Caring for clients with Spinal Cord Injury

Help your clients survive the immediate and long-term effects of these life-changing injuries.

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Spinal Cord Nerve Anatomy (and associated spinal cord injuries)

CERVICAL
C4 - C6 - Tetraplegia (Quadriplegia) paralisis of arms and legs

THORACIC
T1 and below - Paraplegia occurs when the spinal cord is damaged below the cervical spine. It may be injured in the thoracic spine (mid-back), or lumbar (low back).

LUMBAR
The spinal cord ends at L2, but SCI injuries are possible below the end of the spinal cord. This area is called the cauda equina. The cauda equina is a bunch of spinal nerves resembling a horse’s tail.

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From: http://www.hopkinsmedicine.org/healthlibrary/conditions/physical_medicine_and_rehabilitation/spinal_cord_injury_85.P01180/
Structure and function of the spinal cord

The spinal cord is a vital link between the brain and the body, and from the body to the brain. The spinal cord lies within the spinal canal of the vertebral column, surrounded by the meninges and cerebrospinal fluid (CSF). Like the brain, the spinal cord contain two main types of tissue: grey matter, containing nerve cell bodies, dendrites, and supporting cells which originates and processes nerve impulses; and white matter, containing columns of nerve fibers that carry signals to and from the brain along the length of the spinal cord (white matter transmits impulses). It extends from the foramen magnum where it is continuous with the medulla to the level of the first or second lumbar vertebrae. Two consecutive rows of nerve roots emerge on each side of the vertebrae and is divided into four regions: cervical (C), thoracic (T), lumbar (L) and sacral (S) each of which is comprised of several segments. The spinal nerve contains motor and sensory nerve fibers to and from all parts of the body. There are 31 segments, defined by 31 pairs of nerves exiting the cord. The thirty one pairs of spinal nerves are grouped according to the level from which they arise. These nerves are divided into 8 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 1 coccygeal nerve. Dorsal and ventral roots enter and leave the vertebral column respectively through intervertebral foramen at the vertebral segments corresponding to the spinal segment. The spinal cord is surrounded by the same three meninges as is the brain: the pia, arachnoid and dura mater. The dura mater is the tough outer sheath, the arachnoid lies beneath it, and the pia closely adheres to the surface of the cord.

- It carries sensory information (sensations) from the body and some from the head to the central nervous system (CNS) via afferent fibers, and it performs the initial processing of this information.
- Motor neurons in the ventral horn project their axons into the periphery to innervate skeletal and smooth muscles that mediate voluntary and involuntary reflexes.
- It contains neurons whose descending axons mediate autonomic control for most of the visceral functions.
- It is of great clinical importance because it is a major site of traumatic injury and the locus for many disease processes.

**Spinal cord injury (SCI)**

Spinal cord injury is a catastrophic, life-changing injury that affects all systems of the body and can affect people of all ages. A spinal cord injury can occur either from trauma or from a disease. In most spinal cord injuries, the vertebrae pinch the spinal cord. The spinal cord may become bruised or swollen. The injury may actually tear the spinal cord and its nerve fibers. Currently the spinal cord cannot heal itself once damage has occurred. However, depending on the nature of the damage, such is with bruising or swelling, the client may experience some neurologic recovery.

Cervical spine injuries usually cause loss of function in the upper and lower extremities usually referred to as tetraplegia or quadriplegia.

Thoracic vertebral injuries usually affect the trunk and the legs with resulting paraplegia.

Injuries to the lumbar and sacral vertebral usually results in some loss of function in the hips and legs.

**Classification of Spinal Cord Injury**

Spinal cord injuries are classified according to their anatomical location; that is,

**Box 1: American Spinal Injury Association (ASIA) Impairment Scale**

Source: International standards for neurological classification of spinal cord injury (2011)

- **A=** Complete. No sensory or motor function is preserved in the sacral segments S4-S5. No sensory or motor function is preserved in the sacral segments S4-S5.
- **B=** Sensory Incomplete. Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5. AND no motor function is preserved more than three levels below the motor level on either side of the body.
- **C=** Motor Incomplete. Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3 (0-2).
- **D=** Motor Incomplete. Motor function is preserved below the neurological level, and at least half or more of key muscles below the neurological level have a muscle grade greater than or equal to 3.
- **E=** Normal. Sensory and motor function is normal.
A spinal cord injury can also be classified as "complete or incomplete" based upon the sacral sparing definition. "Sacral Sparing" refers to the presence of sensory or motor function in the most caudal sacral segments as determined by the examination (i.e. preservation of light touch or pin prick sensation at the S4-S5 dermatome, deep anal pressure (DAP) or voluntary anal sphincter contraction).

A complete injury is defined as the absence of sacral sparing (i.e. sensory and motor function in the lowest sacral segments, S4-S5), whereas an incomplete injury is defined as the presence of sacral sparing (i.e. some preservation of sensory and/or motor function at S4-S5). ASIA Impairment Scale (AIS) designation is used in grading the degree of impairment. (See box 1.)

**Spinal Cord Injury Clinical Syndromes**

SCI clinical syndromes represent a significant proportion of SCI admissions to in client rehabilitation. There are 6 SCI syndromes: central cord syndrome (CCS), Brown-Sequard syndrome (BSS), anterior cord syndrome (ACS), posterior cord syndrome (PCS), conus medullaris syndrome (CMS), and cauda equina syndrome (CES). (See table 1 for description of SCI clinical syndromes).

**Causes of Spinal cord injury.**

Spinal cord injury may be traumatic or non-traumatic.

**Traumatic injuries** results from traumatic events such as: falls, automobile accidents, gunshot wounds, diving accidents, Mechanism of injury can be compression, flexion injury, extension injury, and/or

**Prevent Further Spinal Injury**

Anyone with a head injury is treated as if he/she has also suffered a spine injury until proven otherwise. The neck must be stabilized to prevent any movement. When no cervical collar is available, use a shirt, towel, coat, or other material rolled and placed around the neck as a collar to keep the neck as straight as possible, preventing it from flexing or hyperextending. If the victim must be moved to safety, he/she should be rolled like a log, as one straight piece, onto a flat surface, such as a piece of plywood or a door removed from its hinges. The client is rolled as one piece onto his/her side, the flat surface placed beside her, and then she is carefully rolled back onto the board. This is done slowly and carefully to avoid twisting or bending the spinal column. The victim is kept still.
Non-traumatic injuries results from tumors, degenerative disease (osteoarthritis, Spondylolysis), infection, loss of blood supply, Epidural Hemorrhage, Embolism, Epidural abscess, Amyotrophic Lateral Sclerosis etc.

Whatever the cause of spinal cord injury, motor and sensory losses may occur. The amount of loss of function and sensation depends on the level and extent of injury to the spinal cord.

**Pathophysiology**

Fracture or dislocation of the vertebral column often results in spinal cord damage. Cord injury is caused by compression, pulling and twisting, or tearing of the cord, with four types of injuries occurring.

Penetrating trauma from gunshot or knife wounds or other types of accidents may cause severance, compression, or contusion of the spinal cord. Extreme flexion or hyperextension of the neck, or falling on the buttocks, which causes flexion of the lower thoracic and lumbar spine, all may cause spinal cord damage. Tumor growth may compress or destroy spinal cord tissue. Whatever the cause of injury to the spinal cord, nerve transmission to the brain or from the brain may no longer occur below the level of the damage, resulting in paralysis.

Microscopic bleeding occurs in the gray matter immediately after spinal cord injury. Irritation of the cells causes edema to develop and spread along the next one or two cord segments. The edema peaks in 2 to 3 days and subsides in about 7 days after injury. The edema causes temporary loss of function and sensation. Hemodynamic instability with drops in blood pressure may cause decreased blood flow and hypoxia in the cord that increases the initial damage. The inflammatory process may injure the myelin covering the axons, and the chemical and electrolyte changes interrupt nerve impulse transmission.

**Clinical Signs of Spinal Cord Injury**

A complete severance, or damage to the entire thickness, of the cord results in a total loss of sensation and control in the parts of the body below the point of injury.

If the cord is damaged in the cervical region, the paralysis and loss of sensory perception may include both arms and both legs quadriplegia (tetraplegia).

Interruption of the thoracic spinal cord through L1 and L2 causes paraplegia (paralysis of both legs).

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The phrenic nerves that innervate the diaphragm originate in the third, fourth, and fifth cervical segments. Therefore severe injury to the cord above the level of the fifth cervical vertebra often is fatal if emergency care is not immediate. Branches of the phrenic nerves play a major role in the control of respiration, and when they are severed, respiration must be maintained by artificial means.
Injury to the spinal cord that does not involve complete severance of the cord may result in a temporary paralysis, which may subside as the spinal cord recovers from the swelling and initial shock of the injury.

**Clinical Signs of Cervical Spinal Cord Injury**

- Areflexia
- Diaphragmatic Breathing
- Forearm flexion
- Response to pain above the clavicle
- Hypotension and bradycardia (sympathetic nervous system paralysis)
- Priapism (paralysis of parasympathetic)

**Diagnosis of Spinal cord injury**

- Physical examination and testing of reflexes.
- X-rays to show where along the vertebrae the damage
- A Magnetic Resonance Image (MRI)
- Computed tomography
- Complete neurological evaluation.
- A myelogram may be performed when other tests do not reveal sufficient information

**Treatment of Acute Spinal Cord**

There are four main objectives in the treatment and nursing care of the client with an injury of the spinal cord:

- To save the victim’s life
- To prevent further injury to the cord by careful handling of the client
- To repair as much of the damage to the cord as possible
- To establish a routine of care that will improve and maintain the client’s state of health and prevent complications, so that eventual physical, mental, and social rehabilitation is possible.

The goal of initial treatment is to prevent further damage. Assume a spine injury until proven otherwise.

**Initial assessment/primary survey**

Airway; Breathing; Circulation; Disability: Moves upper and lower extremities; and Exposure. This should take place at the site of injury or accident before the client reaches the hospital or trauma center. When an accident victim complains of neck or back pain, or cannot move the legs or has no feeling in them, treat the victim CT scan or MRI may be performed to determine the extent of the damage and to see whether the cord is completely severed. This helps determine if neurologic deficits are likely to be permanent.
as if she has a spinal cord injury. *To avoid flexion of the neck, no pillow or other kind of support is placed under the head. Do not move the victim unless life-threatening conditions require it.* Client should be transferred to the hospital with the spine immobilized.

**Secondary Survey (Emergency department)**

In the emergency department of the hospital, the client’s condition is stabilized and a thorough examination is conducted to establish the extent of her injuries.

- Methylprednisolone 30mg/kg is given as soon as possible (within the first 8 hours after injury) for proven NON-PENETRATING spinal cord injury.
- 5.4 mg/kg/hr. for the next 23 hours. (If given within 8 hours of injury, it is thought to minimize further damage and improve the return of both motor function and sensation).
- Normal saline is used for fluid replacement.
- Dopamine (Intropin) may be given to sustain a sufficient blood pressure to prevent cord hypoxia.

Careful orthopedic and neurologic evaluation takes place in the secondary survey.

**History**

Detailed pre-injury neurologic status; mechanism of injury; review pre-hospital report; any changes in neurologic status, and documentation of findings.

Poor protection of the Cervical Spine can cause injury. The nurse should suspect cervical spine injuries if the client has supraclavicular injury; maxillofacial trauma; head injury; is involved in high speed injury.

**Initial Treatment of Possible Cervical Spine Injury**

- Immobilization
- Imaging studies
- (X-rays)- AP, lateral and open mouth spine films
- CT scan
- MRI to view ligaments and spinal cord
- Assess the client for occult injury in client with a neurologic deficit
- DOCUMENT FINDINGS
- Early neurosurgical/orthopedic consultation

**Spinal Shock**

Spinal shock following a spinal cord injury (SCI) is a specific term that relates to the loss of all neurological activity below the level of injury. The disruption in the nerve communication pathways between upper motor neurons and lower motor neurons immediately causes spinal shock. It is characterized by flaccid paralysis, loss of reflex activity below the level of the damage, bradycardia, hypotension, and occasionally paralytic ileus. It can start between 30-60 minutes following a spinal cord injury, and last up to 6 weeks to months. The return of the reflexes indicates the end of spinal shock. Assessment of the end of spinal shock is based on the return of reflexes, with the bulbocavernous reflex typically being the first to return.

- Temporary COMPLETE cessation of spinal cord function
- Occurs IMMEDIATELY after injury
- Complete loss of all reflexes- including the bulbocavernous
- Flaccidity of all muscles

**Neurogenic Shock**
Neurogenic shock is caused by sympathetic nervous system (SNS) depression, loss, or disruption resulting from physical injury to the central nervous system, especially high thoracic spinal injury (T6 level or higher) or damage to the brainstem’s vasomotor center.

In neurogenic shock, reduction or loss of sympathetic nervous system influence allows the parasympathetic nervous system to dominate, causing peripheral vasodilation and bradycardia. Bradycardia reduces cardiac output, while vasodilation then causes cardiac preload to decrease, which ultimately results in inadequate cellular oxygenation. The most damaging effect of this condition is shunting of oxygen rich blood away from tissues surrounding the primary injury site, which are at greatest risk of secondary injury.

Signs and symptoms of neurogenic shock include; bradyarrhythmias (possibly including asystole), hypotension, poikilothermy, hypothermia, or both, causing a flushed appearance; warm, dry skin (from vasodilation); and flaccid paralysis below the spinal injury level. Other findings may include: altered mental status, if the client’s cerebral perfusion pressure is altered; hypoactive or absent bowel sounds (from shunting of blood away from nonessential abdominal organs to compensate for shock symptoms).

The treatment goal is to restore adequate oxygenation to vital tissues and limit cellular damage. During the acute period, vital signs and fluid intake and output must be monitored at least hourly. Orotracheal intubation and mechanical ventilator support may be needed, as well as aggressive blood pressure support with cautious I.V. fluids and vasoactive drugs. A central venous catheter may be placed to aid resuscitation and hemodynamic monitoring.

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**Halo Brace**

- The halo brace keeps the head and neck completely still and also provides support to the neck muscles.
- The halo traction equipment is made up of three pieces:
  - A metal ring with openings for the skull pins.
  - An adjustable metal framework, which connects the ring to the plastic vest.
  - A plastic vest with a washable liner to support the framework.
- Halo traction is attached to the head by titanium screws which are screwed into the skull bone. The screws have to be tightened periodically to ensure the halo is fitting correctly.
- Patients in halo brace are able to get out of bed sooner and move about.
- There are four halo pins called skull pins, which hold your head and neck in place. Twice a day, the pin sites should be checked for redness, swelling, pain and drainage.
**Respiratory Management.**

One of the most important aspects of spinal cord injury care is respiratory management.

All clients must receive continuous oxygen saturation monitoring. Intubation and mechanical ventilation is often required to sustain life in clients with an injury at C5 or above. Clients with intact phrenic nerve innervation may receive a phrenic nerve stimulator that assists them to breathe by stimulating action of the diaphragm. Clients who can breathe when they first arrive at the hospital may be intubated because as cord edema progresses, respiration may become impaired.

Mechanical ventilation relieves the muscle work of breathing and conserves the client’s energy during the emergent phase of the injury. An oral airway may be placed if a tracheostomy is unnecessary. Intubating a client with suspected or actual C-spine fracture present a particular set of challenges. It increase the risk of injury to the spinal cord. Chin lift should not be used in this situation, a jaw thrust should be used to open the airway. If the airway is not able to be opened adequately with the jaw thrust, use a head-tilt chin-lift to open the airway. See box 3.

Respiratory muscles are assessed through a vital capacity measurement performed at least once per nursing shift. Vital capacity should be trended to make sure patients are not slowly decompensating without notice. A patient's ability to cough should also be assessed frequently.

Multiple techniques and equipment are used to help patients with lung expansion, coughing and clearing secretions. When patients begin to tire, noninvasive breathing assistance is an option. Continuous positive airway pressure (CPAP) and bi-level positive airway pressure (BiPAP) help prevent intubation by assisting in opening the lungs and allowing rest. Patients with tetraplegia may experience an increase in bronchial mucus production.

The inability of some patients to clear secretions can be dangerous if the airway is occluded by mucus. Assisted coughing can help patients expel secretions. Chest physiotherapy and vibration vests can help loosen and break up consolidations within the lungs. Patients with tetraplegia have better respiratory performance when placed in a supine position rather than sitting erect.

The use of a rotational (oscillating) bed programmed to turn patients laterally on an intermittent or continual basis and for a certain degree of turn can prevent respiratory complications such as pneumonia and ARDS. Rotational beds help mobilize secretions throughout the entire lung and promote increased oxygenation by allowing each lung to spend time in a dependent position, allowing for optimal blood flow. When patients are placed in such beds, great care should be taken to monitor skin integrity and psychological status. If a patient is prone to motion sickness, measures to prevent

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**Box 3.**

The majority of patients with cervical cord injury require intubation in the field or within 24 hours of injury. These patients have shallow, rapid breathing that leads to fatigue and does not allow for adequate gas exchange. Patients who do not require early intubation should be closely monitored and respiratory muscle function and secretion clearance should be initiated. Patients should receive daily chest x-rays to monitor for pneumonia and atelectasis as well as arterial blood gases to determine gas exchange ability.
nausea are necessary because vomiting in these beds carries a high risk for aspiration.

**Immobilization and surgery.**

**Surgical Spine Intervention:** The goal of surgical spine intervention after traumatic SCI is typically for vertebral stabilization and/or decompression of neural tissue. Indications for Spine Surgery include; neurologic deterioration, unstable fracture, epidural hematoma, or narrowing of spinal canal.

**Immobilization:** Cervical spinal cord injury is usually treated with traction to immobilize the affected vertebrae and maintain alignment. All clients with unstable Cervical Fracture or Dislocation, should be maintained in a rigid cervical collar with strict cervical and log roll precautions until temporary stabilization using halo traction or halo vest is applied. If the client will be maintained in halo traction for >24 hours he/she should be placed on a rotorest bed to promote respiratory toileting, to be discontinued after surgical fixation. Definitive operative stabilization of such fracture dislocations should occur within the first 24-48 hours of hospitalization.

Traction can be accomplished by a head halter; skeletal traction using Crutchfield or Gardener-Wells tongs with ropes, pulleys, and weights or a halo ring and fixation pins. The halo is often used for cord injury not requiring surgery and allows for early ambulation.

**Flaccidity and Spasticity:** Immediately after a cord injury, the client will usually have a flaccid type of paralysis. Later, as the cord adjusts to the injury, the paralysis will become spastic, and there will be strong, involuntary contractions of the skeletal muscles. These muscle spasms, which may be violent enough to throw the client from the bed or wheelchair, must be anticipated and the client secured so that accidents can be avoided. If the upper extremities are involved, she is likely to tip over glasses, water pitchers, or anything within reach of her arms when seized with uncontrollable muscle spasms.

The client and family may interpret these spasms as a return of voluntary function of the limbs and will have false hopes of complete recovery. The nurse or the physician must explain to them that these spasms are frequently seen in clients with spinal cord injuries.

**Management:** avoid grasping the muscle itself during transfer as this
stimulating the muscles when moving the client and thereby precipitating a spasm. Use the palms of the hands are used to support the joints above and below the affected muscles. Administer of antispasmodic medications such as baclofen (Lioresal) to decrease the severity of the spasms.

**Pressure ulcers:** Patients with SCI are at an increased risk for pressure ulcers due to altered circulation, unexercised muscles and sensory dysfunction. Pressure ulcers can cause severe discomfort and can be a life-threatening complication of SCI if they become infected. Pressure relieving devices, meticulous skin care with regular inspection, and manual repositioning are essential to prevent this problem.

When turning patients, care should be taken to not turn them onto a discolored area. Pressure ulcers most often occur over bony prominences such as ischi, sacrum/coccyx, trochanters and heels; these areas should be avoided when repositioning. Skin assessment should be performed and documented every time the patient is turned. **Characteristics such as redness, discoloration, bruises, warmth, wetness, hardness and softness are all causes for concern.**

Nutritional status should also be assessed since malnutrition and impaired nutrient intake have important implications for the development and treatment of pressure ulcers. The patient with SCI who develops a pressure ulcer has increased metabolic demands compared to SCI patients without pressure ulcers, therefore caloric intake must be adjusted to meet these energy needs.

Prevention is the best strategy where pressure ulcers are concerned. Repositioning patients frequently while avoiding shearing, maximizing the use of pressure relieving devices, assessing and monitoring nutritional status closely, and cleaning patients who are soiled or have been excessively sweating are all reliable preventive interventions.

**Bowel management**

Two types of neurogenic bowel can occur after a spinal cord injury depending on the region of the spinal cord was injured. Upper motor neuron or reflex bowel: Spinal cord injury is above the T12 level can lead to loss of the ability to feel when the rectum is full. The anal sphincter muscle remains tight, but bowel movements will occur on a reflex basis when the rectum is full. This condition can be managed by causing the defecation reflex to occur at a socially appropriate time and place.

Lower motor neuron or flaccid bowel: A spinal cord injury below T12 level may damage the defecation reflex and relax the anal sphincter muscle. There is loss of normal reflexes to empty the bowel. Management of this type of bowel problem may require more frequent attempts to empty the bowel and bearing down or manual removal of stool.

Both types of neurogenic bowel can be managed successfully to prevent unplanned bowel movements and other bowel problems such as constipation, diarrhea and impaction. A bowel program helps the client to regain control of bowel function. An effective bowel program consists of complete emptying of the bowel at a predictable time so that a reliable pattern is established.
Tips to Effectively Manage a Bowel Program

Positioning: Sitting up in a commode chair rather than lying in bed will have gravity help empty the lower bowel. When client is in bed, turn to the left side to place enema or suppository. The bowel will empty easier when lying on the left side.

Proper Diet / Fluids: Lack of water and dietary fiber can irregular bowel movement and or constipation. 2 to 3 liters of fluids daily is recommended. Non-caffeinated, non-alcoholic liquids are best. Caffeinated and alcoholic drinks can cause dehydration.

Timing: Eating a meal may stimulate the bowel movement. Beginning bowel program 30 minutes after the client eat may help get faster and better results. A regular set-time for bowel program will help retrain the muscle.

Digital Rectal Stimulation: Digital stimulation is when a lubricated, gloved finger is gently inserted into the rectum. Use only water soluble lubricant for lubrication. The finger is gently rotated in a circle motion. This should only be done for 10 to 20 seconds at a time and every 5 to 10 minutes until a bowel movement occurs. This can trigger autonomic dysreflexia. If this occurs, stop the rectal stimulation.

Prevention of contractures: Splint extremities to prevent flexion contractures— splints MUST be well padded to protect skin. Range of motion of joints; Occupational and Physical Therapy

Hyper-Reflexia: Autonomic dysreflexia is an exaggerated and potentially dangerous response of the autonomic nervous system to a stimulus below the level of spinal injury. The most common cause is bladder over-distention.

However, dysreflexia can be caused by any stimulus below the level of injury. Other common causes include: over-distended rectum, ingrown toenail, pressure on a pressure ulcer, sexual activity, the insertion of rectal suppositories, enemas, and sudden changing of position (menstrual cramps, and labor. If left untreated, dysreflexia may result in seizures, retinal hemorrhage, a stroke or death. It should be considered a medical emergency!

Symptoms include:

- Sudden onset of a pounding headache.
- Elevated blood pressure (e.g. 320/180).
- Bradycardia
- Goosebumps above the level of injury.
- Sweating and flushing above the level of injury.
- Restlessness

Management of Dysreflexia

Efforts should be made to lower blood pressure by placing her in a sitting position or elevating her head to a 45-degree angle.

Identify and correct the cause immediately. For example, an impacted bowel, overdistended bladder, or pressure against

Autonomic dysreflexia is a medical emergency and the cause of the stimulation must be eliminated. One of the most common causes of autonomic dysreflexia after a spinal cord injury is related to bladder or bowel problems. For this reason, you must pay close attention to your bladder management.
the skin; the stimulus should be removed as gently and quickly as possible.

Notify the physician immediately so that the appropriate medications can be prescribed and administered. Clients who experience repeated attacks of AD may require surgery to sever the nerves responsible for the exaggerated response to stimulation.

**Pulmonary Embolus and DVT prophylaxis:** The development of a DVT or PE can greatly increase the length and cost of a patient's hospital stay. Decreased blood pressure combined with lack of muscle movement slows venous return to the heart. Thrombosis may occur. Compression stockings, sequential compression devices, and/or heparin injections may be needed to prevent deep venous thrombosis. The recommendation is to start the client a low molecular weight heparin (LMWH) or unfractionated heparin within 72 hours after SCI provided the patient has no active bleeding. If an anticoagulant is initiated, it is important for the nurse to assess the patient for any signs of new onset bleeding. As soon as the patient is medically stable, mobilization and passive range of motion should be started to help prevent blood stasis.

It is important for nurses caring for SCI patients to be able to identify the signs and symptoms of DVT. These patients should be assessed for fevers with no known cause, pain or tenderness in an extremity, an extremity warm and reddened, and increased unilateral edema. SCI patients should be watched for shortness of breath, chest pain, fever and anxiety, since these can be symptoms of PE. Early intervention for suspected thromboembolism can prevent poor patient outcome. The patient and his or her family members should receive education about DVT prevention and identification. If anticoagulant therapy is initiated, the patient should receive education about the risks and side effects associated with the medication, along with any follow-up and regular lab work that may be required.

**Orthostatic Hypotension:**
Vasoconstriction is impaired after spinal cord injury, and the lack of muscle function in the legs causes pooling of blood in the lower extremities. Sudden change in position from supine to sitting or sitting to standing may cause dizziness and fainting. Compression stockings, moving slowly, and a reclining wheelchair may help prevent this problem.

**Bladder management.**
The goal of a bladder management program is to
- Maintain a healthy functioning upper urinary tract (the ureters and kidneys).
- Minimize infection and other complications
- Empty the bladder regularly and completely at low pressures.
- Avoid over-distension of bladder.
- Provide adequate urine storage.
- Achieve social and vocational acceptability and adaptability.

**The primary purpose of a bladder management program is to help the client to be in control of elimination. Bladder training program will be successful when the client is able to use specific methods to empty your bladder without “accidents.”**

Immediately after a spinal cord injury, a client may experience a temporary period of spinal shock during which all spinal reflexes may be absent (or flaccid). At this point, the bladder is usually flaccid and unable to hold urine. During this time, bladder distention is important to keep the urethra patent and to prevent bladder spasms.
time the client may lose bladder control and will require Foley catheter insertion to empty the bladder. After the initial shock or flaccid phase, the level of spinal cord injury will determine how urinary system will function in the future. In the spinal cord, the sacral reflex arc (the sacral levels S2-3-4) are responsible for bladder function.

**Areflexic / Flaccid Neurogenic Bladder:** In spinal cord injuries below the T12 level, the sacral / reflex arc is usually damaged and the bladder will remain flaccid. This can also occur in a complete cauda equina injury. In addition to the connection between the brain and the bladder being disrupted, the reflex “loop” is damaged also, so the bladder loses its ability to empty automatically. The bladder is flaccid and the walls lose their normal tone leading to over distension of the bladder. This can cause urine leakage out of the sphincters. Clients with areflexic neurogenic bladder are prone to urinary tract infections. Management of areflexic neurogenic bladder include: an Intermittent Catheterization (IC) Program, urinary diversions and indwelling Foley catheters.

**Reflex / Spastic Neurogenic Bladder:** If the reflex arc is not injured (usually in spinal cord injuries above the T12 level), the bladder may develop into a reflex bladder. Messages will continue to travel between the bladder and the S2-3 reflex segments of the spinal cord and back to the bladder in a large reflex “loop.” However, the connection between the brain and the bladder that allows the client to feel bladder fullness and the ability to control urination is lost, resulting in an automatic, or reflex emptying of the bladder which may or may not be complete. Management of methods for reflex neurogenic bladder may include use an external condom catheter, an intermittent catheterization program or indwelling Foley catheters.

**Pain Management:** Acute pain is common after a spinal cord injury (SCI). The pain may occur as a result of the damage to the spinal cord, or it may occur from damage to other areas of the body at the time of injury. It is also common for many people with SCI to experience chronic pain. It can occur in areas where there is normal sensation, and it can occur in parts of the body where there is little or no feeling after injury. Pain may be neurogenic, musculoskeletal, or visceral. Effective pain management is important for the patient’s rehabilitation and quality of life.

**Infection.** Impaired respiratory muscles with decreased cough and shallow respirations predisposes the client with spinal cord injury to respiratory infection. Mechanical ventilation with intubation provides an avenue for microorganisms to enter the lungs and is a risk factor for infection. Urinary catheterization for loss of bladder control is a risk factor for infection as well.

**Renal Complications.** Urinary reflux from the bladder to the kidney often occurs due to impaired bladder function. Catheterization and immobility predispose to UTI which may travel up the ureters to the kidneys. Permanent damage may eventually occur from the infections. Meticulous hygiene, catheter care, adequate hydration is important to prevent UTI.

**Nursing Management**

Care for the client with a spinal cord injury can be very complex depending on the level of the injury. The client will often be transferred to a rehabilitation facility for intensive rehabilitation and retraining in activities of daily living. When a stabilization device is in place on the head, assessment
and care of the pin sites is performed every shift initially and then twice a day. Sterile technique is used and is performed according to agency policy. Solutions such as sterile normal saline, hydrogen peroxide, or ointments such as povidone iodine or bacitracin may be used. Weights used for cervical traction must be kept hanging free to be effective. Traction pull should never be interrupted.

If the client is wearing a halo fixation device, skin care must be given frequently and the skin checked to see that the jacket or cast is not causing pressure ulcers. One finger should be able to slip easily beneath the cast or jacket to be sure it is not too tight. The client is never moved or turned by holding or pulling on the halo device. The halo jacket is never unfastened unless the client is supine as head movement will immediately occur. Moving the client as a unit, or “log rolling,” must be done with extreme care to avoid twisting the vertebral column and further damaging the spinal cord.

Realistic goals should be set for the client and every effort made to achieve them. Implementation of actions requires encouraging the client to do whatever she can for herself as soon as feasible. The overall goal is to promote as much independence as possible. A great deal of encouragement and praise are required. You can be a pillar of support for the client. Evaluation is ongoing to see if the interventions have been successful in achieving the expected outcomes. If they have not been successful, the plan is rewritten.

**Rehabilitation**

A full team of professionals will be involved in the care and rehabilitation of the client with a spinal cord injury. The physical therapist, occupational therapist, psychologist, physician, respiratory therapist, pharmacist, and ancillary personnel will collaboratively plan the client’s care. The client and family should be invited to actively participate in the planning process.

Communication between team members is crucial to the success of the individual plan. When the client is discharged, all plans and specifics required for her care must be shared with home caregivers and home care nurses who will be involved in her care. Her primary physician must be fully briefed.

The client is included in establishing the long-term care plan, and the goal is to promote as much independence as possible.

**Learning objectives**

Describe the types of injuries that result from spinal cord injury.

Describe the pathophysiology of spinal cord injury.

Describe appropriate nursing interventions for a client with spinal cord injury.

Discuss the diagnostic procedures for spinal cord injury.

Identify appropriate nursing intervention for dysreflexia.
Table 1: Description of SCI clinical syndromes

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<tr>
<th>Syndrome</th>
<th>Description</th>
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<td>Central cord syndrome (CCS)</td>
<td>CCS is characterized by disproportionately more motor impairment of the upper than the lower extremities, bladder dysfunction, usually urinary retention, and varying degrees of sensory loss below the level of the lesion. It is considered the most common of the SCI syndromes, accounting for approximately 9% of all traumatic SCIs. Affects older persons with cervical spondylosis and a hyperextension injury due to cord compression between bony spurs.</td>
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<td>Brown-Sequard syndrome (BSS)</td>
<td>BSS is defined as a lesion that produces ipsilateral proprioceptive and motor loss and contralateral loss of sensitivity to pain and temperature below the level of the lesion. BSS accounts for 1% to 4% of all traumatic SCIs. Only a limited number of clients have the pure form of BSS—much more common is Brown-Sequard plus syndrome.</td>
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<td>Anterior cord syndrome (ACS)</td>
<td>ACS lesion affects the anterior two thirds of the spinal cord while preserving the posterior columns. It is characterized by complete paralysis with hyperesthesia and hypalgesia below the level of the lesion, together with preservation of touch, position, 2-point discrimination, and vibratory sense. Accounts for about 2.7% of all traumatic SCIs.</td>
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<td>Posterior cord syndrome (PCS)</td>
<td>PCS is the least common of the SCI clinical syndromes, with an incidence of less than 1%. The American Spinal Injury Association (ASIA) has actually omitted this syndrome from recent versions of their international standards for classification of SCI. Clinically, it is described as a selective lesion of the posterior columns resulting in a loss of proprioceptive and vibration sense below the level of injury, but with preservation of muscle strength, temperature, and pain sensation. It has been linked to neck hyperextension injuries, posterior spinal artery occlusion, tumors, disk compression, and vitamin B12 deficiency.</td>
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<td>Conus medullaris syndrome (CMS)</td>
<td>CMS is an injury of the sacral cord (conus) and lumbar nerve roots within the spinal canal. This condition is characterized by a combination of upper and lower motor neuron signs. Findings include saddle anesthesia, areflexic bladder and bowel, and variable degrees of lower extremity weakness. Trauma and tumors are among the most common etiologies responsible for this condition.</td>
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<td>Cauda equina syndrome (CES)</td>
<td>CES is not considered a true SCI. Instead, it is an injury to the lumbosacral nerve roots within the neural canal. Clinically, it can present similarly to CMS with saddle anesthesia, bladder and bowel dysfunction, and variable lower extremity involvement. However, this is considered a pure lower motor neuron lesion with the absence of upper motor neuron signs, and it is characterized by asymmetric lower extremity weakness. CES can occur as the result of trauma, tumors, spinal stenosis, disc compression, infection, or postsurgical epidural hematoma. It can be an acute process or a chronic and slowly progressive condition. It is believed to have a better prognosis for neurological recovery than SCIs because nerve roots have the ability to regenerate.</td>
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References


NCLEX Style questions.

1. Which of these would the nurse consider prior to initiating bladder training program for a client after a spinal cord injury? (Select all that apply.)

   a. **Whether the client have any sensation of bladder fullness or the ability to control urination on their own.**
   b. **The client lifestyle and preferences.**
   c. **Whether the client have previous history of urinary tract infection.**
   d. **The client fluid and food intake and output.**
   e. **The client or caregiver’s ability to perform catheterization.**

2. After a discharge teaching for a client with spinal cord injury about management of dysreflexia, the nurse determines that learning has taken place when the client stated; (Select all that apply.)

   a. “I will sit up straight in bed or a chair.”
   b. “I can dangle my legs with help if possible.”
   c. “If the dysreflexia is not relieved in 5 to 10 minutes, call 9-1-1 for medical assistance.”
   d. “I should have someone check my blood pressure,”
   e. “The number one cause is over-distended bladder, I should do an intermittent catheterization immediately.”

3. The client has a nursing diagnosis of sleep pattern disturbance. Which of these nursing actions is a priority for this client?

   a. **Turn and reposition client every 2 hours.**
   b. **Start the client on cognitive rehabilitation activities.**
   c. **Group nursing care activities so client is disturbed less frequently.**
   d. **Help client plan and anticipate concerns and solve problems.**

4. The nurse is monitoring a client with head trauma and suspected cervical spinal injury. The reading on the cerebral tissue perfusion monitoring machine recorded 40 mm Hg. What is the most appropriate initial nursing action?

   a. **Lower the head of the bed to a flat position.**
   b. **Elevate the client’s legs to increase blood flow to the head.**
   c. **Elevate the head of the bed to 60 degrees**
   d. **Increase IV fluids as ordered to improve cerebral blood flow.**
5. A client is rushed to the emergency department after a falling of a ladder. The family stated that client complained of neck pain prior to losing consciousness. Client has very weak pulse but is not breathing. What is the priority intervention for this client?
   
   a. Immobilize the neck and head immediately.
   b. Log roll the client to the side to open the airway.
   c. Use head-tilt chin-lift to open the airway.
   d. Establish an intravenous access and start IV fluids.

6. The nurse has given discharge teaching to client and family who is being discharged after rehabilitation for traumatic brain injury. Which of the following statement by the client and/or family member would indicate that they did not understand the nurse’s instructions. Select all that apply.

   a. “I will take my anti-seizure medications as ordered so I do not have a seizure.”
   b. “I will remind her of previous abilities when she is having problems completing tasks.”
   c. “I will schedule regular rest breaks or naps as part of my daily routine.”
   d. “I will eat slow and chew my food well prior to swallowing to prevent choking.”
   e. “During an outburst, I will remind her to breathe deeply and be reasonable with her expectations.”

7. The nurse working at a summer camp was summoned to the playground after one on the counselors fell of a ladder. Which of these action by those assisting the counselor will cause the nurse to intervene?

   a. Asked the counselor if he can move his arms and legs.
   b. Asked the counselor to lay still when he complain of neck pain.
   c. **Place a rolled up blanket under the counselor’s head for support.**
   d. Someone rolled up 2 towels and placed it around the neck of the counselor.

8. A client with acute spinal cord injury has an order for dopamine (Inotropin). The nurse will explain the rational for this order to the client and family as

   a. Improve blood pressure and prevent cord hypoxia.
   b. This will prevent complications of increase intracranial pressure.
   c. Minimize further damage and improve the return of motor function and sensation.
   d. Decreases spinal cord pressure and further damage to the nerve endings.
9. A client is brought to the emergency department with cervical spine fracture at the level of the C4. Which of these is a priority nursing concern for this client?

a. Risk for impaired skin integrity
b. Risk for spinal cord injury
c. Risk for autonomic dysreflexia
d. Risk for impaired breathing

10. The nurse in a long term acute care facility is observing two co-workers who is caring for a client who is on a halo brace following spinal cord injury. Which of the following actions by the co-worker would require the nurse to intervene? Select all that apply.

a. Lay the client flat to open the halo and check the client’s skin.
b. Holding on to the framework while turning the client in bed.
c. Elevated the head of the client’s bed to >60 degrees during meals.
d. Closing the buckles on the vest prior to getting the client out of bed.
e. Closed and buckled the vest without a liner in place.

11. The nurse is caring for a client who has spinal cord injury in a rehabilitation facility. The client’s spouse asks the nurse for information regarding the client’s treatment plan. Which of the following responses would be most appropriate for the nurse to make?

a. “I cannot give you information on any client.”
b. “Can you verify the client’s date of birth?”
c. “Let me ask the primary health care provider to speak with you.”
d. “You should speak directly with the client about the treatment plan.”

12. The nurse has taught a client who is scheduled for a myelogram. Which of the following statements by the client would require follow up?

a. “I will sign an informed consent form after the procedure.”
b. “I will get injection to numb the skin in my lower back during the procedure.”
c. “I can go back to work this evening after the procedure.”
d. “I can walk around to relief the headache after the procedure.”
e. “I will be placed in the knee-chin position for the procedure.”
f. “I cannot have anything to drink for 12 hours after the procedure.”
13. The nurse is teaching a client about self-care while in halo brace. Which of the following information should the nurse include?

   a. You should let your doctor or nurse know if you have neck pain or headache.
   b. You should let your doctor or nurse know if you are able to move your head (even slightly).
   c. If you feel the pins are loose, get to a mirror quickly and tighten it.
   d. You should never shower or wash your hair while in the halo brace.
   e. Check the vest daily to make sure that all the nuts and bolts are tight.

14. The nurse is caring for a client who had a halo brace place after a C5 fracture. Which of the following findings would be essential for the nurse to follow-up immediately?

   a. The pin site is slightly red with no drainage.
   b. The client is having trouble swallowing pills while in the halo.
   c. The client is able to turn their head slightly to look at the nurse.
   d. The skin under the vest is red around the scapula areas.

15. The registered nurse (RN), licensed practical/vocational nurse (LPN/VN) and the nursing assistant (NA) are working as a team on a unit. Which of the following clients care would be most appropriate to assign to the RN?

   a. Repositioning the client with suspected neurologic injury.
   b. Assist and transfer a client after spinal surgery.
   c. Providing daily bathing and morning care to a client on
   d. Assist the nurses to log roll the client after thoracic vertebral repair.

16. A 40-year-old man with a T4 spinal cord injury suddenly complains of severe headache, increased pulse rate, and sweating above the level of the spinal cord lesion, and “goose bumps” below the level of injury. Immediate nursing actions should include which of the following? (Select all that apply.)

   a. Place the client flat in bed immediately.
   b. Identify cause of stimulation.
   c. Administer antihypertensives as ordered.
   d. Provide measures to facilitate bowel movement.
   e. Clamp any indwelling Foley catheter immediately.
   f. Elevate the lower extremities to levels above the heart
17. A 30-year-old male client was admitted to the emergency department after a motor vehicle accident. On examination, the client was diagnosed with a T6 spinal cord injury. He had flaccid paralysis, slowed heart rate, low blood pressure, and no bowel sounds. The nurse recognizes that because of the client’s diagnosis, the findings are probably due to

   a. Autonomic dysreflexia.
   b. Neurogenic Shock
   c. Spinal shock.
   d. Diabetic ketoacidosis.

18. The nursing assistant is attending to the needs of a client with head injury who is lethargic and has increased intracranial pressure. Which of the following actions by the nursing assistant indicates a need for further teaching?

   a. Stopping the client from blowing his nose.
   b. Monitoring blood pressure using automated B/P machine.
   c. Dangling the client on the side of the bed.
   d. Reporting soiled saturated dressing to head wound.

19. The nurse is performing assessment on a client with autonomic dysreflexia. Which of the following findings should the nurse anticipate?

   a. Respiratory distress, bradycardia, and projectile vomiting
   b. Bradycardia, agitation, and hypertension
   c. Tachycardia, distended bladder, and agitation
   d. Third-spacing, tachypnea, and hyperthermia

20. The charge nurse stated to the incoming nurse in a neuro ICU unit, “The client’s spinal shock is resolving.” Which of the following assessment finding will most likely be related to the nurse’s statement? Select all that apply.

   a. The presence of bulbocavernosus reflex.
   b. The client’s blood pressure is 96/58.
   c. The client’s pupils are round equal and reactive to light.
   d. The client opens her eyes in response to verbal stimulation.

21. A client with a T2 spinal cord injury is admitted to the critical care unit. The client is soon exhibiting manifestations of neurogenic shock. Which of these actions by the nurse would represent the most appropriate care for this client?

   a. Prepare to transfuse packed red blood cells.
   b. Prepare for interventions to increase the client's BP.
   c. Place the client in the Trendelenburg position.
d. Prepare an ice bath to lower core body temperature.

22. The nurse is planning care for a client with spinal cord injury who has a nursing diagnosis of altered mobility. Which of the following intervention will be essential for the nurse to include in the client's plan of care?

   a. Placing the client on a fluid restriction as ordered
   b. Applying thigh-high elastic stockings
   c. Turn and reposition the client every 2 hours
   d. Administering an antifibrinolytic agent
   e. Assisting the client with passive range of motion (PROM) exercises

23. Autonomic dysreflexia is often experienced by clients with spinal cord injuries. To minimize the risk of occurrence the nurse would avoid?

   a. Strict adherence to a bowel retraining program
   b. Preventing unnecessary pressure on the lower extremities
   c. Keeping linens wrinkle free under the client.
   d. Limiting bladder catheterization once every 8 hours.

24. The nurse is caring for a client who suffered spinal cord injury 56 hours ago. To monitor for gastrointestinal complications the nurse should assess for:

   a. A history of diarrhea
   b. Hematest-positive nasogastric tube drainage
   c. A flattened abdomen
   d. Hyperactive bowel sounds.

25. The nurse is planning care for the client in spinal shock. Which of the following actions would be least helpful in minimizing the effects of vasodilation below the level of the injury?

   a. Monitoring vital signs before and during position changes
   b. Using vasopressor medications as prescribed
   c. Moving the client quickly as one unit
   d. Applying Teds or compression stockings.

26. A 26-year-old client who fell approximately 30' is unresponsive and not breathing. A cervical spine injury is suspected. How should the first-responder open the client’s airway for rescue breathing?

   a. By performing a jaw-thrust maneuver
   b. By inserting a nasopharyngeal airway
c. By inserting a oropharyngeal airway
d. By performing the head-tilt, chin-lift maneuver

27. Which of the following interventions describes an appropriate bladder program for a client in rehabilitation for spinal cord injury?

a. Insert an indwelling urinary catheter to straight drainage
b. Schedule intermittent catheterization every 2 to 4 hours
c. Perform a straight catheterization every 8 hours while awake
d. Perform Crede’s maneuver to the lower abdomen before the client voids.

28. The nurse is assessing a client admitted with spinal shock following a spinal cord injury. Which of the following will the nurse expect to find?

a. Spastic paralysis of the legs, bowel and bladder incontinence, hyperreflexia
b. Spastic paralysis of the legs, bowel and bladder retention, hyperreflexia
c. Flaccid paralysis of the legs, bowel and bladder incontinence, areflexia
d. Flaccid paralysis of the legs, bowel and bladder retention, Areflexia

29. A client is admitted with T8 spinal cord injury. Which of these statement by the client represent an unrealistic expectation and lack of understanding of the expected outcome?

a. “I know this means that my legs won’t work like before.”
b. “I know this means making some adaptive changes to my car before I can drive again.”
c. “I know this mean I will be on mechanical ventilation for the rest of my life.”
d. I know this means using a Foley catheter for a while or even for the rest of my life.”

30. The nurse at a community health center assess a client who report to the clinic with pounding headache. The client has a history of T3 injury that occurred some time ago. The nurse should first assess for

a. Autonomic dysreflexia
b. Neurogenic shock
c. Sinus infection
d. Migraine headaches
Rationale for NCLEX Style Questions.

1. Rationale: The goal of bladder retraining is to develop a healthy and manageable way for the client to empty their bladder. There are several factors considered prior to beginning bladder retraining to decide which techniques are the best to help the client control and manage the bladder after a spinal cord injury including.

2. Rationale: A, B, C, D, E.

3. Rationale: (C.)

4. Rationale: (D) Maintenance of adequate CPP is important to prevent serious complications of head injury due to decreased cerebral perfusion. Adequate CPP is greater than 50 mm Hg (50 – 70 mm Hg). CPP below 50 mm Hg can cause increase ICP which can further impair cerebral tissue perfusion and cause hypoxia and ischemia, leading to permanent brain damage. Implement measures to maintain adequate cerebral tissue perfusion such as elevating the head of the bed to 30 degrees, increase IV fluids, Assessing for and reporting signs and symptoms of decreased cerebral tissue perfusion (irritability and restlessness, decreased level of consciousness, paresthesias, weakness, and paralysis.) If the client is hypotensive, perform actions to improve cerebral blood flow. Increasing the head of the bed beyond 30[degrees] and decreasing the head of the bed below 15[degrees] have been associated with increased ICP and/or decreased CPP.

5. Rationale: (C.) For an unconscious, non-breathing person it is more important to have an open airway rather than consideration of a potential spinal injury.

6. Rationale: B and E.

7. Rationale: (C.) Anyone with a head injury is treated as if she has also suffered a spine injury until proven otherwise. The neck must be stabilized to prevent any movement. When no cervical collar is available, use a shirt, towel, coat, or other material rolled and placed around the neck as a collar to keep the neck as straight as possible, preventing it from flexing or hyperextending. If the victim must be moved to safety, she should be rolled like a log, as one straight piece, onto a flat surface, such as a piece of plywood or a door removed from its hinges.

8. Rationale: (A) Normal saline is used for fluid replacement, and drugs such as dopamine (Intropin) may be given to sustain a sufficient blood pressure to prevent cord hypoxia.
9. **Rationale:** (D) The phrenic nerves that innervate the diaphragm originate in the third, fourth, and fifth cervical segments. Therefore severe injury to the cord above the level of the fifth cervical vertebra often is fatal if emergency care is not immediate. Branches of the phrenic nerves play a major role in the control of respiration, and when they are severed, respiration must be maintained by artificial means.

10. **Rationale:** (B and E) The framework should not be used to turn or transfer the client. The client should always have a liner in place when the vest is closed. Client should not get out of bed without having the framework of the vest checked, the buckles on the vest closed, and the pins tightly screwed into the head. The halo can be opened to check for skin problems and to change liners only when the client are flat in bed. Clothing should not be worn underneath the vest and no lotion or cream on the skin underneath the vest.

11. **Rationale:** (A) Maintain client confidentiality and privacy. Unless client has given written permission to give information the nurse should not client’s care with anyone including the spouse.

12. **Rationale:** (A, C, D, F) Informed consent is signed before the procedure not after. The client is encouraged to increase fluid intake to flush the contrast out of the system. The client will not be able to drive for 24 hours after the myelogram and are usually advised to rest and avoid strenuous activities for the first 48 hours. Headache is usually worse when the client sits up or stands. Lying down relieves the headache.

13. **Rationale:** (A, B, E) Instruct the client to report any neck pain, a headache or any head movement (even just a little). These are all signs of the halo not being properly adjusted. If the pins are loose, the client should stay flat in bed until they are tightened. Client may take a shower and wash their hair once the doctor has cleared it.

14. **Rationale:** (C) the client should not be able to turn their head even slightly. The client should stay flat in bed until the nurse checks and tightens the halo. The pin sites are checked and cleansed at least twice a day or as directed by the surgeon. Hair around the pin sites should be kept short. The nurse should check the pin sites for redness, swelling, pain and drainage. The client may find it hard to swallow with a halo brace. To eat more easily, a cup and straws may make it easier to drink without bending the neck,, cut food into small pieces and take small bites,. And crush the pills in apple sauce.

15. **Rationale:** (D) Although many tasks may be delegated to the certified nursing assistant (CNA) or UAP, moving or positioning the client with neurologic injury
or surgery should not be delegated. If given proper, complete instructions, the CNA or UAP may help log roll the client with the nurse’s help and supervision.

16. **Rationale:** (B, C, D). The client is experiencing symptoms of autonomic dysreflexia. Efforts should be made to lower blood pressure by placing him in a sitting position or elevating his head to a 45-degree angle. Identify and correct the cause immediately. For example, an impacted bowel or overdistended bladder.

17. **Rationale:** (C.) The client’s assessment findings are consistent with spinal shock.

18. **Rationale:** (C.), placing the client in an upright position has been shown to increase intracranial pressure.

19. **Rationale:** Symptoms include; include sudden onset of a pounding headache; Elevated blood pressure, bradycardia; Goosebumps above the level of injury, Sweating and flushing above the level of injury, Restlessness.

20. **Rationale:** (A). Assessment of the end of spinal shock is based on the return of reflexes, with the bulbocavernosus reflex typically being the first to return. Other signs that the spinal shock is resolving include; return of deep tendon reflexes; development of hyperreflexia instead of flaccidity; return of ability to empty bladder, which depends on the level of the injury.

21. **Rationale:** (B). Manifestations of neurogenic shock include decreased BP and heart rate. Cardiac markers would be expected to rise in cardiogenic shock. Transfusion, repositioning, and ice baths are not indicated interventions.

22. **Rationale:** (B) It is important to promote venous return to the heart and prevent venous stasis in a client with altered mobility. Applying elastic stockings will aid in the prevention of a DVT. The client should not be placed on fluid restriction because a dehydrated state will increase the risk of clotting throughout the body. Antifibrinolytic agents cause the blood to clot, which is absolutely contraindicated in this situation. PROM exercises are not an effective protection against the development of DVT.

23. **Rationale:** (D). One of the most common causes of autonomic dysreflexia after a spinal cord injury is related to bladder distension. Straight catheterization should be done every 4 to 6 hours or as ordered by the physician, and Foley catheters should be checked frequently for kinks in the tubing. Constipation and fecal impaction are other causes so maintaining bowel regimen is very
Important. Stimulation of the skin, from tactile, thermal, or painful stimuli are among the other causes.

24. Rationale: (B). After spinal cord injury, a client can develop paralytic ileus which is characterized by absence of bowel sounds and abdominal distension. Development of stress ulcers is common with critical injuries such as spinal cord injury, and can be detected by Hematest - positive stool occult blood or NG tube aspirate. History of diarrhea is irrelevant test.

25. Rationale: (C). Reflex vasodilation below the level of the spinal cord injury places the client at risk for orthostatic hypotension, which may be profound. Measures to minimize this include measuring vital signs before and during position changes, use of a tilt-table with early mobilization, and changing the client’s position slowly. Venous pooling can be reduced by using Teds (compression stockings) or pneumatic boots. Vasopressor medications are administered per protocol.

26. Rationale: (A). If the client has a suspected cervical spine injury, a jaw-thrust maneuver should be used to open the airway. If the tongue or relaxed throat muscles are obstructing the airway, a nasopharyngeal or oropharyngeal airway can be inserted; however, the client must have spontaneous respirations when the airway is open. The head-tilt, chin-lift maneuver requires neck hyperextension, which can worsen the cervical spine injury.

27. Rationale: (B). Intermittent catherization should begin every 2 to 4 hours early in the treatment. When residual volume is less than 400 ml, the schedule may advance to every 4 to 6 hours. Indwelling catheters may predispose the client to infection and are removed as soon as possible. Crede’s maneuver is not used on people with spinal cord injury.

28. Rationale: (D). During spinal shock, there is loss of voluntary control of the skeletal muscles, autonomic reflex below the level of the injury. This leads to flaccid paralysis, loss of the spinal reflex arcs, and bowel and bladder retention.

29. Rationale: (C). Mechanical ventilation will not be necessary for T8 injury. The other options are all applicable to T8 injury.

30. Rationale: (A). A client with Spinal cord injury at or above the T6 can experience autonomic dysreflexia at any time.

injury NCLEX review, NCLEX review questions, Spinal cord injury NCLEX review questions, SCI NCLEX review. Spinal cord disorder NCLEX review, Spinal cord injury questions for nurses, NCLEX RN questions, review questions, C-Spine fracture, Spinal trauma review questions, Spinal trauma NCLEX questions, C-Spine fracture NCLEX questions.