TRAIN FOR SUCCESS INC.
SPINAL CORD INJURIES 2HR

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PURPOSE

The purpose of this course is to educate and reinforce the knowledge of Nurses; ARNP, RN, LPN, CNA /HHA, Occupational Therapists (OT/OTA) and other Professionals who are working in the health care environment, as well as other students/ individuals regarding working with patients with Spinal cord injuries. Review of the central nervous system. Review of fact sheets regarding autonomic dysreflexia, respiratory health, bladder management, alternative surgical management for bladder, bowel function and sexual function after spinal cord injury, skin care, pressure sore, pain, recovery and rehabilitation after spinal cord injury.

OBJECTIVES/ GOALS:

After successful completion of this course the students will be able to:

1. Define the central nervous system
2. Discuss signs and symptoms often experienced by patients with Spinal cord injuries
3. Describe the treatment modalities
4. Discuss the effects seen at High-Cervical Nerves (C1 – C4) injuries
5. Discuss the effects seen at Low-Cervical Nerves (C5 – C8)
6. Discuss the effects seen at Thoracic Nerves (T1 – T5)
7. Discuss the effects seen at Thoracic Nerves (T6 – T12)
8. Discuss the effects seen at Lumbar Nerves (L1 – L5)
9. Discuss the effects seen at Sacral Nerves (S1 – S5)
10. Discuss the Occupational and Physical Therapists role in the Care of Individuals with Spinal Cord Injury
11. Detail some of the available resources within the community and online.

THE CENTRAL NERVOUS SYSTEM (CNS)

The nervous system sends and receives signals throughout the body to control bodily functions. The nervous system consists of:

The central nervous system (brain and spinal cord) and
The peripheral nervous system (nerve fibers that attach to and lie outside the brain and spinal cord).

The nervous system has two components, motor (efferent) and sensory (afferent), that carry information to and from the central nervous system (CNS).

The brain is the organ of thought, emotion, and processing of the various senses and communicates with and controls various other systems and functions.

The nervous system also provides special senses such as sight, hearing, taste, feel, and smell. It uses the eyes, ears, tongue, skin, and nose to gather data/ information.

THE SPINAL CORD

The spinal cord is the main pathway for information connecting the brain and peripheral nervous system. The human spinal cord is protected by the bony spinal column. The spinal column is made up of bones called vertebrae.

The spinal cord is an extension of the brain and is surrounded by the vertebral bodies that form the spinal column.

The central structures of the spinal cord are made up of gray matter (nerve cell bodies), and the external or surrounding tissues are made up of white matter.

Within the spinal cord are segments that belong to 4 sections (cervical, thoracic, lumbar, sacral), based on their location:

Eight cervical segments: These transmit signals from or to areas of the head, neck, shoulders, arms, and hands.

High-Cervical Nerves (C1 – C4)

Low-Cervical Nerves (C5 – C8)

Twelve thoracic segments: These transmit signals from or to part of the arms and the anterior and posterior chest and abdominal areas.

Thoracic Nerves (T1 – T5)

Thoracic Nerves (T6 – T12)

Five lumbar segments: These transmit signals from or to the legs and feet and some pelvic organs.

Lumbar Nerves (L1 – L5)

Five sacral segments: These transmit signals from or to the lower back and buttocks, pelvic organs and genital areas, and some areas in the legs and feet.

Sacral Nerves (S1 – S5)

A coccygeal remnant is located at the bottom of the spinal cord.

PERIPHERAL NERVOUS SYSTEM

Nerve fibers that exit/ leave the brainstem and spinal cord become part of the peripheral nervous system. Cranial nerves leave the brainstem and function as peripheral nervous system mediators of numerous functions, including eye movements, facial strength and sensation, hearing, and taste.

The spinal cord is also covered by the pia matter and the arachnoid membranes. The cerebrospinal fluid circulates around the pia and below the outer arachnoid, and this space is also referred to as the subarachnoid space.

The roots of the cauda equina and the rootlets that make up the nerve roots from higher segments are bathed in cerebrospinal fluid. The dura surrounds the pia-arachnoid of the spinal cord.

SPINAL CORD INJURY

A spinal cord injury usually begins with a sudden, traumatic blow to the spine that fractures or dislocates vertebrae.

The damage begins at the moment of injury when displaced bone fragments, disc material, or ligaments bruise or tear into spinal cord tissue.

Most injuries to the spinal cord do not completely sever the spinal cord.

Instead, an injury is more likely to cause fractures and compression of the vertebrae, which then crush and destroy axons; extensions of nerve cells that carry signals up and down the spinal cord between the brain and the rest of the body.

An injury to the spinal cord can damage a few, many, or almost all of these axons. Some injuries will allow almost complete recovery while other injuries will result in complete paralysis.

TREATMENT

Improved emergency care for individuals with spinal cord injuries and aggressive treatment and rehabilitation can minimize damage to the nervous system and even restore limited abilities.

Respiratory complications are often an indication of the severity of spinal cord injury About 1/3 of those with injury to the neck area will need help with breathing and require respiratory support.

The steroid drug methylprednisolone appears to reduce the damage to nerve cells if it is given within the first 8 hours after injury (NINDS.GOV 2016).

Prehospital care focuses on the need to immobilize and stabilize the spine on the basis of mechanism of injury, pain in the vertebral column, and /or neurologic symptoms. A cervical hard collar is usually placed on the injured person and he /she is usually transported to the emergency department (ED) on a hard backboard. Commercial equipments are available to secure the patients to the backboard.

The patients need to be secured so that if the patient experiences any emesis, the backboard can be quickly rotated 90° while the injured person remains immobilized in a neutral position.

Rehabilitation programs combine occupational and physical therapies with skill-building activities and counseling to provide social and emotional support.

Electrical stimulation of nerves by neural prosthetic devices may restore specific functions, including bladder, breathing, cough, and arm or leg movements, though eligibility for use of these devices depends on the level and type of the spinal cord injury.

PROGNOSIS

Spinal cord injuries are classified as either complete or incomplete.

An incomplete injury means that the ability of the spinal cord to convey messages to or from the brain is not completely lost.

Individuals with incomplete injuries retain some motor or sensory function below the injury. A complete injury is indicated by a total lack of sensory and motor function below the level of injury.

The American Spinal Injury Association (ASIA) Impairment Scale

The extent of injury is defined by the American Spinal Injury Association (ASIA) Impairment Scale using the following categories:

A = Complete: No sensory or motor function is preserved in sacral segments S4-S5

B = Incomplete: Sensory, but not motor, function is preserved below the neurologic level and extends through sacral segments S4-S5

C = Incomplete: Motor function is preserved below the neurologic level, and most key muscles below the neurologic level have a muscle grade of less than 3.

D = Incomplete: Motor function is preserved below the neurologic level, and most key muscles below the neurologic level have a muscle grade that is greater than or equal to 3.

E = Normal: Sensory and motor functions are normal.

Individuals who survive a spinal cord injury will most likely have medical complications such as chronic pain and bladder and bowel dysfunction, along with an increased susceptibility to respiratory and heart problems.

Successful recovery depends upon how well these chronic conditions are handled day to day.

Surgery to relieve compression of the spinal tissue by surrounding bones broken or dislocated by the injury is often necessary, through timing of such surgery may vary widely.

Prioritizing care at the scene of an accident

Priority refers to actions that are established in order of importance or urgency. When an individual arrives on scene of an accident, the rescuer has to first assess the situation.

Your initial observations will allow you to take appropriate actions that will assist the victim or injured person, without causing further harm or injury to that person or to yourself.

Prioritize all actions in order of urgency/ importance. There might be several injured persons at the scene; prioritizing care will allow you to determine who will need assistance or treatment first.

CONDUCT AN INITIAL ASSESSMENT

Always check the environment (Scene), look carefully to make sure the scene is safe. Do not just rush to the victim. There might be dangers that you are not aware of, for example, the victim may have a gunshot wound and the attacker might still be at the scene or in the area. There may also be environmental hazards, such as electrical issues or power lines down making it unsafe to get to the injured person, therefore in this instance, you cannot get to the victim and must call 911 tell them what you observed, the victim and the environmental dangers. The 911 operator will ask you for important information regarding location etc. so stay on the line until that 911 operator tells you otherwise.

Other environmental hazards that may prevent you from getting to the victim may include, but not limited to:

- Flooding,
- Fire,
- Lightning,
- High winds,
- Traffic,
- Ground is unstable or sinkhole activity
- Edge of cliff
- Wild animals in environment

If in your initial assessment you observed that the scene is safe;

Check the person for responsiveness; call out "Do you need help"? This might be an individual who was just sleeping / taking a nap. If you receive no response, tap the individual on the shoulder and call out again "are you OK?

If you have encountered an emergency situation and the victim is **conscious**;

- Tell the victim your name
- Obtain consent by asking the victim if you can help him/her
  If the victim gives consent, provide the appropriate care.
- Ask the victim what happened,
- Ask if he/she has any pain/discomfort
- Ask if he/she has any medical conditions,
- Ask if he/she has any difficulty moving any extremities (arms or legs)
- Ask if he/she is experiencing any numbness,
- Ask if he/she has any allergies,
- Ask when was last time he/she had anything to eat,
- Ask when was last time he/she had anything to drink,
- Ask if he/she are taking any medications.

Update the EMS personnel with this information, when they arrive on scene. Remember, If the victim is conscious and does not give you his/her consent, ***do not*** give care but call 911.

Term	Definition
Consent	To agree to do or allow something: to give permission for something to happen or be done.

If the victim is unconscious and therefore unable to give verbal consent; in this situation you will use implied consent. The victim is also unable to give you clues regarding what

has happened but as you assess the victim, check for Medic Alert bracelet, watch, sports bands, necklace, shoe tags, ID bracelets which may provide a diagnosis.

Check the injured person/victim to find out whether he/she has a severe injury that requires a call to 911 or if the injury is minor and can be easily taken care of on scene or by a car ride to a physician's office or hospital. If you are not sure regarding the severity of the victim status, call 911.

HEAD -TO -TOE ASSESSMENT

Check the victim from the Head to Toe. Start by looking at the top of the head, face, ears, nose and his/her mouth. You are looking for bumps/ swelling, bruises, discoloration, cuts, fluid leakage, bleeding and any unusual depressions or indentation in the skin.

- Look at the coloring of the skin,
- Look at the color changes on the face (pale, flushed)
- Look at the color changes on the lips (cyanosis, blue)
- Check how the skin feels (moist, sweating, increased warmth/hot or cold)
- Check the forehead with the back of your hand (for temperature changes)
- Monitor for changes in breathing and consciousness
- Check/ look all over the body, try not to move the victim,
- Observe the victim for signs/ symptoms of pain (the victim may grimace or make have facial expression changes when a part of the body is touched).
- Listen for sounds of discomfort/pain (moaning or groans)

Call 911 for serious accidents/ injuries such as:

- Difficulty breathing
- Victim losses consciousness
- Signs/ symptoms of shock
- Confusion
- Accident with impact injury/injuries
- Severe bleeding
- Burns that are severe

- Severe fall
- Traumatic Head injury
- Drug overdose
- Fracture with bone piercing through the skin
- Possible fracture of spine, neck, head, femur or pelvis
- Chest pain, tightness or pressure
- Unable to move
- Decreased or loss of sensation
- Open wound
- Pupils are unequal
- Deformity of the extremities or joints
- Cyanosis of extremities or lips

HEAD, NECK AND SPINE INJURY

SPINAL COLUMN ANATOMY

When an injury occurs within the spinal cord, movement and sensation may be interrupted, this may cause a permanent or temporary loss of function, paralysis and loss of sensation.

Some basic anatomy facts

The brain is surrounded by the skull. The skull is a bony structure; the head in the skeleton, which supports the structures of the face and forms a cavity for the brain. The adult skull consists of two parts which are of different embryological origin the;

- Neurocranium and the
- viscerocranium.

The neurocranium (braincase) is a protective cranial vault that surrounds the brain and the brainstem. The viscerocranium (facial skeleton or splanchnocranium) is formed by the bones supporting the face. With the exception of the mandible, all of the bones of the adult skull are joined together by synarthrodial (immovable) joints formed by bony ossification, with Sharpey's fibres (bone fibers) permitting some flexibility.

Sharpey's fibres are a matrix of connective tissue consisting of bundles of strong collagenous fibres connecting periosteum to bone. They are part of the outer fibrous layer of periosteum, entering into the outer circumferential and interstitial lamellae of bone tissue. The skull's bony structure is to protect the brain from any damage.

If an injury occurs to the head, there is always risk of brain damage. Therefore, you should always assume that if there is a risk of head injury then there is also a risk of neck injury and spine injury.

Term	Definition
Neurocranium	Those bones of the cranium enclosing the brain, as distinguished from the bones of the face.
Viscerocranium	That part of the cranium derived from the embryonic pharyngeal arches; comprises the facial bones of the facial skeleton(under *bone*) and is distinct from that part of the cranium that forms the neurocranium (braincase).
Periosteum	a dense layer of vascular connective tissue enveloping the bones except at the surfaces of the joints.

THE SPINAL CORD

The spinal cord is a bundle of nerves that runs down the middle of the back. The spinal cord carries signals back and forth between the body and the brain. A spinal cord injury may disrupt the signals.
The spinal cord is surrounded by rings of bone called the vertebrae. Both are covered by a protective membrane. The vertebrae and the membrane make up the spinal column, or the backbone.

The backbone/ spinal column protects the spinal cord; it starts at the base of the skull and ends just above the hips. The *spinal cord is about 18 inches long*. It extends from the base of the brain, down the middle of the back, to just below the last rib in the waist area.

The main function of the spinal cord is to be the communication system (carries signal) between the brain and the body by carrying messages that allow the individual to move and feel sensation.

Spinal nerve cells, which are called neurons, carry the messages to and from the spinal cord by way of the spinal nerves. The messages carried by the spinal nerves leave the spinal cord through openings that are located within the vertebrae.

Spinal nerve roots branch off the spinal cord in pairs, one goes to each side of the body. Every nerve has a special function for movement and feeling. The nerves tell the muscles in the arms, hands, fingers, legs, toes, chest and other parts of the body how to move and when to move. They also able to carry the messages back to the brain about sensations, for example pain, touch and temperature.

You should suspect injury to head, neck and / or spine in cases such as:

- Car accident
- Motorcycle accident
- Fall from height
- Electrocution
- Injury to the head from sporting event or fight

- even minor bump can cause internal head injury

Also suspect a head, neck and/ or spine injury if the following symptoms occur after an accident:

- Lack of responsiveness
- confusion
- Seizures
- Visual problems
- Vomiting
- Headache
- Moaning
- Problems walking
- Problems moving

Steps for administering First Aid:

Always make sure the scene is safe for you and the victim
Call 911 or designate someone to call 911
Hold the neck and head so it does not move, bend or twists

Turn the victim only if:

- Victim is in danger,
- if you need to check if the victim is breathing,
- if the victim is vomiting

NOTE: If you have to turn the victim, make sure you are holding the head and neck in place to avoid movement, bending or twisting.

Head Injury Guidelines

Answer the following questions, this will help you determine whether the victim should be taken to the physician, the emergency room, or be treated at home.

Has the victim experience unconsciousness? If yes, seek medical attention.

Has the victim experience loss of memory about the injury? If yes, seek medical attention.

Has the victim experience seizure activity? If yes, seek medical attention.

Are any of the following symptoms / situations present?

- bleeding from the eyes
- bleeding from the ears
- bleeding from the mouth
- fluid draining from nose
- vomiting repeatedly
- visual problems
- change in behavior, irritable, sleep
- lethargy
- irregular heart rate or breathing
- victim under the influence of drugs or alcohol
- possible child abuse
- possible domestic abuse

If answered yes to any of the above, then you must seek medical attention.
If you answered NO to the above questions, then apply home treatment.

Home Treatment for Head Injuries include:

Apply ice to the bruised area to minimize the swelling. A bump often develops at the bruised site. The victim has to be observed carefully. The symptoms of bleeding inside the head usually occur within the first 24 to 72 hours.

A minor head injury may occur when the victim runs into something or someone and bangs his or her head. A bump/ bruise usually begin to form. The victim may vomit once or twice in the first few hours. He or she may nap but is easily aroused, the pupils

are not enlarged. Within eight hours, the individual is back to normal, but the bump/ swelling may take a longer time to resolve.

SPINAL INJURY

NOTE !!

Take special care when assisting the spinal injury victim. All damage to the spinal cord is permanent, because the nerve tissue cannot heal itself. The result of nerve damage is paralysis or death.

If you have to move the victim, remember to keep the neck and the torso of the body as straight as possible; pull in the direction that will keep the victim's spine in a straight line. Pull the body from the shoulders or feet. You may also pull the victim by the clothing. You may grab the victim by the collar of the shirt and support the victim's head with your forearm while pulling. The clothing drag is preferred method because the victim's head is supported while the victim is being moved. NEVER try to pull the body sideways. It is more ideal to have at least two rescuers assist the victim.

Some causes of spinal injuries include traumatic injuries due to:

- Motor vehicle accidents
- Falls
- Diving into shallow water
- Football
- Gymnastics
- Fight /Violence

The majority of victims who sustained a spinal cord injury are young adults between the ages of 16 and 30 due to riskier behaviors displayed. Spinal cord injury affects more male than female.

Some causes of spinal injuries non-traumatic injuries/illnesses may be caused by:

Cancer

Osteoporosis

Inflammation of the spinal cord

Arthritis

Multiple sclerosis

The effects of spinal cord injury may cause symptoms such as:

- Inability to move / Loss of movement
- Unable to feel/ Loss of sensation
- Loss of control of bowel and/or bladder
- Changes in sexual function
- Changes in sexual sensitivity
- Changes in fertility
- Exaggerated spasms or reflex actions
- Pain or intense tingling sensation

AIRWAY MANAGEMENT

Airway management in the setting of spinal cord injury is very important and very complex.

The cervical spine has to be maintained AT ALL TIMES in neutral alignment.

KEEPING THE AIRWAY CLEAR

The clearing of all oral secretions and debris is very important maintaining airway patency and preventing any aspiration.

The modified jaw thrust and insertion of an oral airway may be all that is required to maintain an airway in some cases. However, intubation may be required in other cases.

HYPOTENSION (HEMORRHAGIC AND/OR NEUROGENIC)

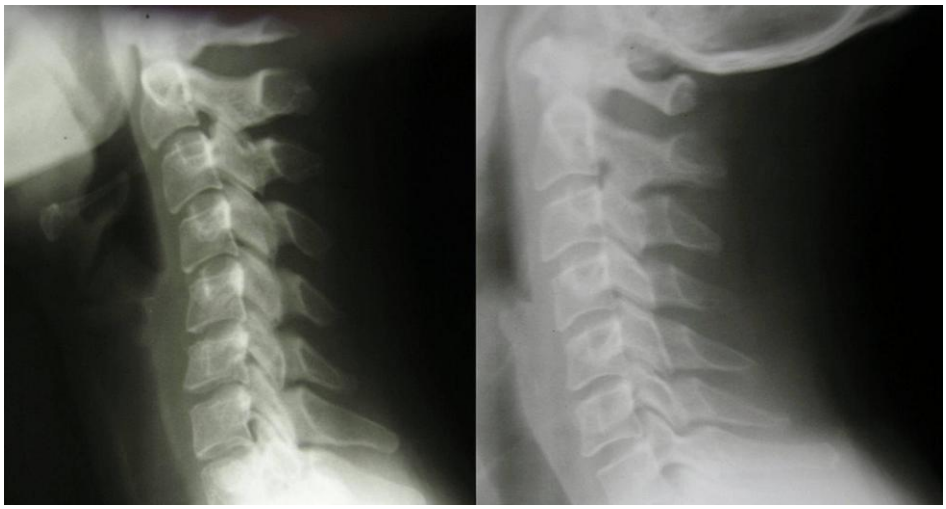
Hypotension (low blood pressure) may be hemorrhagic (bleeding) and/or neurogenic in acute spinal cord injury.

The most common sources of occult (hidden) hemorrhage are injuries to the abdomen, chest, and retroperitoneum as well as fractures of the pelvis and /or long bones. Thorough assessments and workup/ labs are needed such as radiography or computed tomography (CT) scanning.

If the patient is unstable, diagnostic peritoneal lavage or bedside FAST (focused abdominal sonography for trauma) ultrasonographic study may be needed to locate or

detect any intra-abdominal hemorrhaging. When occult sources of hemorrhage have been excluded, initial treatment of neurogenic shock will focus on fluid resuscitation; fluid replacement, with monitoring as these patients are at risk for acute respiratory distress syndrome (ARDS).

LEVELS OF SPINAL INJURY



The Vertebrae are grouped into different sections:

- High-Cervical Nerves (C1 – C4)
- Low-Cervical Nerves (C5 – C8)
- Thoracic Nerves (T1 – T5)
- Thoracic Nerves (T6 – T12)
- Lumbar Nerves (L1 – L5)
- Sacral Nerves (S1 – S5)

The higher the injury occurs on the spinal cord, the more dysfunction can occur.

High-Cervical Nerves (C1 – C4)

This is the most severe of spinal cord injury levels
Paralysis noted in arms, hands, trunk and the legs
The victim may not be able to breathe on his/her own
The victim may not be able to cough
The victim may not be able to control bladder or bowel movements
The ability to speak is sometimes reduced or impaired
When all four limbs are affected, this is called quadriplegia, tetraplegia
The individual will require 24 hour a day personal care
He /she will not be able to drive a car on their own
The victim will require complete assistance with all activities of daily living, such as dressing, eating, bathing, moving in or out of chair or bed etc.
He /she may be able to use a powered wheelchair which has special controls so that he/ she can move around on his/her own.

Low-Cervical Nerves (C5 – C8)

Corresponding nerves control the arms and hands.
The individual with this level of injury may be able to breathe on his/ her own.
The individual with this level of injury may be able to speak normally.

C5 injury

The victim can raise his / her arms and can bend the elbows.
May have some paralysis or total paralysis of wrists, hands, trunk and the legs
Is able to speak and use diaphragm, but breathing will be weakened
Will require assistance with most activities of daily living, but is able to move around in a power wheelchair.

C6 injury

Typical to observe paralysis in hands, trunk and the legs
Nerves affect the wrist extension.
May be able to bend the wrists back
Able to speak and use the diaphragm, but breathing will be weakened
Will be able to move in and out of the bed and wheelchair with assistive equipment
He /she may also be able to drive an adapted vehicle
Very little or no voluntary control of bladder or bowel, but may be able to manage on his/ her own with special equipment.

C7 injury

The Nerves control elbow extension and some finger extension
Most victims can straighten the arm and have normal movement of the shoulders
He /she may also be able to drive an adapted vehicle
The victim is able to do most activities of daily living by himself/ herself, but may need assistance with more difficult activities / tasks
May have little or no voluntary control of bowel or bladder, but may be able to manage on their own with special equipment.

C8 injury

The nerves control some hand movement.
The victim should be able to grasp objects and release them
He /she can do most activities of daily living by themselves, but may require assistance with the tasks that are more difficult.
May have little or no voluntary control of bowel or bladder, but may be able to manage on their own with special equipment.

The victim may be able to also drive an adapted vehicle.

THE THORACIC VERTEBRAE

The Thoracic vertebrae are located in the mid-back.

Thoracic Nerves (T1 – T5)

The corresponding nerves affect the muscles; upper chest, mid-back and muscle of the abdomen.
The victim's arm and hand function is usually normal.
The Injuries usually affect the trunk and the legs which is referred to as paraplegia.
The victim most likely will use a manual wheelchair
He /she can learn to drive a modified car
The victim may be able to stand in a standing frame or may be able to ambulate with braces.

Thoracic Nerves (T6 – T12)

The nerves affect the muscles of the trunk (abdominal and back muscles) depending on the level of injury.
When these nerves are affected, this usually results in paraplegia
The victim may have little or no voluntary control of bladder or bowel but can manage with special equipment
The victim will have normal upper body movement
He / she will have fair to good ability to balance and control the trunk while in seated position.
The victim should be able to have a productive cough; if the muscles of the abdomen are intact.

Some individuals can stand in a standing frame, others may walk with braces.
He /she will most likely use a manual wheelchair.
The victim can learn to drive a modified car

Lumbar Nerves (L1 – L5)

The injuries usually result in some loss of function in the legs and the hips.
The victim, depending on strength in his/ her legs, may need the wheelchair and may also ambulate with braces.
The victim may have little or no voluntary control of bladder or bowel, but can manage with special equipment.

Sacral Nerves (S1 – S5)

Injuries usually result in some loss of function to the hips and the legs.
He /she most likely will be able to ambulate.
The victim may experience little or no voluntary control of bladder or bowel, but can manage with special equipment

NURSING PRIORITIES

When caring for the patient with spinal cord injury, some nursing priorities include:

Prevent further injury to spinal cord

Maximize respiratory function

Promote mobility

Promote independence

Minimize complications

Prevent complications

Support psychological adjustment of patient

Support psychological adjustment of family/ significant other

Provide information about injury

Provide information about prognosis

Provide information about expectations

Provide information about treatment needs

Provide information about preventable complications.

Patient may have nursing diagnoses such as:

Risk for Ineffective Breathing Pattern

Risk factors may include:

- Mixed or complete loss of intercostal muscle function
- Impairment of innervation of diaphragm

Therefore maintaining patient airway will be a major priority;

- Keep head in neutral position and elevate head of bed slightly if tolerated,
- Patients with high cervical injury, impaired gag, and impaired cough reflexes will require assistance in preventing aspiration and in maintaining their airway.

- Auscultate lungs sounds bilaterally, assess for areas of absent or decreased breath sounds or development of abnormal /adventitious breath sounds such as rhonchi.

- Hypoventilation is very common and will lead to complications; the collection of secretions, atelectasis, and pneumonia.

- Observe skin color for signs of decreased oxygen levels; such as duskiness, cyanosis (impending respiratory failure)

- Administer oxygen as ordered, by appropriate method such as nasal cannula, mask, intubation, or ventilator. Method is determined by the level of injury, the degree of respiratory insufficiency, and the amount of recovery of respiratory muscle function.

- ABGs and pulse oximetry to record status of ventilation and oxygenation. Monitoring help to identify respiratory/pulmonary complications for example hypoventilation.

- Assist patient in taking control of respirations as needed. Breathing may no longer be a totally voluntary activity and requires conscious effort (depends on level of injury and the involvement of the respiratory muscles)

- Assist with use of incentive spirometer and chest physiotherapy /chest percussion

- Suction as necessary

- Assess for enlarged abdomen /abdominal distension as well as muscle spasm

- Abdominal fullness will interfere with diaphragmatic excursion, leading to reduction in lung expansion

- Assist with coughing as indicated for level of injury

- Consult with the respiratory and physical therapists.

OT/ OTA ROLE – CLICK ON LINKS

OCCUPATIONAL THERAPY AND THE CARE OF INDIVIDUALS WITH SPINAL CORD INJURY

Occupational therapy practitioners (occupational therapists and occupational therapy assistants) assist individuals with Spinal cord injury return to productive lives.

Occupational therapy practitioners have the education and skills to facilitate collaborative goal setting and achievement by considering physical, psychosocial, occupational, and contextual factors that impact occupational performance (AOTA 2016).

Occupational therapy practitioners (occupational therapists and occupational therapy assistants) have expertise in analyzing activities and adapting tasks to help individuals develop the skills needed to accomplish their goals (AOTA 2016).

Some of the roles of the Occupational therapy practitioners (occupational therapists and occupational therapy assistants) include:

Identifying and practicing activities that are unique to each patient, and to modify the activities and the environment as needed.

Optimizing upper extremity function and preventing deformities for example, fabricate an orthosis to allow or enable the use of a keyboard; fit mobile arm supports to support the weak muscles.

Teaching the patients how to perform activities of daily living for example dressing and feeding, and provide adaptations /equipment as needed such as reachers, grab bars, etc.

Physical therapists focus on lower extremity function and on the difficulties with mobility.

Rehabilitation following spinal cord injuries is most effectively completed with a multidisciplinary (team-based) approach.

Some common terminologies surrounding the spinal injury may include:

AUTONOMIC DYSREFLEXIA

Autonomic Dysreflexia is a potentially life threatening condition caused by painful stimuli below the level of injury that the body cannot respond to because of non-functioning nerve cells; especially in victims with complete tetraplegia.

Symptoms may include:

- Painful headache due to a sudden increase in blood pressure,
- Slowed / reduced heart rate,
- Red blotches on the skin,
- Increased or abnormal sweating and
- Restlessness.

It is very important to assess for the causes; for example:

- Impacted stool,
- an overfull bladder,
- Infection
- Infected pressure ulcers
- Ingrown toenails etc.

ASIA/ ISCoS Exam and Grading System

American Spinal Injury Association (ASIA) / International Spinal Cord Society (ISCoS)

System to describe the spinal cord injury and help to determine future rehabilitation and the recovery needs. It is based on a victim's ability to feel sensation at multiple/ different points on the body and also tests the motor function. It is usually first given within 72 hours after the initial injury.

ASIA/ ISCoS Exam Chart (ASIA Impairment Scale):

- **Grade A -** Complete lack of motor and sensory function below the level of injury (including the anal area)
- **Grade B -** Some sensation below the level of the injury (including anal sensation)
- **Grade C-** Some muscle movement is spared below the level of injury, but 50 percent of the muscles below the level of injury cannot move against gravity.
- **Grade D-** Most (more than 50 percent) of the muscles that are spared below the level of injury are strong enough to move against gravity.
- **Grade E-** All neurologic function has returned.

ARTERIOVENOUS MALFORMATION
Arteriovenous malformation refers to misconnection between the arteries and the veins.

COMPLETE INJURY
No function or sensation below the level of the injury.

CT Scan (Computerized Tomography)
Provides the physicians with more detailed information about spinal cord or brain damage than X-rays are able to show.

INCOMPLETE INJURY
Some sensory function or motor function below the primary level of the injury.

HEMORRHAGE
External or Internal bleeding caused by damage to a blood vessel.

MOTOR FUNCTION
The ability to control the muscles voluntarily and their resultant use.

MOTOR INDEX SCORE (MIS)
A portion of ASIA/ISCoS exam that determines muscle strength of 10 different muscles on both sides of the body.

MRI (Magnetic Resonance Imaging)
MRI uses a strong magnetic field and radio waves to produce computer-generated images. It can help identify swelling, blood clots or skull fractures that may be compressing the brain and/or the spinal cord.

MYELOGRAPHY

Myelography is a test using injected dye to enable the physician to visualize the victim's spinal nerves more clearly. After the dye is injected into the spinal canal, X-rays and CT scans of the vertebrae can reveal herniated disks or other anomalies.

PARAPLEGIA
Loss of motion/ paralysis. It typically affects the trunk and both legs, but not the arms. This is usually a result of injuries at the thoracic and lumbar levels.

PHYSIATRIST
The Physician who specializes in physical medicine and rehabilitation.

PHYSICAL THERAPIST
Treats disabilities that result from motor and sensory impairments

RECREATIONAL THERAPIST OR THERAPEUTIC RECREATION SPECIALIST
Helps the victims to discover the wide variety of recreational options they may be able to participate in and trains him/ her to do so.

REHABILITATION NURSE
The Nurse with special training in rehabilitative and restorative medicine.

TETRAPLEGIA ALSO CALLED QUADRIPLEGIA
Paralysis located from approximately the neck down, due to injury to the spinal cord in the neck and is associated with partial or total loss of function in bilateral upper and lower extremities (both arms and legs).

SENSORY INDEX SCORE (SIS)
Part of ASIA/ISCoS exam- it measures the victim's response to light touch and a pinprick in 28 points on each side of the body to determine what the victim is able to feel. Together, the Sensory Index Score (SIS) and Motor Index Score (MIS) determine the victim's level and severity of injury.

VOCATIONAL THERAPIST
Helps the individual assess his/ her job skills/readiness, and return to work options.

SOME HELPFUL RESOURCES, AND CREDIBLE ORGANIZATIONS AND WEB SITES ARE:

The American Trauma Society
Dedicated to the prevention of trauma and improvement of trauma care.

www.amtrauma.org 1- 800-556-7890

Christopher & Dana Reeve Paralysis Resource Center
Promoting the health and wellbeing of people living with spinal cord injury, mobility impairment and paralysis by providing comprehensive information, resources and referral services.

www.paralysis.org
Tellephone:1-800-539-7309

Family Voices
Aim to achieve family-centered care for all children and youth with special health care needs and/or disabilities.

www.familyvoices.org/states
telephone: 1-888-835-5669

Disabled Sports USA
A network of community-based chapters offering sports rehabilitation programs to anyone with a permanent disability

www.dsusa.org/chapter.html
information@dsusa.org

National Spinal Cord Injury Association
Leading the way in maximizing the quality of life, and opportunities for people with spinal cord injuries and diseases since 1948.

www.spinalcord.org
1- 800-962-9629

NTAF
NTAF helps families address financial hardships arising from uninsured medical expenses related to catastrophic spinal cord or brain injury. Established in 1983 by medical professionals, NTAF is a 501(c)(3) nonprofit organization that provides expert fundraising guidance to patients, families and communities nationwide, while offering fiscal accountability for funds raised.

www.ntafund.org
Telephone: 1-800-642-8399

Office of Disability Employment Policy
Federal government agency within the U.S. Department of Labor helping ensure that people with disabilities have equal employment opportunities

www.dol.gov/odep
telephone: 1- 866-487-2365

Spinal Cord Injury Information Network
The UAB-SCIMS works to maintain and improve a cost-effective, comprehensive service delivery system for people who incur a spinal cord injury. A Model System facility must demonstrate outstanding care to individuals with spinal cord injury, from the emergency medical services to acute care in the hospital to rehabilitation.

www.spinalcord.uab.edu
telephone: 1- 205-934-3450

If the individual has a dual diagnosis of both brain and spinal cord injury, the following organizations are available resources:

American Heart Association
Works to build healthier lives, free of cardiovascular diseases and stroke

www.americanheart.org
telephone: 1- 800-242-8721

American Stroke Association
Works to build healthier lives, free of cardiovascular diseases and stroke

www.strokeassociation.org
telephone: 1- 888-478-7653

Brain Injury Association of America
Dedicated to increasing access to quality health care and raising awareness and understanding of brain injury through advocacy, education and research

www.biausa.org
telephone:1-800-444-6443

Brain Trauma Foundation
Dedicated to improving the outcome of traumatic brain injury (TBI) patients worldwide by developing best practices guidelines, conducting clinical research, and educating medical professionals and consumers

www.braintrauma.org
telephone: 1-212-772-0608

RESEARCH

The National Institute of Neurological Disorders and Stroke (NINDS) conducts spinal cord research in the laboratories at the National Institutes of Health (NIH) as well as supports additional research through grants to major research institutions across the country.

Most demographic and epidemiological data related to traumatic spinal cord injury (TSCI) in the United States have been collected by the Model Spinal Cord Injury Care Systems and are published by the National Spinal Cord Injury Statistical Center.

REVIEW FACT SHEETS:

FACT SHEETS- SPINAL CORD INJURY

FACT SHEETS – RECOVERY & REHAB

FACT SHEETS – AUTONOMIC DYSREFLEXIA

BLADDER MANAGEMENT

SURGICAL MANAGEMENT FOR BLADDER

BOWEL FUNCTION AFTER SPINAL CORD INJURY

TAKE EXAM

Bibliography

AOTA.org (2016) Occupational Therapy and the Care of Individuals with Spinal Cord Injury. Retrieved from http://www.aota.org/about-occupational-therapy/professionals/rdp/spinal-cord-injury.aspx

American Academy of Orthopaedic surgeons (2012) Fractures. Retrieved from http://orthoinfo.aaos.org/topic.cfm?topic=a00139

American Academy of Otolaryngology- Head and Neck Surgery.(2014) Antihistamines, decongestants, and cold remedies. Retrieved from http://www.entnet.org/HealthInformation/coldRemedies

Centers for Disease Control and Prevention. (2014) Rates of TBI- related Emergency Department Visits, Hospitalization and Deaths United States 2001-2010. Retrieved from http://www.cdc.gov/traumaticbraininjury/data/rates.html

Centers for Disease Control and Prevention. (2014) Rates of TBI- related Deaths by Sex – United States 2001- 2010 Retrieved from http://www.cdc.gov/traumaticbraininjury/data/rates_deaths_bysex.html

Doenges, Moorhouse & Murr (2010). Nurse's Pocket Guide; Diagnosis, Prioritized Interventions, and Rationales (12th ed.) Philadelphia: F.A. Davis Company

Deglin, Vallerand & Sanoski (2011). Davis's Drug Guide For Nurses (12th ed.) Philadelphia: F.A. Davis Company

Family Doctor.org. (2014) Nosebleeds. Retrieved from http://familydoctor.org/familydoctor/en/diseasesconditions/nosebleeds printerview. all.html

Farlex Partner Medical Dictionary. (2012). Neurocranium. (n.d.) Retrieved from http://medical-dictionary.thefreedictionary.com/neurocranium

Farlex Partner Medical Dictionary. (2012). Viscerocranium. (n.d.) Retrieved from http://medical-dictionary.thefreedictionary.com/viscerocranium

Florida Statues 768.13 (2014) Good Samaritan Act; immunity from civil liability. Retrieved from http://www.leg.state.fl.us/statutes/index.cfm?mode=View%20Statutes&SubMenu=1&App_mode=Display_Statute&Search_String=good+samaritan&URL=0700-0799/0768/Sections/0768.13.html

International Safety Equipment Association (2015) American National Standard - Minimum Requirements for Workplace First Aid Kits and Supplies. Retrieved from https://www.safetyequipment.org/c/stdz3081-2014.cfm

Jarvis, C. (2012) Physical Examination & Health Assessment (6th ed.) St. Louis, Missouri: ELSEVIER SAUNDERS

Lewis, S., Dirksen, S., Heitkemper, M., Bucher, L., Camera, I. (2011) Medical-Surgical Nursing; Assessment and Management of Clinical Problems. (8th ed.) St. Louis, Missouri: ELSEVIER MOSBY

Occupational Safety and Health Administration (2011) Medical Services and First Aid. Retrieved from https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9806&p_table=STANDARDS

Plantz, S. (2014) Bleeding. Retrieved from http://www.emedicinehealth.com/wilderness_bleeding/topic-guide.htm

Shepherd Center (2015) Understanding Spinal cord injury: Level of Injury. Retrieved from http://www.spinalinjury101.org/details/levels-of-injury

Tarr, C. (2014) Hand Injuries- Causes, Symptoms, Treatment.. Retrieved from http://www.emedicinehealth.com/hand_injuries/page13_em.htm#author_and_editor

United States National Library of Medicine. (2013) Bleeding. Retrieved from http://www.nlm.nih.gov/medlineplus/ency/article/000045.htm

U.S. National Library of Medicine (2014) Spinal Cord Injuries Retrieved from http://www.nlm.nih.gov/medlineplus/spinalcordinjuries.html

www.uptodate.com (2016) Spinal Column injuries in Adults: Definition, Mechanisms and Radiographs. Retrieved from http://www.uptodate.com/contents/spinal-column-injuries-in-adults-definitions-mechanisms-and-radiographs?source=see_link

www.nindsnih.gov (2016) NINDS Spinal Cord Injury Information Retrieved from http://www.ninds.nih.gov/disorders/sci/sci.htm

Web MD. (2015) Types of Bone Fractures: Buckle Fracture, Stress. Retrieved from www.webmd.com/a.../understanding-fractures-basic-information Understanding bone fractures- the basics.

WebMD. (2013) Nosebleeds –Home Treatment How to stop a nosebleed http://www.webmd.com/first-aid/tc/nosebleeds-home-treatment

Web MD. (2013) First Aid & Emergencies-Puncture Wound Treatment: First Aid Information. Retrieved from www.webmd.com/first-aid/puncture-wound-treatment

Wedro, B. (2014) Internal Bleeding: Learn the Symptoms and Diagnosis. Retrieved from http://www.emedicinehealth.com/internal_bleeding/article_em.htm

Wood, R. et. al (2014) Anaphylaxis in America: The Prevalence and Characteristics of Anaphylaxis in the United States. Retrieved from http://www.jacionline.org/article/S0091-6749(13)01302-X/abstract

WWW.aota.org (2014) Occupational Therapy and the Care of Individuals with Spinal Cord Injury. Retrieved from http://www.aota.org/about-occupational-therapy/professionals/rdp/spinal-cord-injury.aspx