CSF) analysis

**Medical Management**

* The primary goal is to manage the cognitive and behavioral symptoms.
* No cure and no way to slow the progression
* Cholinesterase inhibitors, such as donepezil hydrochloride are used to manage cognitive symptoms. The drugs enhance acetylcholine uptake in the brain to maintain memory skills for a period of time.

**Nursing management**

**Assessment**

Health history, mental status examination and physical examination, noting symptoms indicating dementia

**Nursing Diagnoses**

* Impaired thought processes related to decline in cognitive function
* Risk for injury related to decline in cognitive function
* Anxiety related to confused thought processes
* Imbalanced nutrition: less than body requirements related to cognitive decline
* Activity intolerance related to imbalance in activity/rest pattern
* Deficient self-care, bathing/hygiene, feeding, toileting related to cognitive decline
* Impaired social interaction related to cognitive decline
* Deficient knowledge of family/caregiver related to care for patient as cognitive function declines
* Ineffective family processes related to decline in patient’s cognitive function

**Planning**

**Goals:**

* supporting cognitive function,
* physical safety,
* reduced anxiety and agitation,
* adequate nutrition,
* improved communication,
* activity tolerance,
* self-care,
* socialization,
* Support and education of caregivers.

**Nursing Interventions**

**Supporting Cognitive Function**

* Provide a calm, predictable environment to minimize confusion and disorientation.
* Ensure clear, simple explanations; and use of memory aids and cues.

**Promoting Physical Safety**

* Provide a safe environment to allow patient to move about as freely as possible
* Prevent falls: remove obvious hazards, provide adequate lighting, install handrails
* Prohibit driving.
* Allow smoking only with supervision.
* Reduce wandering behavior with gentle persuasion and distraction.
* Supervise all activities outside the home to protect the patient.
* Secure doors leading from the house.
* Ensure that patient wears an identification bracelet or neck chain.
* Avoid restraints because they may increase agitation.

**Promoting Independence in Self-Care Activities**

* Simplify daily activities into short achievable steps for a sense of accomplishment.
* Maintain patient’s personal dignity and autonomy.
* Encourage participation in self-care activities as much as possible.

**Reducing Anxiety and Agitation**

* Provide emotional support to reinforce a positive self-image.
* When skill losses occur, adjust goals to fit patient’s declining ability to prevent agitation.
* Keep the environment simple, familiar, and noise-free; limit changes.
* Remain calm and unhurried, particularly if the patient is experiencing a combative, agitated state known as catastrophic reaction (overreaction to excessive stimulation).

**Improving Communication**

* Reduce noises and distractions.
* Use easy-to-understand sentences to convey messages.

**Providing for Socialization and Intimacy Needs**

* Encourage visits, letters, and phone calls (visits brief and nonstressful, one or two visitors at a time).
* Encourage patient to participate in simple activities or hobbies.
* Advise that the friendliness of a pet can be satisfying and an outlet for energy.
* Encourage to talk about sexual concerns and suggest sexual counseling if necessary.

**Promoting Adequate Nutrition**

* Keep mealtimes simple and calm; avoid confrontations.
* Cut food into small pieces to prevent choking, and convert liquids to gelatin to ease swallowing. Offer one dish at a time.
* Prevent burns by serving food and beverages warm.

**Balancing Activity and Rest**

* Offer music, warm milk, or a back rub to help patient relax and fall asleep.
* For nighttime sleep, ensure sufficient daytime exercise. Discourage long periods of daytime sleeping.
* Address psychological needs that may prompt wandering or inappropriate behavior.

**Supporting Home- and Community-Based Care**

* Be sensitive to the highly emotional issues that the family is confronting.
* Notify the local adult protective services agency if neglect or abuse is suspected.
* Refer to the Alzheimer’s Association for support groups and adult day care services.

**Evaluation**

**Expected Patient Outcomes**

* Maintains cognitive, functional, and social interaction abilities for as long as possible.
* Remains free of injury.
* Participates in self-care activities as much as possible.
* Demonstrates minimal anxiety and agitation.
* Able to communicate (verbally or nonverbally).
* Socialization and intimacy needs are met.
* Receives adequate nutrition, activity, and rest.
* Patient and family caregivers are knowledgeable

**Amyotrophic lateral sclerosis**

Also known as Lou Gehrig disease, is an incapacitating, fatal neuromuscular disease, progressive muscle weakness and progressive wasting and paralysis of the muscles, accompanied by atrophy or fasciculation (Spontaneous contractions of muscle fibers). About 80% of cases begin between ages 40 and 70. The life expectancy of an ALS patient averages 2 to 5 years.

**Pathophysiology and Etiology**

* Degeneration of upper motor neurons (nerves from the brain to medulla or spinal cord) and lower motor neurons (nerves from the spinal cord to the muscles of the body).
* Progressive loss of voluntary muscle contraction and functional capacity (legs, feet, arms and hands, and those that control swallowing and breathing).
* Cause is unknown.

**Clinical Manifestations**

* Progressive weakness and wasting of muscles of arms, trunk, and legs
* Fasciculation and spasticity
* Difficulty swallowing (regurgitation through nose), difficulty speaking and breathing
* Cranial nerve deficits: dysarthria, voice deterioration, and dysphagia

**Diagnostic Evaluation**

* Electromyography
* Nerve conduction study
* Pulmonary function tests
* Barium swallow
* MRI, CT scan
* Laboratory tests: creatine kinase, heavy metal screen, thyroid function tests,

**Management**

* There is no cure for ALS or therapy to prevent or reverse the disorder.
* Most treatment is palliative and symptomatic.
* Antispasmodic medication
* Diazepam (Valium) to control fasciculations.
* Antidepressants, sleep medications.
* Feeding gastrostomy.
* Mechanical ventilation eventually becomes necessary.

**Complications**

* Respiratory failure
* Aspiration pneumonia
* Cardiopulmonary arrest
* Locked-in syndrome: fully conscious but unable to respond in any way

**Nursing Assessment**

* Evaluate respiratory function: rate, depth, tidal volume.
* Perform cranial nerve assessment, particularly gag reflex and swallowing.
* Assess voluntary motor function and strength.

**Nursing Diagnoses**

* Ineffective Breathing Pattern related to respiratory muscle weakness
* Impaired Physical Mobility related to disease process
* Imbalanced Nutrition: Less Than Body Requirements related to inability to swallow
* Fatigue related to denervation of muscles
* Social Isolation related to fatigability and decreased communication skills
* Risk for Infection related to inability to clear airway

**Planning**

**Goals:**

* Maintaining Respiration
* Optimizing Mobility
* Meeting Nutritional Requirements
* Minimizing Fatigue
* Maintaining Social Interaction
* Preventing Aspiration and Infection

**Nursing Interventions**

**Maintaining Respiration**

* Monitor vital capacity frequently, document pattern,
* Position upright, suction upper airway, chest physical therapy to enhance respiration
* Encourage use of incentive spirometer to exercise respiratory muscles.
* Assess for hypoxia: tachypnea, hypopnea, restlessness, poor sleep, excessive fatigue
* Establish the wishes of the patient in terms of life-support measures
* Assist with intubation, tracheostomy, and mechanical ventilation when indicated
* Suctioning and routine care of a patient with artificial airway and mechanical ventilation

**Optimizing Mobility**

* Encourage usual activities as long as possible, but modify exertion to avoid fatigue.
* Physical therapy, ROM exercises to strengthen unaffected muscles, prevent contractures.
* Encourage energy-conservation techniques.
* Assistive devices: special feeding devices, remote controls, and a motorized wheelchair.

**Meeting Nutritional Requirements**

* Provide high-calorie, small, frequent feedings.
* Meals of a texture the patient can handle; semisolid food is usually easiest to swallow.
* Do not wash down solids with fluids, may cause choking and aspiration.
* Provide assistive devices for self-feeding when possible.
* Examine oral cavity for food debris before and after meals,
* Encourage rest periods before meals to alleviate muscle fatigue.
* Place patient upright for meals with neck flexed to partially protect the airway.
* Swallowing technique: take a breath before swallowing, hold breath to swallow, exhale or cough after swallow, and swallow again.
* Tell patient to avoid talking while eating.
* Prepare patient for gastrostomy or other alternate feeding methods when appropriate.

**Minimizing Fatigue**

* Encourage activity alternating with frequent naps.
* Encourage patient to accomplish most important activities early in day.
* Consult with occupational therapist about energy-conservation techniques

**Maintaining Social Interaction**

* Use mechanical speech aids or communication board.
* Develop a code system to serve as a communication method.
* Provide adaptive call light, constant monitoring and surveillance to meet patient's needs.
* Allow patient to select which social activities are meaningful.
* Refer to counselor or psychologist for coping with communication barriers

**Preventing Aspiration and Infection**

* Consult speech therapist for techniques and devices to assist swallowing.
* Discourage bed rest to prevent pulmonary stasis.
* Perform chest physiotherapy as tolerated.
* Monitor for fever and tachycardia, and obtain sputum, urine, and other cultures

**Community and Home Care Considerations**

* Teach caregivers suctioning, tracheostomy care, and ventilator care at home
* Clean technique will be used rather than sterile.
* Teach caregivers how to perform gastrostomy feedings and care of tube.
* Assess for adequate supplies for care and ability of caregivers to carry out procedures.
* Encourage cleanliness, avoidance of contact with anyone with respiratory infection

**Patient Education and Health Maintenance**

* Stress the importance of physical exercise.
* Review proper eating mechanics to avoid fatigue and aspiration.
* Inform the patient of right to make decisions if he decides against artificial ventilation.
* Encourage the family to seek support and respite care.
* Remind the family that in ALS there is full alertness, sensory function, and intelligence
* Refer the patient/family for more information and support to ALS agencies

**Evaluation: Expected Outcomes**

* Respirations 28, shallow, unlabored at rest
* Does active ROM exercises for 15 minutes twice per day; uses assistive utensils to feed self
* Tolerates small, frequent feedings without aspiration
* Naps twice per day for 1 to 2 hours
* Communicates needs effectively to staff and family
* No signs of respiratory or urinary infection

**Parkinson’s disease**

Parkinson's disease is a chronic, progressive neurologic disease affecting the brain centers responsible for control and regulation of movement. It is characterized by tremor, bradykinesia, rigidity, and postural abnormalities. It is less common in younger ages.

**Pathophysiology and Etiology**

* Deficiency of dopamine, due to degenerative changes in the substantia nigra of the brain,
* Etiology: virus; genetic susceptibility; toxicity from pesticides, herbicides, methyl-phenyl-tetrahydropyridine, or welding fumes; repeated head injuries, or other unknown cause.

**Clinical Manifestations**

* slowness of movement, loss of spontaneous movement and delay in initiating movements
* Resting (pill-rolling) tremor affecting the limbs, the head, neck, face, and jaw.
* Rigidity that increases during movement, pain especially in the arms and shoulders.
* Poor balance when moving or changing body position abruptly. May lead to falls.
* Sleeplessness, salivation, sweating, orthostatic hypotension, dizziness.
* Depression, dementia.
* Masklike face secondary to rigidity.
* Gait difficulties: decreased or nonexistent arm swing; short, shuffling steps, difficulty in negotiating turns; and sudden freezing (inability to take the next step).
* Verbal fluency may be impaired.
* Finger tapping responses are slowed.
* Micrographia (change in handwriting, with the script becoming smaller)
* Problems with speech, breathing, swallowing, and sexual function.

**Diagnostic Evaluation**

* Observation of clinical symptoms; may do imaging studies to rule out other disorders.
* Physical examination: elbow extension reveals rigidity
* Uses abnormally high force for grips and holds longer than normal
* Responds favorably to a single dose of levodopa, this confirms the diagnosis.

**Management**

**Pharmacologic**

* Anticholinergics e.g. artane to controll tremor, but cause confusion and hallucinations.
* Amantadine blocks reuptake but increases release of dopamine by neurons in the brain,
* The combination of levodopa-carbidopa; carbidopa prevents levodopa from being metabolized in the gut, liver, and other tissues, and allows more to get to the brain. Therefore, a smaller dose of levodopa is needed to treat symptoms, and the unpleasant adverse effects are greatly reduced.
* Bromocriptine activates dopamine receptors in the brain.
* Monoamine oxidase inhibitor
* Tolcapone and entacapone block the enzyme that breaks down levodopa before it reaches the brain. Must be taken with levodopa.

Watch for adverse effects: anxiety, confusion, and hallucinations; cardiac effects, such as dizziness, orthostatic hypotension, and pulse irregularity; and blepharospasm (twitching of the eyelid), dry mouth, nausea, drowsiness, and insomnia.

**Surgery**

* Medial pallidotomy (electrode destroys cells in the globus pallidus) often improves longstanding symptoms such as dyskinesia, akinesia, rigidity, tremor,
* Chronic deep brain stimulation of the thalamus: electrodes are implanted in the thalamus or globus pallidus and connected to a pacemaker-like device, which the patient can switch on or off as symptoms dictate.

**Complications**

* Dementia
* Aspiration
* Injury from falls

**Nursing Assessment**

* History of symptoms and their effect on mobility, feeding, communication, self-care
* Assess cranial nerves, cerebellar function (coordination) and motor function.
* Observe gait and performance of activities.
* Assess speech for clarity and pace.
* Assess for signs of depression.
* Assess family dynamics, support systems, and access to social services.

**Nursing Diagnoses**

* Impaired Physical Mobility related to bradykinesia, rigidity, and tremor
* Imbalanced Nutrition: Less Than Body Requirements related to motor difficulties with feeding, chewing, and swallowing
* Impaired Verbal Communication related to decreased speech volume and facial muscle involvement
* Constipation related to diminished motor function, inactivity, and medications
* Ineffective Coping related to physical limitations and loss of independence

**Planning**

**Goals:**

* Improving Mobility
* Optimizing Nutritional Status
* Maximizing Communication Ability
* Preventing Constipation
* Strengthening Coping Ability

**Nursing Interventions**

**Improving Mobility**

* Encourage daily exercise; walking, riding a stationary bike, swimming, or gardening.
* Advise on stretching and postural exercises as outlined by physical therapist.
* Encourage warm baths and massage to relax muscles.
* Instruct on frequent rest periods to overcome fatigue and frustration.
* Teach postural exercises and walking techniques to offset shuffling gait

**Optimizing Nutritional Status**

* Teach the sequence of swallowing: close lips with teeth together; lift tongue up with food on it; then move tongue back and swallow while tilting head forward.
* Instruct patient to chew deliberately and slowly, using both sides of mouth.
* Instruct to control accumulation of saliva by holding head upright and swallowing periodically.
* Ensure use of secure, stabilized dishes and eating utensils.
* Suggest smaller meals and additional snacks.
* Monitor weight.

**Maximizing Communication Ability**

* Encourage compliance with medication regimen.
* Suggest referral to speech therapist.
* Teach patient facial exercises and breathing methods to obtain appropriate pronunciation, volume, and intonation
* Exercise facial muscles by smiling, frowning, grimacing, and puckering.

**Preventing Constipation**

* Encourage foods with moderate fiber content whole grains, fruits, and vegetables.
* Increase water intake.
* Obtain a raised toilet seat to encourage normal position.
* Encourage patient to follow regular bowel regimen.

**Strengthening Coping Ability**

* Help the patient establish realistic goals and outline ways to achieve goals.
* Provide emotional support and encouragement.
* Encourage therapists, primary care provider, social worker, and social support network.
* Encourage open communication, discussion of feelings, and exchange of information
* Have patient take an active role in activity planning and evaluation of treatment plan.
* Observe for changes in depression and response to antidepressants.

**Community and Home Care Considerations**

* Recommend interdisciplinary home health care program.
* Encourage use of soothing music to reduce pain and depression.
* Assess safety in environment to reduce risk of falls.
* Utilize physical therapy services to encourage safe ambulation and reduce fear of falls.
* Encourage social services, respite care and health visitors, mental health counselors, and support groups to prevent caregiver strain.
* Use occupational therapy aids: grab rails in the tub or shower, raised toilet seat, hand rails on both sides of the stairway, rope secured to foot of bed to achieve sitting position, and straight-back wooden chairs with armrests.

**Patient Education and Health Maintenance**

* To avoid sedatives, vitamin B preparations, vitamin-fortified foods, this can reverse effects of medication.
* Teach drug reactions: orthostatic hypotension, dry mouth, dystonia, muscle twitching, urine retention, impaired glucose tolerance, anemia, and elevated liver function tests.
* Follow-up and monitore for diabetes, glaucoma, hepatotoxicity, and anemia while on drug therapy.
* Teach patient ambulation cues to avoid freezing and falls
* Family not to pull patient during episodes of freezing to prevent falls
* Refer the patient/family to support agencies

**Evaluation: Expected Outcomes**

* Attends physical therapy sessions, does facial exercises 10 minutes twice per day
* Eats three small meals and two snacks, no weight loss
* Enunciation clear, speaking in four to five words per breath
* Passes soft stool every day
* Asks questions about Parkinson's, obtains help from family and/or friends

**Huntington’s autoimmune disorders**

Huntington disease is a chronic, progressive hereditary disease of the nervous system characterized by progressive involuntary choreiform (dancelike) movements and dementia.

It is believed that glutamine abnormally collects in certain brain cell nuclei, causing cell death.

It is majorly a genetic disorder; each child of a parent with Huntington disease has a 50% risk of inheriting the illness. Onset usually occurs between 35 and 45 years of age.

**Clinical Manifestations**

* Constant writhing, twisting, and uncontrollable movements of the entire body (chorea),
* Intellectual decline, emotional disturbance.
* Facial tics and grimaces;
* Speech becomes slurred, hesitant, explosive, and eventually unintelligible.
* Difficult chewing and swallowing with risk of aspiration and choking
* Gait becomes disorganized, and ambulation is eventually impossible;
* Bowel and bladder control is lost.
* Progressive intellectual impairment and dementia.
* Personality changes: nervous, irritable, or impatient behaviors.
* Uncontrollable anger; suicidal depression; apathy; anxiety; psychosis; euphoria.
* Hallucinations, delusions, and paranoid thinking
* Patient dies in 10 to 20 years from heart failure, pneumonia, infection, a fall or choking.

**Assessment and Diagnostic Findings**

* clinical presentation of symptoms, family history, presence of a genetic marker,
* A genetic marker for Huntington disease has been located but it offers no hope of cure

**Medical Management**

* No treatment stops or reverses the process; palliative care is given.
* Thiothixene hydrochloride and haloperidol decanoate, block dopamine receptors, improve the chorea in many patients;
* Antiparkinsonian medications, such as levodopa (Larodopa) to relieve rigidity.
* Evaluate motor signs continually, akathisia (motor restlessness) in the overmedicated patient is dangerous and should be reported.
* Psychotherapy to allay anxiety and reduce stress
* Antidepressants for depression or suicidal ideation
* Antipsychotic medications to treat psychotic symptoms

**Nursing Management**

* Teach patient and family about medications, signs indicating need for change in dosage or medication.
* Manage symptoms (chorea, swallowing problems, ambulation problems, or altered bowel or bladder function).
* Arrange for consultation with a speech therapist, if needed.
* Support due to emotional, physical, social, and financial implications of the disease.
* Emphasize the need for regular follow-up.
* Refer for home care, day care centers, and eventually skilled long-term care to assist patient and family to cope.

**Multiple sclerosis**

MS is a chronic, progressive neurologic disease of the CNS of unknown etiology and uncertain trajectory. It is characterized by small patches of demyelination of the white matter of the optic nerve, brain, and spinal cord, involves exacerbations and remissions of symptoms over the course of the illness.

**Pathophysiology and Etiology**

* Demyelination refers to the destruction of the myelin, the fatty and protein material that covers certain nerve fibers in the brain and spinal cord
* Disordered transmission of nerve impulses.
* Inflammation and scarring of the affected nerve fibers.
* Cause unknown but related to autoimmune dysfunction, genetics or infectious process.
* More prevalent in the northern latitudes and among Caucasians.

**Classification**

* Relapsing remitting (RR) with complete recovery
* Secondary progressive (SP): disease progression occurs with or without relapses
* Primary progressive (PP): steady progression of disability from onset without exacerbations and remissions
* Progressive relapsing (PR): patients experience acute exacerbations with a steadily progressive course.

**Clinical Manifestations**

Symptoms reflect the location of the area of demyelination.

* Fatigue and weakness.
* Abnormal reflexes absent or exaggerated.
* Vision disturbances: impaired and double vision, nystagmus.
* Motor dysfunction: weakness, tremor, incoordination.
* Sensory disturbances: paresthesias, impaired deep sensation, impaired vibratory and position sense.
* Impaired speech: slurring, dysarthria.
* Urinary dysfunction: hesitancy, frequency, urgency, retention, incontinence; upper UTI.
* Neurobehavioral syndromes: depression, cognitive impairment, emotional lability.

**Diagnostic Evaluation**

* Establishing a definitive diagnosis is often difficult,
* MRI
* Electrophoresis study of CSF shows abnormal IgG antibody.
* Visual, auditory, and somatosensory evoked potentials, slowed conduction shows evidence of demyelination.

**Management**

MS treatment is dynamic and rapidly evolving, covering two main areas: direct treatment of MS, and treatment of the effects or symptoms resulting from MS. Treatment is aimed at relieving symptoms and helping the patient function.

**Disease-Modifying Drugs**

* Corticosteroids or adrenocorticotropic decrease inflammation, shorten duration of relapse or exacerbation.
* Immunosuppressive agents may stabilize the course.
* Plasmapheresis (plasma exchange)

**Chronic Symptom Management**

* Treatment of spasticity: diazepam, physical therapy, nerve blocks, surgical intervention
* Control of fatigue with amantadine (and lifestyle changes
* Treatment of depression with antidepressant drugs and counseling
* Bladder management with anticholinergics, intermittent catheterization, antibiotics
* Bowel management with stool softeners, bulk laxative, suppositories
* Multidisciplinary rehabilitation: physical therapy, occupational therapy, speech therapy, cognitive therapy, vocational rehabilitation, and complementary and alternative medicine
* Control dystonia with carbamazepine
* Management of pain syndromes with carbamazepine, phenytoin, amitriptyline

**Complications**

* Respiratory dysfunction
* Infections: bladder, respiratory, sepsis
* Complications from immobility
* Speech, voice, and language disorders such as dysarthria

**Nursing Assessment**

* Observe motor strength, coordination, and gait.
* Perform cranial nerve assessment.
* Evaluate elimination function.
* Explore coping, activity and sexual function, emotional adjustment.
* Assess patient and family coping, support systems, available resources.

**Nursing Diagnoses**

* Impaired Physical Mobility related to muscle weakness, spasticity, and incoordination
* Fatigue related to disease process and stress of coping
* Disturbed Sensory Perception (tactile, kinesthetic, visual) related to disease process
* Impaired Urinary Elimination related to the disease process
* Interrupted Family Processes related to inability to fulfill expected roles
* Sexual Dysfunction related to disease process

**Planning**

**Goals:**

* Promoting Motor Function
* Minimizing Fatigue
* Optimizing Sensory Function
* Maintaining Urinary Elimination
* Normalizing Family Processes
* Promoting Sexual Function

**Nursing Interventions**

**Promoting Motor Function**

* Perform muscle stretching and strengthening exercises daily,
* Apply ice packs before stretching to reduce spasticity.
* Tell patient to avoid muscle fatigue by engaging in activity they can tolerate
* Teach patient how to use such devices as braces, canes, and walkers when necessary.
* Inform to avoid sudden changes in position, walk with a wide-based gait to avoid falls
* Encourage frequent change in position to prevent contractures

**Minimizing Fatigue**

* Patient and family should understand that fatigue is an integral part of multiple sclerosis.
* Plan ahead, and prioritize activities. Take brief rest periods throughout the day.
* Avoid overheating, overexertion, and infection.
* Encourage energy conservation techniques, such as sitting to perform activity, limiting trips up and down stairs, pulling, or pushing rather than lifting.
* Help patient develop healthy lifestyle with balanced diet, rest, exercise, and relaxation.

**Optimizing Sensory Function**

* Eye patch or frosted lens (alternate eyes) for patients with double vision.
* Encourage ophthalmologic consultation to maximize vision.
* Orient patient to the environment, arrange furniture and personal articles.
* Make sure floor is free from obstacles, loose rugs, or slippery areas.
* Teach the use of all senses to maintain awareness of environment.

**Maintaining Urinary Elimination**

* Ensure adequate fluid intake to help prevent infection and stone formation.
* Assess for urine retention, and catheterize for residual urine as indicated.
* Teach patient to report signs of UTI immediately.
* Set up bladder training program to reduce incontinence.

**Normalizing Family Processes**

* Encourage counseling and use of church or community resources.
* Household duties and child-care responsibilities should be less stressful.
* Expand treatment efforts to include the whole family.
* Support mothers with MS during their child-rearing years.

**Promoting Sexual Function**

* Encourage open communication between partners.
* Discuss birth control options, if appropriate.
* Suggest sexual activity when patient is most rested.
* Suggest consultation with sexual therapist to help obtain greater sexual satisfaction.

**Community and Home Care Considerations**

* The nurse is a care provider, facilitator, advocate, educator, counselor, and innovator.
* Teach the patient and family to use their own judgment, knowledge to control symptoms.
* Teach patient and family how to conduct periodic self-assessment of daily functioning

**Patient Education and Health Maintenance**

* Encourage the patient to maintain activities at a lower intensity.
* Advise the patient to avoid exposure to heat and cold or infectious agents.
* Encourage a nutritious diet high in fiber to promote health and good bowel elimination.
* Advise that some medications may cause weakness: antibiotics, muscle relaxants, antiarrhythmics , antihypertensives, antipsychotics, oral contraceptives, antihistamines
* Refer the patient/family to support agencies

**Evaluation: Expected Outcomes**

* Performs exercises correctly without spasm
* Rests at intervals, tolerating activity well
* Moves about in environment without injury
* Voids every 2 hours with no incontinent episodes
* Family sharing care, discussing feelings
* Reports satisfaction with sexual activity

**Myasthenia gravis**

Myasthenia gravis is a chronic autoimmune disorder affecting the neuromuscular transmission of impulses in the voluntary muscles. Antibodies against acetylcholine receptor sites impair transmission of impulses across the myoneural junction. Therefore, fewer receptors are available for stimulation.

Women are affected more frequently than men, and they tend to develop the disease at an earlier age (20 to 40 years of age, versus 60 to 70 years for men).

**Pathophysiology**

* Depletion of acetylcholine receptors at neuromuscular junctions due to autoimmune attack leading to failed transmission of nerve impulses resulting in decreased muscle power

**Etiology**

* Genetic make-up and environmental factors
* Thyroid gland abnormalities and thymic tumor

**Clinical Manifestations**

It is purely a motor disorder with no effect on sensation or coordination.

* Extreme muscular weakness and easy fatigability.
* Vision disturbances: diplopia and ptosis from ocular weakness
* Facial muscle weakness causes a masklike facial expression.
* Dysarthria and choking from weakness of laryngeal and pharyngeal muscles
* Proximal limb weakness, with specific weakness in the small muscles of the hands.
* Weak intercostal muscles result in respiratory failure

**Diagnostic Evaluation**

* Serum test for acetylcholine receptor (AChR) antibodies.
* Injection of edrophonium (have atropine available for side effects), improvement in muscle strength is a positive test and usually confirms the diagnosis.
* Electromyography: reduced response to repetitive nerve stimulation.
* CT scan to assess enlargement of thymus gland

**Management**

Improving function and reducing and removing circulating antibodies, there is no cure; treatments do not stop the production of the acetylcholine receptor antibodies.

* Pyridostigmine bromide inhibits the breakdown of acetylcholine
* Immunosuppressive drugs, such as prednisone
* Plasmapheresis removes antibodies from the blood
* Thymectomy for those people with tumor of the thymus gland

**Complications of myasthenia gravis**

**1. Myasthenic crisis:** exacerbation characterized by severe generalized muscle weakness and may result in respiratory failure.

**Causes:** respiratory infection, aspiration, physical/emotional stress, surgery, pregnancy, medications that exacerbate myasthenia.

**Symptoms:** sudden respiratory distress, dysphagia, dysarthria, ptosis, and diplopia, tachycardia, anxiety, rapidly increasing weakness of extremities and trunk

**2. Cholinergic crisis:** caused by overmedication with cholinesterase inhibitors; atropine sulfate should be on hand to treat bradycardia or respiratory distress.

NB: Neuromuscular respiratory failure is the critical complication in myasthenic and cholinergic crises.

**3. Complications of decreased physical mobility**

**Interventions for myasthenic crisis:**

* Immediate hospitalization and may require intensive care
* Edrophonium (Tensilon)
* Airway: mechanical ventilation, suctioning, oxygen therapy, postural drainage with percussion and vibration, intubation, semi-Fowler's position, especially in obese patients.
* Plasmapheresis
* Pyridostigmine bromide
* Discontinue anticholinergic medications until respiratory function improves;
* Atropine to reduce excessive secretions for cholinergic crisis

**Nursing Assessment**

* History of extreme muscle weakness and fatigue.
* Assess cranial nerve function, motor fatigability with repetitive activity, and speech. Observe eye muscles (usually affected first) for ptosis, ocular palsy, diplopia.
* Assess for breathlessness, respiratory weakness, tidal volume, and vital capacity

**Nursing Diagnoses**

* Fatigue related to disease process
* Risk for Aspiration related to muscle weakness of face and tongue
* Social Isolation related to diminished speech capabilities and increased secretions

**Planning**

**Goals:**

* Minimizing Fatigue
* Preventing Aspiration
* Maintaining Social Interactions

**Nursing Interventions**

**Minimizing Fatigue**

* Plan exercise, meals, and other ADLs during energy peaks.
* Assist the patient in developing realistic activity schedule.
* Provide an eye patch to protect the eyes for the patient with diplopia
* Allow for rest periods throughout the day
* Obtain assistive devices to help patient perform ADLs.

Some medications can worsen the weakness include some antibiotics, antiarrhythmics, local and general anesthetics, muscle relaxants, and analgesics.

**Preventing Aspiration**

* Assess patient's oral motor strength before each meal.
* Head in a slightly flexed position to protect airway during eating.
* Minimize risk of aspiration; give soft, solid foods instead of liquid.
* Have suction equipment available
* I.V. fluids and NG tube in impaired swallowing; elevate head of bed after feeding.
* Suction frequently if on a mechanical ventilator; assess breath sounds and chest X-ray

**Maintaining Social Interactions**

* Encourage alternative communication method if speech is affected.
* Instruct to speak slowly to avoid voice strain; refer to speech therapist
* Patient to cup chin in hands during speech to support lower jaw and assist with speech.
* Teach patient to tilt head, and to carry a handkerchief to manage secretions in public.
* Encourage family participation in care.
* Refer patient to the Myasthenia Gravis Foundation to meet other patients with the disease

**Community and Home Care Considerations**

* Avoid physical and emotional stress e.g. uncomfortable temperature, draft, loud noises
* Emphasize follow-up and compliance with treatment regimen.
* Refer to community agencies such as physical therapy, nutritional services.
* Teach patient and family how to use home suction in case of aspiration

**Patient Education and Health Maintenance**

* Instruct the patient and family regarding the symptoms of crisis.
* Review medications and adverse effects such as GI distress.
* Stress the importance of scheduled rest periods before fatigue develops.
* Patient to prevent crisis by avoiding infections, excessive heat and cold, emotional upset
* Encourage patient to wear a MedicAlert bracelet.
* Stress importance of adequate nutrition; instruct to chew food thoroughly and eat slowly.
* Advise patient to avoid alcohol
* Refer patient/family for more information to Myasthenia Gravis Foundation

**Evaluation: Expected Outcomes**

* Demonstrates optimal self-care in bathing, eating, toileting, and dressing without fatigue
* Breathes effectively, cough is effective, suctioning own secretions, lungs clear
* Visits friends, participates in social activities, uses alternative method of communications

**Guillain Barre Syndrome**

Guillain–Barré syndrome (GBS) refers to acute, rapid segmental demyelination of peripheral nerves and some cranial nerves, causing ascending weakness with dyskinesia (inability to execute voluntary movements), hyporeflexia, and paresthesias (numbness).

Mortality results from respiratory failure, autonomic disturbances, sepsis, and complications of immobility.

**Pathophysiology**

This is an autoimmune attack on peripheral nerve myelin proteins (substances speeding conduction of nerve impulses). The Schwann cell (which produces myelin in the peripheral nervous system is not affected allowing for remyelination in the recovery phase of the disease.

**Causes:**

* An autoimmune destruction of the myelin sheath surrounding peripheral nerve axons
* Viral infection, immunization, or surgery may trigger the autoimmune response.
* Can follow Campylobacter infection, an acute infectious diarrheal illness.
* Cell-mediated immune reaction causes demyelination and axonal degeneration

**Clinical Manifestations**

* Acute onset of symmetric progressive ascending muscle weakness; beginning in the legs and ascending to the trunk, upper extremities, and facial muscles with diminished reflexes of the lower extremities; may progress to tetraplegia;

**Demyelination of various nerve fibers and the consequences:**

* Diaphragm and intercostal muscles : decreased vital capacity, depth of respirations, and breath sounds
* Paresthesia and pain of the hands and feet
* Optic nerve demyelination may result in blindness.
* Glossopharyngeal and vagus nerves leads to inability to swallow or clear secretions.
* Vagus nerve: autonomic dysfunction (tachycardia, bradycardia, hypertension, or orthostatic hypotension).
* Cranial nerve: difficulty with swallowing, speech, and chewing
* Decreased or absent deep tendon reflexes, position and vibratory perception.
* Occasionally spasm and fasciculations of muscles.

NB: GBS does not affect cognitive function or level of consciousness.

**Diagnostic Evaluation**

* History and neurologic exam: upward progression of symmetric motor weakness, diminished reflexes, decreased sensation and decreased deep tendon reflexes.
* History of recent viral infection.
* Changes in vital capacity and negative inspiratory force
* CSF examination shows elevated protein levels.
* Evoked potential studies: progressive loss of peripheral nerve conduction velocity

**Medical Management**

* A medical emergency managed in an intensive care unit.
* Anticoagulants and antiembolism stockings to prevent thrombosis and pulmonary emboli.
* Plasmapheresis or intravenous immunoglobulin (IVIG) to reduce circulating antibodies
* ECG monitoring and treatment of cardiac dysrhythmias.
* Short-acting alpha-adrenergic blocking agents to treat tachycardia and hypertension.
* intravenous fluid to manage hypotension
* Analgesics and muscle relaxants
* Intubation and mechanical ventilation if respiratory paralysis develops.

**Complications**

* Respiratory failure
* Cardiac dysrhythmias
* Complications of immobility and paralysis
* Anxiety and depression

**Nursing Assessment**

* Assess pain level due to muscle spasms and dysthesias.
* Assess cardiac function including orthostatic BPs.
* Assess respiratory status closely to determine hypoventilation due to weakness.
* Perform cranial nerve assessment, especially ninth cranial nerve for gag reflex.
* Assess motor strength.

**Nursing Diagnoses**

* Ineffective Breathing Pattern related to weakness/paralysis of respiratory muscles
* Impaired Physical Mobility related to paralysis
* Imbalanced Nutrition: Less Than Body Requirements, related to inability to swallow
* Impaired Verbal Communication related to intubation, cranial nerve dysfunction
* Chronic Pain related to demyelination of sensory fibers
* Anxiety related to communication difficulties and deteriorating physical condition

**Planning**

**Goals:**

* Maintaining respiratory function,
* Improving mobility,
* Promoting adequate nutrition
* Maintaining communication,
* Relieve pain
* Decreased fear and anxiety, and absence of complications.

**Nursing Interventions**

Maintaining Respiration

* Monitor respiratory status: vital capacity, rate and depth, breath sounds
* Monitor level of weakness as it ascends toward respiratory muscles.
* Calm environment, head of bed elevated to provide for maximum chest excursion.
* Avoid opioids and sedatives that may depress respirations.
* Monitor for signs of impending respiratory failure; heart rate above 120 or below 70 beats/minute; respiratory rate above 30 breaths/minute; prepare to intubate.
* Assess blood pressure and heart rate frequently to identify autonomic dysfunction.
* Suction to maintain a clear airway

**Avoiding Complications of Immobility**

* Provide passive range-of-motion exercises at least twice daily; support the paralyzed extremities in functional positions. Change patient’s position at least every 2 hours.
* Physical and occupational therapy exercises to regain strength
* Assess for contractures, pressure ulcers, edema of lower extremities, and constipation.
* Provide assistive devices such as cane or wheelchair,
* Refer to rehabilitation services or physical therapy for evaluation and treatment.
* Administer prescribed anticoagulant regimen to prevent DVT and pulmonary embolism;
* Antiembolism stockings or compression boots, and adequate hydration.
* Place pads over bony prominences such as elbows and heels to prevent pressure ulcers.

**Promoting Adequate Nutrition**

* Provide adequate nutrition to prevent muscle wasting, involve physician and dietitian
* In paralytic ileus, intravenous fluids and parenteral nutrition till bowel sounds return
* If chewing and swallowing are inadequate, provide gastrostomy tube feedings
* Evaluate lab results that indicate malnutrition or dehydration (risk for pressure ulcers).
* Assess the return of the gag reflex and bowel sounds before resuming oral nutrition
* During rehabilitation, encourage a well-balanced, nutritious diet

**Maintaining Communication**

* Use lip reading, picture cards, or eye blinking etc. with patient who cannot speak
* Have frequent contact with patient, explain and reassure if the patient is fully conscious.
* Provide some type of patient call system for the severely weak GBS patient.
* Refer to speech therapy for evaluation and treatment.
* Refer to counselor, social workers, or psychologist to develop/enhance coping skills

**Relieving Pain**

* Analgesics; note reactions (hypotension, nausea, vomiting, respiratory depression).
* Provide pain management therapies: massage, diversion, guided imagery
* Explain procedures to relieve anxiety because anxiety augments pain.
* Turn the patient frequently to relieve painful pressure areas.

**Reducing Anxiety**

* Allow and encourage family members to participate in physical care of patient
* Create a positive attitude and atmosphere.
* Discuss fears and concerns while verbal communication is possible.
* Reassure patient that recovery is probable.
* Use relaxation techniques such as listening to soft music.
* Provide choices in care, and give patient a sense of control.
* Encourage diversional activities: music, reading books, watching television
* Refer patient and family to a support group

**Community and Home Care Considerations**

* Interdisciplinary approach (nurse, physician, occupational, physical, speech and respiratory therapists).
* Long-term rehabilitation and community reintegration.
* Assess the family for communication, knowledge, adjustment, use of support systems
* Exercise and positioning to prevent contractures, deep vein thrombosis (DVT), hypercalcemia, and pressure ulcers.

**Patient Education and Health Maintenance**

* Acute phase lasts 1 to 4 weeks, then patient stabilizes and rehabilitation can begin, convalescence may be lengthy, from 3 months to 2 years.
* Instruct patient in breathing exercises or use of incentive spirometer
* Encourage supportive and protective shoes to prevent injuries
* Routine checking of feet because trauma may go unnoticed due to sensory changes.
* Maintenance of normal weight; additional weight will further stress the motor abilities.
* Encourage the use of scheduled rest periods to avoid fatigue.
* Refer the patient/family for more information and support to relevant agencies

**Evaluation: Expected Outcomes**

* Respirations 24 breaths/minute, deep, unlabored
* Performs assistive ROM exercises every 2 hours; no pressure ulcers or edema present
* Gag reflex present, eating small meals without aspiration
* Uses short phrases and head nodding to communicate effectively
* Verbalizes decreased pain
* Verbalizes reduced anxiety

**PERIPHERAL NERVOUS SYSTEM DISORDERS**

**Bell’s palsy**

Bell’s palsy (facial paralysis) is an acute peripheral involvement of the seventh cranial nerve on one side, which results in weakness or paralysis of the facial muscles unilaterally. It is a self-limiting process that usually improves in 3 to 6 months.

**Pathophysiology and Etiology**

Cause is unknown but can result from ischemia, viral disease (herpes simplex, herpes zoster and influenza), autoimmune demyelination, or a combination.

**Clinical Manifestations**

* Paralysis of ipsilateral side of face from vertex of scalp to chin; can affect speech
* Diminished taste from anterior two-thirds of tongue, decreased blink reflex, decreased lacrimation, inability to close eye, photophobia, drooling
* Increased lacrimation and painful sensations in the face, behind the ear, and in the eye.
* Hyperacusis (enhanced optic perception) on the affected side
* Distorted body image due to change in facial appearance

**Diagnostic Evaluation**

* History to determine previous illness, onset of paralysis
* Evaluation of seventh cranial nerve function and corneal sensation
* Exclusion of lesions that mimic Bell's palsy, such as tumor, infection, trauma, or stroke
* Electrophysiologic testing; action potentials and EMGs to evaluate nerve function.

**Medical management**

The objectives of management are to maintain facial muscle tone and to prevent or minimize denervation

* Corticosteroid to decrease inflammation and edema (prednisone).
* Eye lubrication if unable to close, to be patched during sleep.
* Physical therapy: electrical stimulation to prevent muscle atrophy
* Surgical closure of eyelid to protect cornea (tarsorrhaphy).
* Surgery for exploration of the facial nerve, suspected tumor, surgical decompression of the facial nerve, and surgical rehabilitation of a paralyzed face.

**Complications**

* Keratitis (inflammation of the cornea), ulceration and vision loss
* Body image disturbance related to facial nerve paralysis

**Nursing Assessment**

* Test motor components of facial nerve (VII) by assessing smile, ability to whistle, purse lips, wrinkle forehead, and close eyes. Observe for asymmetry.
* Observe ability to handle secretions, food, fluids; observe for drooling.
* Assess patient's ability to blink and speak clearly.
* Assess effect of altered appearance on body image.

**Nursing Diagnoses**

* Impaired Tissue Integrity related to loss of protective eye closure
* Chronic Pain related to physiologic alterations of disorder
* Disturbed Body Image related to facial nerve paralysis

**Planning**

**Goals:**

* Protecting Corneal Integrity
* Relieving Pain
* Enhancing Body Image

**Nursing Interventions**

**Protecting Corneal Integrity**

* Administer or teach patient to administer artificial tears and ophthalmic ointment
* Patch eye to keep shut at night
* Inspect eye for redness or discharge.
* Advise patient to report eye pain immediately.

**Relieving Pain**

* Administer corticosteroids to reduce inflammation and NSAIDs to relieve pain.
* Teach patient to apply moist heat to face.
* Perform or teach patient to perform facial massage to alleviate feelings of stiffness.

**Enhancing Body Image**

* Encourage patient to express feelings related to body image disturbance.
* Assist patient to use mirror as means to obtain feedback about actual versus perceived appearance and identify factors that impede or enhance.

**Patient Education and Health Maintenance**

* Patient to wear wraparound sunglasses to decrease evaporation from the eye, to avoid eye irritants, and to increase environmental humidity.
* Instruct on use of ophthalmic drops and ointment, eye lid closure, patching of the eye.
* Demonstrate facial exercises (eg, raise eyebrows, squeeze eyes shut, purse lips)
* Refer to relevant Palsy Foundation,

**Expected Outcomes**

* Cornea without redness, pain, or discharge
* Reports adequate pain control
* Verbalizes adjustment to body image disturbance

**Cerebral palsy**

Refers to non-progressive disorder resulting from malfunction of the motor centers and pathways or defect or lesion of the developing brain, characterized by symmetrical, bilateral, nonprogressive paralysis weakness, incoordination, or ataxia

Cerebral palsy occurs in approximately 2 per 1,000 live births. It is a major cause of disability among children

**Etiology:**

**Prenatal causes**

* Infections: rubella, syphilis, toxoplasmosis, Herpes simplex and cytomegalovirus.
* Maternal anoxia, anemia, placental infarcts, abruptio placentae.
* Prenatal cerebral hemorrhage, maternal bleeding, maternal toxemia, Rh or ABO incompatibility.
* Prenatal anoxia; twisting or kinking of the cord.
* Genetic factors, Toxins, drugs

**Perinatal causes**

Birth asphyxia is responsible for about 50% of CP cases,

* Anoxia: anesthetic and analgesic drugs during labor, prolonged labor, placenta previa or abruptio placentae, respiratory obstruction, cerebral trauma during delivery.
* Complications of birth: small for gestational age babies, prematurity, immaturity, post maturity, low birth weight (especially < 1,500 g), hyperbilirubinemia, hemolytic disorders, respiratory distress, infections, electrolyte disturbances (hypoglycemia, hypocalcemia

**Postnatal causes**

* Bilirubin encephalopathy, meningitis, encephalitis, intracranial haemorrhage, hydrocephalus, Head trauma, Infections: meningitis, encephalitis, brain abscess. Vascular accidents, Anoxia, neoplastic and late neurodevelopmental defects

**Types of Cerebral Palsy**

1. **Spastic type**: defect in the cortical motor area or pyramidal tract; joint movement is impaired, deep tendon reflexes are increased, permanent contractures may develop if no muscle training.
2. **Dyskinetic/Choreoathetoid type:** lesions of the extrapyramidal tract and basal ganglia; involuntary, uncoordinated, uncontrollable movements of muscle groups.
3. **Ataxia:** disturbances of balance due to cerebellar involvement.

**Clinical Manifestations**

**Early Signs**

* Asymmetrical movements.
* Lethargy or irritability.
* Difficulty in feeding or swallowing or poor sucking
* Excessive, high-pitched, or feeble cry.
* Long, thin infants who are slow to gain weight.
* Poor head control.

**Late Signs**

* Failure to follow normal pattern of motor development.
* Delayed gross motor development is a universal manifestation of cerebral palsy.
* Persistence of infantile reflexes.
* Weakness.
* Preference for one hand before the infant is age 12 to 15 months.
* Abnormal postures.
* Delayed or defective speech.
* Evidence of mental retardation.

**Common Associated Findings**

* Seizures.
* Hearing deficiency.
* Visual defect.
* Perceptual disorders.
* Mental retardation.
* Language disorders.
* Growth disorders.
* Gastroesophageal reflux.
* Behavioral problems.

**Diagnostic Evaluation**

* Thorough evaluation of prenatal, perinatal, and postnatal factors; Apgar scores.
* Computed tomography (CT) scan or magnetic resonance imaging (MRI) and blood testing to rule out presence of toxins, infectious processes, neoplasms.
* Psychological testing to determine cognitive functioning.

**Management**

* Antispasticity medications, such as dantrolene or diazepam
* Antireflux medications, such as metoclopramide or bethanechol
* Orthopedic management of scoliosis, contractures, dislocations
* Selective dorsal rhizotomy in an attempt to decrease spasticity
* Development of prevocational, vocational and socialization skills.
* Emotional, behavioral, and social adjustments

**Complications**

Contractures, deafness, visual defects,speech difficulties, mental retardation,convulsions, and growth retardation

**Nursing Assessment**

* Assess ability to perform activities of daily living (ADLs).
* Perform a developmental assessment;
* Evaluate ability to protect airway gag reflex, swallowing.
* Assess nutritional status growth, signs of deficiency.
* Assess mobility, range of motion (ROM), spasticity, coordination.
* Assess speech, hearing and vision.
* Evaluate parent-child interactions.
* Determine parents' understanding of and compliance with treatment plan.

**Nursing Diagnoses**

* Impaired Physical Mobility related to altered neuromuscular functioning
* Delayed Growth and Development related to the nature and extent of the disorder
* Interrupted Family Processes related to the nature of the defect, the demands of daily management, and resultant changes in family life
* Risk for Injury related to deficit in motor activity and coordination

**Planning**

**Goals:**

* Increasing Mobility and Minimizing Deformity
* Maximizing Growth and Development
* Strengthening Family Processes
* Preventing Injury

**Nursing Interventions**

**Increasing Mobility and Minimizing Deformity**

* Engage physical therapist to carry out appropriate exercises
* Splints and braces for muscle control, inspect underlying skin for redness and irritation
* Modify handles of grooming tools, writing implements, and utensils, for easy handling
* Encourage self-dressing with easy pull-on pants, large sweatshirts
* Board games, ball games, pegboards, and puzzles, to improve coordination.
* Maintain good body alignment to prevent contractures.
* Avoid exciting events before rest or bedtime.
* Administer or teach parents to administer muscle relaxants or anticonvulsants
* Schedule physical therapy after rest; avoid stress and frustration during physical therapy.

**Maximizing Growth and Development**

* Obtain history from the parents regarding the child's usual home routines, weaknesses and strengths, and likes and dislikes. Evaluate the child's developmental level
* Formulate a care plan on feeding, sleeping, physical therapy, play, special interests and emotional needs
* Communicate the care plan to all disciplines involved in the child's care.
* During feeding, maintain a pleasant, distraction-free environment.
* Serve the child alone initially, after mastering the task, encourage to eat with others
* Do not feed if fatigued.
* Allow to hold the spoon even if self-feeding is minimal.
* Stand behind, reach over the child's shoulder, guide the spoon from plate to the mouth.
* Serve foods that stick to the spoon, such as mashed potatoes.
* Encourage foods that the child can handle alone.
* Provide utensils with special handles and special feeding chair for independent feeding
* Neglect messy eating; use a large plastic bib or towel to protect the child's clothes.
* Feed slowly and carefully due to difficulty sucking and swallowing
* Cut solid foods into small pieces.
* Place the food back on the tongue for ease in swallowing.
* Be alert for sensory deficits that delay development and need correction: hearing, speech, vision, squinting, and failure to follow objects / bringing objects very close to the face.

**Strengthening Family Processes**

* Encourage the parents to express their feelings about the child and cerebral palsy
* Help the parents to recognize immediate needs and identify short-term goals that can be integrated into the long-range plan.
* Provide positive feedback for effective parenting skills and positive approaches to care
* Assist the parents to deal with siblings' responses to the disabled child.
* Encourage family to maintain contacts with friends and community and engage in outside activities as much as possible.

**Protecting the Child from Injury**

* Evaluate safety measures: suction machine, safety helmet, or seizure precautions
* Select toys that are safe.
* Frequent position changes and adequate fit on orthotics, wheelchairs, and walking or standing devices, to prevent skin breakdown. Assess skin integrity daily.

**Community and Home Care Considerations**

* Assess the home environment for safety. Stairs, clear paths suitable for assistive devices.
* parents to keep health maintenance visits and immunizations
* For social and play time, physical and occupational therapists to choose appropriate toys.
* Participate in the development of the child's Individual Education Plan (IEP
* Reinforce exercises, contracture prevention, and infection prevention.
* Assess the family for signs of stress, and help them arrange for respite care as needed.
* Service all adaptive equipment, braces, and walkers for correct fit
* Provide care and teach family about surgical procedures as indicated.

**Family Education and Health Maintenance**

* Encourage regular immunizations medical and dental evaluations.
* Advise parents that the child needs discipline to feel secure and relaxed.
* Refer parents to agencies concerned with Cerebral Palsy Evaluation:

**Expected Outcomes**

* Dresses and feeds independently; no contractures noted
* Consistent growth curve maintained; developmental milestones consistent with condition achieved
* Family participates in school and community activities; uses respite care once per week
* Child wears bicycle helmet while playing outdoors; no injury reported

**Poliomyelitis**

Poliomyelitis is a Greek word; polio means grey and myelos means the spinal cord. It is a disease of the anterior horn motor neurons of the spinal cord and brain stem caused by poliovirus an enterovirus, which often targets insulating material covering nerve cell fibres (myelin)

Poliomyelitis a highly infectious viral disease, mostly affecting young children; the virus is transmitted by person-to-person mainly through the fecal-oral route, or less frequentl by (e.g. contaminated food or water) and multiplies in the GI tract from where it can invade the nervous system and can cause paralysis.

Initial symptoms of polio include fever, fatigue, headache, vomiting, stiffness in the neck, and pain in the limbs.

**Statistics and Incidences**

The global incidence of poliovirus infection has decreased by more than 99% since 1988.

Wild poliovirus type 2 (WPV2) was officially eradicated in 2015 which prompted the replacement of trivalent oral poliovirus vaccine with OPV containing only types 1 and 3.

Poliovirus affects mainly children; however, individuals of any age (especially those who are immunocompromised) may also develop the disease.

**Etiology**

Polioviruse, an enterovirus within the Picornaviridae family.

**Risk Factors**

* Age: Infants and elderly
* Living with an infected person
* Compromised immmune system
* Lack of immunization against polio
* Extreme stress or strenous activity
* Travel to an area that has experienced a polio outbreak.

**Pathophysiology**

* Poliovirus is an RNA virus that is transmitted majorly through the feco-oral route but also through ingestion of contaminated water,inhalation or entry through conjunctiva, droplets of respiratory secretions
* Three serotypes are able to cause human infection: **-** PV1, PV2, PV3
* The incubation period for poliovirus is 5 to 35 days.
* The viral particles initially replicate in the nasopharynx and GI tract and then invade lymphoid tissues, with subsequent hematologic spread.
* After a period of viremia, the virus destroys motor neurons in the anterior horn and brainstem leading to flaccid paralysis, which may be bulbar or spinal in distribution.

**Clinical features/ types**

Infection may occur in two forms:-

1. Inapparent/ asymptomatic (90-95%); virus stays in intestinal tract and does not attack the nerves, is shed in the stool so infected individual is still able to infect others

2. Apparent/ symptomatic (5-10%); abortive polio, does not lead to paralysis

Minor illness Symptoms: - Low grade fever, Sore throat, Vomiting, Abdominal pain, Loss of appetite, Malaise, Recovery: - complete, most recover in <1 week, no paralysis.

**Diagnosis**

* History,
* Clinical examination
* Stool is the major sample, CSF and throat swab for viral cultures
* Serum antibod test for the 3 polioviruses
* Immunoglobulin G (IgG) antibody titers

**Collection of stool sample:-** 2 samples 24hr apart within 14 days of onset of paralysis, 8-10 grams or thumb size stool specimen in a clean wide mouth bottle- plastic or glass with screw cap, stored below 8oC, no dessication or leakage till received at WHO accredited lab

**Medical Management**

The goal of the treatment is to control symptoms while the infection runs its course as there is no specific treatment for the viral infection:

* Hospitalization (for those individuals who develop paralytic poliomyelitis).
* If the respiratory is involved, long-term ventilation is necessary.
* Catheterization of distended bladder may be necessary.
* Antibiotic for urinary tract infection
* Moist heat to reduce pain and muscle spasm
* Analgesics (such as acetaminophen) to reduce muscle pain, headache
* Physical therapy, braces or corrective shoes, orthopaedic surgery to recover muscle strength & function
* Bed rest during acute phase:-physical activity and trauma increases risk of paralytic polio
* Posture to be changed every 2-3hrs.
* Child to be placed on abdomen for short period each day, to prevent pneumonia
* Hot moist packs applied to the muscles to relieve pain and spasm.
* Joints and paralysed muscles- moved passively through full range for 10min., 2-3times/day to Prevents deformities, contracture and to promote development of muscle power in paralysed muscles.
* Nutritious, balanced and wholesome ;normal diet in non-paralytic polio, NG tube feeding in paralytic polio, Diet rich in fiber to prevent constipation
* Surgical release of tight fascia and lengthening of tendons may be necessary for contractures persisting longer than 6 months.
* Occupational therapy (OT) to promote function, health, and wellness and to prevent further injury or disability
* Recreational Therapy: leisure activities to reduce stress and promote group activities
* Speech Therapy: to protect the airway and prevent aspiration pneumonia**,**
* Physical therapy in paralytic disease to prevent pressure ulcers
* Total hip arthroplasty in patients who develop hip dysplasia and degenerative disease.

**Prognosis:**

* Non paralytic cases go through complete recovery
* Paralytic polio leads to permanent weakness

**Post-polio syndrome:**

Observed in people who had polio during their childhood, having complete recovery but may develop signs of polio in later stage. Signs and symptoms:

* Progressive muscle or joint weakness and pain
* General fatigue and exhaustion after minimal activity
* Muscle atrophy
* Breathing or swallowing problems
* Sleep-related breathing disorders, such as sleep apnea
* Decreased tolerance of cold temperatures
* Cognitive problems, such as concentration and memory difficulties
* Depression or mood swings

**Prevention**

* Polio vaccine: An inactivated (killed) polio vaccine (IPV) and live attenuated (weakened) oral polio vaccine (OPV)
* Hygiene and good sanitation practices

**Complications:** Myocarditis, Hypertension, Pulmonary edema, Pneumonia, Urinary tract infections, Compression neuropathy, Scoliosis, Osteoporosis, Bone fractures, Skeletal deformities- Equinus foot

**Nursing Management**

**Nursing Assessment**

History of vaccination, travel and contact with recently returned travelers.

Physical assessment: possible signs and symptoms of polio

**Nursing Diagnosis**

* Imbalanced nutrition: less than body requirement related to anorexia, nausea, and vomiting.
* Ineffective thermoregulation related to the infection process.
* Ineffective airway clearance related to muscle paralysis.
* Ineffective breathing pattern related to muscle paralysis.
* Acute pain related to the infection that attacks the nerve.
* Impaired physical mobility related to paralysis.
* Anxiety in children and families related to disease conditions.

**Nursing Care Planning and Goals**

* The client will be able to improve and maintain a nutritious diet.
* The client will be able to maintain adequate thermoregulation.
* The client will be able to clear the airway and breathe effectively.
* The client will be able to reduce the pain.
* The client will be able to mobilize effectively.

**Nursing Interventions**

**Nutrition**

* Encourage frequent small meals to promote nutritional and fluid intake;
* Maintain nasogastric tube feeding, if ordered;
* Hyperalimentation may be necessary
* Eliminate unpleasant smells from the environment during meals.
* Monitor skin turgor every shift.
* Involve a nutritionist in planning a diet for the child that includes favourite foods.

**Thermoregulation**

* Reduce or eliminate the sources of heat loss in infants,
* Monitor the body temperature.
* When a shower, prepare a warm environment.
* Avoid the flow of air (air conditioning, ceiling fan, open vent)
* Warm stethoscopes, scales, before use
* Patients bed should be away from the window

**Airway clearance**

* Assess respiratory rate, rhythm, depth, effort, and breath sounds;
* Elevate the head of the bed to promote lung expansion.
* Suction per: Nasal, Oral, Tracheal in case of secretions

**Pain**

* Administer analgesics as prescribed,
* Educate the patient on diversional activities to reduce the pain.

**Mobility**

* Exercise Therapy: Ambulation
* Range of motion exercises
* Ensure protection from falls
* Frequent change of position to prevent pressure ulcers
* Bed Rest Care

**Evaluation**

The client was able to improve and maintain a nutritious diet.

The client was able to maintain adequate thermoregulation.

The client was able to clear the airway and breathe effectively.

The client was able to reduce the pain.

The client was able to mobilize effectively.

**Muscular dystrophy**

Muscular dystrophy (MD) refers to a group of genetical, progressive, degenerative myopathies affecting a variety of muscle groups. Many patients with MD are children. Most with Duchenne's MD rarely survive beyond ages 20 to 25.

**Pathophysiology and Etiology**

* Inherited; may be X-linked, autosomal dominant, or recessive.
* Genetic coding defect causes abnormal muscle development and function.
* Loss of skeletal muscle fibers but no abnormalities in peripheral nerves or spinal cord.
* Marked reduction of dystrophin, a protein vital to muscle function.

**Clinical Manifestations**

* Progressive muscular weakness
* Gower's sign is the main feature of Duchenne's MD, to rise from floor the child will:
  + Roll onto hands and knees.
  + Bear weight with legs by creating a wide base of support, while using hands on floor to support some weight.
  + Use arms to climb up legs.
  + Push torso to an upright stance with legs remaining wide apart.
* Heart muscle weakens, and tachycardia develops.
* Respiratory muscles weaken, causing ineffective cough and frequent infections.

**Diagnostic Evaluation**

* Nerve conduction test and electromyography show abnormalities.
* Serum creatinine kinase elevated.
* Deoxyribonucleic acid analysis of blood.
* Muscle biopsy

**Management**

* Goals of treatment: maintaining mobility, quality of life, and prevention of complications.
* Medications to control symptoms e.g. antiarrhythmic and bronchodilators.
* Ambulation in calipers after loss of ability to walk; use of wheelchair
* Provision of spinal orthotic supports.
* Surgical tendon releasing to treat contractures.
* Physical therapy e.g. passive stretching to preserve function.
* Vigorous respiratory therapy, such as chest percussion, inspirometry, and assisted cough.
* Pulmonary function monitoring.
* Genetic counseling on implications of Duchenne MD to parents and sibling carriers.

**Complications**

* Infections (pulmonary, urinary, systemic).
* Cardiac dysrhythmias.
* Respiratory insufficiency/failure secondary to weakness of diaphragm and chest muscles.
* Aspiration pneumonia due to oropharyngeal dysfunction.
* Depression.
* Orthopedic deformities; contractures, lordosis, scoliosis.
* Learning and behavioral disorders.

**Nursing Assessment**

* Assess muscle strength, atrophy, gait, age-related motor development.
* Evaluate respiratory and cardiac status, breath sounds, heart sounds, pulse rate/rhythm.
* Evaluate ADL skills.
* Identify psychosocial issues: altered self-concept, decreased socialization, family discord.

**Nursing Diagnoses**

* Ineffective Breathing Pattern related to muscle weakness
* Impaired Physical Mobility related to muscle weakness
* Decreased Cardiac Output related to cardiac muscle involvement
* Impaired Swallowing related to muscle weakness
* Deficient Diversional Activity related to weakness

**Planning**

**Goals:**

* Maintaining Breathing Pattern
* Preserving Optimal Motor Function
* Improving Cardiac Output
* Monitoring Swallowing Function
* Encouraging Diversional Activities

**Nursing Interventions**

**Maintaining Breathing Pattern**

* Encourage upright positioning to provide for maximum chest excursion.
* Encourage energy-conservation techniques and avoidance of exertion.
* Teach deep-breathing exercises to strengthen respiratory muscles.
* Assess rate, depth, and pattern of respirations, breath sounds; and report any change
* Note results of arterial blood gas levels, sputum cultures, and chest X-rays.
* Encourage coughing and deep breathing, perform chest physiotherapy as indicated.

**Preserving Optimal Motor Function**

* Refer to physical therapy for stretching and strengthening exercises
* Perform ROM exercises to preserve mobility and prevent atrophy.
* Schedule activity; consider energy levels throughout the day.
* Consult with occupational therapist for assistive devices to maintain independence.
* Apply braces and splints to prevent contractures.

**Improving Cardiac Output**

* Monitor vital signs, and signs of heart failure e.g. edema, weight gain, lung sounds
* Monitor intake and output, and maintain I.V. or oral fluid intake as ordered.

**Monitoring Swallowing Function**

* Assess cranial nerve function for swallowing (gag reflex) and chewing.
* Provide a diet that the patient can handle; blenderizing food may be necessary.
* High protein and controlled calories to provide optimal nutritional value.
* Encourage eating in upright position without talking, small, frequent meals.
* Administer alternative enteral feeding if gag reflex is diminished.

**Encouraging Diversional Activities**

* Encourage diversional activities but discourage prolonged bed rest and inactivity
* If upper extremities are mostly affected, suggest walking or riding a stationary bike
* For lower extremities, wheelchair promotes mobility and performing simple crafts.
* Discuss patient's interests, and assist with preferred activities.
* Explore various methods of stress management to deal with frustration.
* Administer analgesics and antidepressants to facilitate participation in activities.

**Community and Home Care Considerations**

* Obtain assistive devices to promote maximal functioning e.g.
* Explore physical and recreational activities with family such as Special Olympics.
* Assess child's educational progress and ability to attend school versus homeschooling.
* Establish plan of activities that includes patient's interests, ability, and need for rest

**Family Education and Health Maintenance**

* Offer genetic counseling, if indicated, to determine options of family planning.
* Instruct on ROM exercises, pulmonary care, and methods of transfer and locomotion.
* Refer to community respite and counseling services.
* Stress the importance of fluids to decrease risk of urinary/pulmonary infection.
* Advice to report signs of respiratory infection immediately to prevent heart failure.
* Refer patient and family to agencies such as The Muscular Dystrophy Association,

**Evaluation: Expected Outcomes**

* Deep, unlabored respirations with clear breath sounds
* Ambulates unassisted, no contractures noted
* Vital signs stable, no edema
* Tolerates small blenderized feedings without aspiration
* Out of bed most of day, engages in diversional and social activities

**Seizure disorders**

Seizures (also known as epileptic seizures and, if recurrent, epilepsy) are a sudden alteration in normal brain activity that causes distinct changes in behavior and body function.

**Pathophysiology**

Electrical disturbance (dysrhythmia) in the nerve cells in one section of the brain causes them to emit abnormal, recurring, uncontrolled electrical discharges causing epileptic seizures.

**Classification**

1. **Simple Partial Seizures**

Autonomic symptoms without impairment of consciousness

Only a finger or hand may shake; the mouth may jerk uncontrollably; may talk unintelligibly, dizziness, or may experience unusual or unpleasant sights, sounds, odors, or taste

1. **Complex Partial Seizures**

The patient is motionless or moves automatically but inappropriately for time and place; excessive of fear, anger, elation, irritability; does not remember episode when it is over.

1. **Generalized Seizures (Grand Mal Seizures)**

Involve both hemispheres of the brain; intense rigidity of the entire body, alternations of muscle relaxation and contraction (generalized tonic–clonic contraction).

Simultaneous contractions of diaphragm and chest muscles produce characteristic epileptic cry.

* Tongue is chewed; urine and stool incontinence.
* Convulsive movements last 1 or 2 minutes.
* The patient then relaxes and lies in a deep coma, breathing noisily.

**Postictal State**

Confusion, deep sleep, headache, sore muscles, fatigue, and depression that comes after the seizure,

**Etiology**

The etiology may be unknown or due to one of the following:

* Trauma to head or brain Tumors
* Inherited
* Cranial surgery
* Metabolic disorders (hypocalcemia, hypoglycemia/hyperglycemia, hyponatremia, anoxia)
* Drug toxicity, such as theophylline, lidocaine, penicillin
* CNS infection
* Circulatory disorders
* Drug withdrawal states (alcohol, barbiturates)
* Congenital neurodegenerative disorders

**Clinical Manifestations**

Manifestations are related to the area of the brain involved

* Impaired consciousness
* Disturbed muscle tone or movement
* Disturbances of behavior, mood, sensation, or perception
* Disturbances of autonomic functions

**Diagnostic Evaluation**

* Developmental history
* physical and neurologic examinations
* Biochemical, hematologic, and serologic studies
* EEG with or without video monitoring locates epileptic focus, spread, intensity, and duration; helps classify seizure type
* MRI, CT scan to identify lesion
* Single photon emission CT (SPECT) may be used to identify the epileptogenic zone.
* Neuropsychological studies to evaluate for behavioral disturbances

**Medical Management**

Goals: to stop the seizures as quickly as possible, to ensure adequate cerebral oxygenation, and to maintain a seizure-free state.

* Establish airway and adequate oxygenation (intubate if necessary)
* IV line for administering medications and obtaining blood samples for analysis
* IV diazepam, lorazepam, or fosphenytoin slowly to stop the seizures.
* General anesthesia with a short-acting barbiturate if initial treatment is unsuccessful.
* phenytoin or phenobarbital for continued treatment

**Surgical Management**

• Surgery is indicated when epilepsy results from intracranial tumors, abscesses, cysts, or vascular anomalies.

• Surgical removal of the epileptogenic focus

**Complications:**

* Injuries due to falls, especially head injuries
* Status epilepticus: acute, prolonged, repetitive seizure activity without return to consciousness between attacks; it has high mortality and morbidity (permanent brain damage, severe neurologic deficits).

**Factors precipitating status epilepticus**

* Medication withdrawal, fever, metabolic or environmental stresses, alcohol use, withdrawal of anti-seizure medication, and sleep deprivation and concurrent infection

**Emergency Management of Status Epilepticus**

* Establish airway, and maintain blood pressure (BP).
* Obtain blood glucose, blood urea nitrogen, electrolytes, and anticonvulsant drug levels to determine metabolic abnormalities
* Administer oxygen to prevent hypoxia of brain.
* Establish I.V. lines for blood sampling, drug administration, and infusion of fluids.
* I.V. anticonvulsant lorazepam, phenytoin, diazepam slowly
* Monitor continuously for depression of respiration and BP induced by drug therapy.
* Use mechanical ventilation as needed.
* If initial treatment is unsuccessful, general anesthesia may be required.
* Monitor vital and neurologic signs on a continuous basis.
* Electroencephalographic monitoring during and after administration of diazepam.
* Assess for history of epilepsy, alcohol/drug use, trauma, recent infection.

**Nursing Assessment**

* Obtain seizure history: signs and symptoms, seizure behavior, postictal state
* Ask about factors or events that precipitate the seizures;
* Evaluate for aura before an epileptic seizure (eg, seeing a flashing light)
* Observe and assess neurologic condition during and after a seizure.
* Assess effects of epilepsy on lifestyle.
* Obtain history of drug or alcohol abuse.
* Assess compliance and medication-taking strategies.

**Nursing Diagnoses**

* Ineffective Tissue Perfusion (cerebral) related to seizure activity
* Risk for Injury related to seizure activity
* Ineffective Coping related to psychosocial and economic consequences of epilepsy

**Planning**

**Goals:**

* Maintaining Cerebral Tissue Perfusion
* Preventing Injury
* Strengthening Coping

**Nursing Interventions**

**Maintaining Cerebral Tissue Perfusion**

* Maintain a patent airway until patient is fully awake after a seizure.
* Provide oxygen during the seizure if color change occurs.
* Stress the importance of taking medications regularly.
* Monitor serum levels for therapeutic range of medications.
* Monitor patient for toxic adverse effects of medications.
* Monitor platelet and liver functions for toxicity due to medications.

**Preventing Injury**

* Padding side rails and removing litter.
* Place the bed in a low position.
* Do not restrain the patient during a seizure.
* Do not put anything in the patient's mouth during a seizure.
* Place the patient on side during a seizure to prevent aspiration.
* Protect the patient's head during a seizure.
* Stay with the patient who is ambulating or who is in a confused state during seizure.
* Provide a helmet to the patient who falls during seizure.
* Manage the patient in status epilepticus.

**Strengthening Coping**

* Involve social worker for vocational rehabilitation, counselors, support groups.
* Teach stress reduction techniques
* Answer questions related to Investigations and treatment modalities

**Community and Home Care Considerations**

* Patients with uncontrolled seizures to avoid driving or operating dangerous equipment.
* Assess home environment for safety hazards: crowded furniture, slippery floor etc.
* Support patient in discussion about seizures with employer, school, and so forth.

**Patient Education and Health Maintenance**

* Teach on triggers for seizures (skipped meals, lack of sleep, stress, and menstrual cycle).
* Remind of the importance of following medication regimen.
* To avoid alcohol because it interferes with metabolism of antiepileptic medications.
* Encourage patient to carry or wear a MedicAlert card or bracelet.
* Encourage exercise, mental activity, and nutritional diet.
* Educate on surgical options
* Refer the patient/family for more information and support

**Evaluation: Expected Outcomes**

* Takes medication as ordered, drug level within normal range
* No injuries observed
* Reports using support services and stress management techniques