Spinal Cord Injury

This brochure will help you learn about what to expect after a spinal cord injury (SCI). It describes the 3 phases of recovery:

- Intensive care
- Acute care
- Rehabilitation

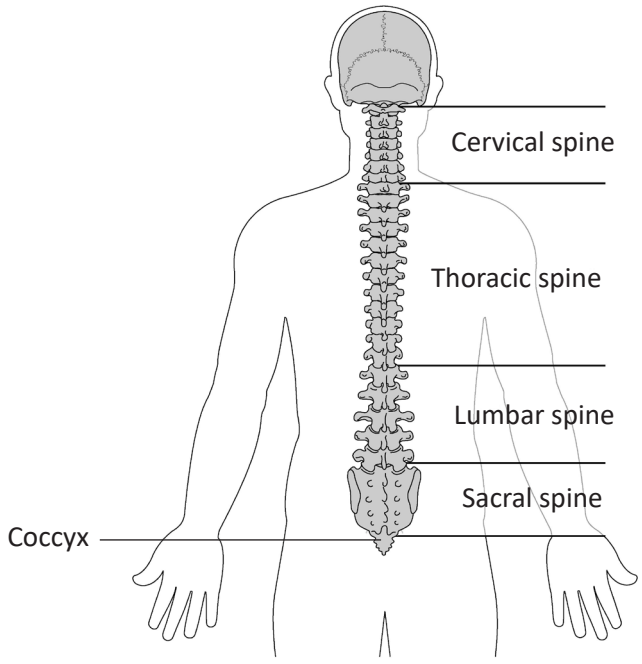
If you have any questions, ask your physician or nurse.

To help you better understand the special care and treatment needed during these phases, it is also helpful to learn more about your spine.

The spine

Your spine is made up of your spinal column and spinal cord. It is divided into 4 areas: cervical, thoracic, lumbar and sacral (Figure 1).

Figure 1. Spine



Your **spinal column** is a group of bones (vertebrae) that surround, support and protect your spinal cord. Between each vertebra is a disc. The disc absorbs shock and keeps your bones from rubbing together.

Your **spinal cord** is a group of nerves in your spinal column. It starts at the base of your brain and goes to your tailbone (coccyx). These nerves send and get signals between your brain and your body that let you feel sensations such as:

- Touch
- Pain and pressure
- Temperature
- Position

Other signals let you control your arms and legs, as well as other body functions.

Your spine is divided into sections according to the location and number of vertebrae. Each vertebra is known by the letter and number that refer to its place in your spine. The letter comes from the first letter of the spinal area's name. For example, the 4th vertebra in your cervical spine is called C4.

Spinal cord injury

Many things can injure your spinal cord. They include:

- Accidents or trauma
- Sports injuries
- Infections
- Tumors
- Bone diseases
- A lower blood supply

When the spinal cord is damaged, it may change your ability to:

- Feel sensations
- Move parts of the body
- Control certain body functions (such as passing urine or stool)

The type and amount of damage depends on:

- Where the spine is injured (cervical, thoracic, lumbar or sacral spinal areas)
- How severe the spine injury is
- How much of the spine is affected

A **sudden** (acute) SCI is a trauma that causes a bruise, partial injury or complete injury to the spinal cord. Most acute injuries occur where the spine has the most movement. These are the:

- Cervical spine at the back of the neck
- Thoracic-lumbar spine from the trunk to the lower back

Effects of SCI

An injury to the spinal cord affects movement and feeling below the damaged area. Therefore, the higher that the injury is on your spinal cord, the more severe the symptoms may be.

A **cervical** SCI affects the spine between vertebrae C1 through C7. This may cause changes in:

- Feeling to the arms and the body below chest level (numbness, tingling or loss of feeling)
- Movement of the arms and legs (weakness, loss of movement or paralysis)
- Ability to breathe normally
- Bowel, bladder and sexual function

A **thoracic** SCI affects the spine between vertebrae T1 through T12. This may cause changes in:

- Feeling below the chest
- Movement below the waist
- Bowel, bladder and sexual function

A **lumbar** SCI affects the spine between vertebrae L1 through L5. This may cause changes in:

- Feeling below the waist
- Movement of the legs
- Bowel, bladder and sexual function

A **sacral** SCI affects the spine vertebrae S1 through S5. This may cause changes in bowel, bladder and sexual function.

Types of SCI

An SCI may be classified by the severity of the injury and the extent of the injury. The severity of injury describes how much of the spinal cord has been damaged. The damage may be partial or complete.

- **Partial SCI**
  This is sometimes called an incomplete injury. Your brain and the rest of your body still sends and gets nerve signals. Some feeling and function remains below the area of damage.
- **Complete SCI**
  Signals between the brain and body are blocked. Little or no feeling or function remains below the area that is injured.

The extent of the injury is the amount of feeling and function that has been affected.

- **Paraplegia**
  This refers to how much feeling and function has been lost below the waist. It depends on whether the injury was partial or complete.
- **Tetraplegia** (also known as quadriplegia)
  This refers to how much feeling and function has been lost below the neck level. Your chest and abdominal muscles may be affected. If the breathing muscles are affected, you may need a breathing machine. The feeling and function that remains depends on if the injury was partial or complete.

Care and treatment

Tests

To learn more about your injury, your physicians may order tests while you are in the hospital. These tests may include:

- *Myelogram*: Shows where the injury is.
- *CT scan*: Shows the type of injury to the spinal cord.
- *Somatosensory evoked potential (SSEP)*: Helps determine if your SCI is complete or incomplete.
- *Magnetic resonance imaging (MRI)*: Shows the type of injury to the spinal cord.
- *X-ray imaging*: Shows damage to the bones of the spinal column.

Your test results will help your physicians decide how to manage your injured spine. Some patients may need surgery, and others may need bed rest and/or a brace.

Surgery

The most common surgery to treat an SCI is called a spinal fusion. In this surgery, the surgeon joins together (fuses) 2 or more bones in the spine so there is no movement between them. The goals of this operation are to:

- Make the spine stable so it can heal correctly
- Reduce pain from the injury
- Prevent further loss of feeling and movement

A spinal fusion cannot always reverse the loss of feeling or movement.

Your surgeon may use a bone graft, metal plates, rods or wires to straighten and support your spine. After surgery, you will wear a brace for about 3 months until your bones have completely healed.

Braces/orthotics

Different kinds of support braces called orthotics or orthoses can keep your spine from twisting and moving out of place while it heals. After an injury or after surgery, wearing an orthosis can help to:

- Keep the spine straight
- Prevent further injury to the spine

When you wear a brace, you may be able to sit, stand or walk safely. Generally, you may need to wear a brace for 3 months while your spine heals. Your nurse will teach you and your family how to use and care for the brace. There are several types of spinal braces.

Cervical spine braces

- Soft cervical collar: This is made of cloth and foam. This collar lightly supports the back of your neck and under your chin. It does not prevent movement. Instead, it reminds you to limit moving your head from side to side and front to back.
- Hard or rigid cervical collar: This is made of plastic. It restricts side-to-side and front-to-back head movement. It supports the back of your neck, base of your head and under your chin. Examples include the Philadelphia®, Aspen® and Miami J® collars.

- Poster-type brace: This is made of aluminum and plastic. This brace has 3 parts (head, chin and chest pieces). It supports your cervical spine and restricts movement. An example is a sternal occipital mandibular immobilizer (SOMI) brace.
- Halo brace: This brace is for people who need the most cervical support. The halo is a metal ring that goes around your head. Metal pins hold the halo in place on the head. Then, 2 metal rods attach the halo to a vest that you wear.
- Cervical-thoracic orthosis (CTO): This brace goes from your chin to chest. It prevents movement between the cervical spine and chest.

Non-cervical spine braces

A thoracolumbosacral orthosis (TLSO) is a plastic, shell-like brace that protects the middle to lower spine. It is custom-molded to fit your body. The TLSO prevents twisting and bending at the waist. It fits snugly around the chest and back, and goes from your upper chest to the sacral area of your spine. The front and back pieces are attached with hook-and-loop fasteners.

Intensive care

You will need to stay in the intensive care unit (ICU) if you need in-depth monitoring and treatment. The ICU team will watch you closely and make a plan to ensure you get excellent care and treatment.

This team includes:

- Physicians who specialize in SCIs (neurosurgery, orthopaedics and ICU care).
- Advanced practice nurses (APNs) and registered nurses who are skilled in ICU care.
- Physical and occupational therapists who help you regain as much function as possible.
- Speech-language pathologists who help evaluate and treat swallowing or communication problems.
- Respiratory therapists who help manage complex breathing needs.
- Pharmacists who help manage medications.
- Registered dietitians who help ensure you get enough nutrition for healing.
- Chaplains who provide spiritual support to you and your family.
- Social workers and case managers who help you and your family find resources for:
  - Financial and insurance issues
  - Home care
  - After-hospital rehabilitation services

In addition to general nursing care, other care and treatment you get in the ICU may include:

- Breathing support through a breathing tube and machine (ventilator), as needed
- Watching your vital signs, such as heart rate, blood pressure and breathing

- Testing the areas affected by the injury (feeling, movement)
- Positioning with special beds or traction to keep your spine straight and help it heal

Medications

The ICU care team may use these medications in your care:

- **Steroids** to reduce swelling around the injured area of the spinal cord (These may help reduce or relieve paralysis.)
- **Pain medicines**:
  - Narcotic medications such as hydromorphone (Dilaudid®), morphine, hydromorphone/acetaminophen (Norco®, Vicodin®)
  - Antispasmodic medications such as baclofen, cyclobenzaprine (Flexeril®) or diazepam (Valium®) to help prevent painful spasms or spasticity that can make your muscles stiff and affect your ability to move
  - Neuropathic pain medications such as gabapentin (Neurontin®) or pregabalin (Lyrica®) to help treat pain caused by nerve damage
- **Nutrition supplements** to help healing
- **Insulin** to treat high blood sugar (glucose) levels, a common side effect of steroids
- **Bowel medications** to help with regular bowel movements (Constipation is a common problem after an SCI.)

Possible complications

Care in the ICU also focuses on preventing complications, such as:

- **Blood clots** – These are also known as deep vein thrombosis (DVT) and pulmonary embolus (PE). Some treatments to prevent blood clots include:
  - Wearing sequential compression devices (SCDs) on your legs to help the blood circulate (The sleeves gently massage the legs.)
  - Taking anticoagulation ("blood thinner") medications
  - Doing range-of-motion exercises to help your muscles move and promote blood flow
  - Having an inferior vena cava (IVC) filter, which is a tiny filter placed in a large vein (This helps keep blood clots from traveling to your lungs. People who are at higher risk of getting blood clots may need this.)
- **Stomach/stress ulcers** – The care team may give you medications to protect the stomach lining or reduce the acid in your stomach.
- **Pneumonia** – The care team will help you turn, cough and do deep-breathing exercises along with other treatments to help to prevent pneumonia. Some people with pneumonia need antibiotics. People who need a breathing machine for long periods will also have special care to prevent and treat pneumonia.
- **Bladder (urinary tract) infections (UTI)** – People will get antibiotics if they have an infection caused by the catheter in the bladder to drain urine.

- **Pressure sores** – Pressure on certain bony areas from lying or sitting may restrict blood flow to the skin and tissue. The damaged area can become an open sore. The nurse will check your skin often. The care team will help you prevent pressure sores by:
  - Turning every 2 hours
  - Using a special bed
  - Using a special seat pad when sitting out of bed for short periods

  Care to prevent complications starts in the hospital. It must continue as long you cannot change positions on your own. The most common bony areas of the body to develop pressure sores include:
  - Lower back (tailbone) and buttocks
  - Hips
  - Heels and ankles
  - Shoulder blades

  The care team will remove the sources of pressure. Then they will apply special dressings to help pressure sores heal.

After an SCI, some people may develop **spinal shock**. This is a short-term condition that causes a loss of reflexes, feeling or movement below the injury. It may last for several hours to several days. You and your care team may not know the true extent of the SCI until the spinal shock goes away.

Another possible effect of SCI is **autonomic dysreflexia**. This may happen in injuries above the 6th thoracic vertebra (T6). The body reacts with abnormal reflexes that may cause high blood pressure, headache, sweating and chills, or fever. Your care team knows how to recognize and treat this condition.

Acute care

When you no longer need intensive care, you will be ready to transfer to an acute care unit in the hospital. The team who cares for you here is specially trained in caring for patients with SCIs.

This care and treatment includes:

- Monitoring your condition
- Patient and family education
- Physical and occupational therapy
- Assessing your rehabilitation needs
- Developing a discharge plan
- Preventing complications

How long you stay in the hospital depends on where your spine is injured, what other injuries happened and any complications. When ready, you will transfer to a rehabilitation center, a center for extended care or your home.

Rehabilitation

SCI rehabilitation (rehab) therapy begins as soon as possible after your injury. This often means therapy will start in the ICU. Rehab continues until you meet your goals and you return to your community. The goal of rehab is to regain the most function possible.

The rehab process starts when a physiatrist evaluates you in the acute care unit.
A physiatrist is a physician who is also a rehabilitation specialist. They work with you and your rehab team to decide what type of therapy is best for you.

The rehab team may is made up of:

- Physical therapists
- Occupational therapists
- Speech-language pathologists
- Social workers
- Psychologists
- Rehab nurses

Rehab is not limited to a single area. Therapy may happen at the bedside or other areas of the hospital. Therapy focuses on your particular needs and goals. These may include returning to home, work or school.

We urge and expect you to take an active role in your rehab program.

Medical care

The physiatrist directs your medical care during the rehab phase of treatment. This care includes assessment and management of:

- Bowel and bladder function
- Skin care and prevention of pressure ulcers
- Pain and spasticity
- Contractures (shortening of the muscles and tendons that decreases movement)
- Nervous system symptoms and conditions
- Future sexual function

Nursing care

Nurses assess your condition from admission through discharge. They carry out the plan of care to:

- Meet your care needs
- Prevent and manage any complications
- Support and educate you and your family
- Work with you, your family and the rehab team to help you meet your rehab goals

Occupational therapy (OT)

The goal of OT is to help you regain the most function possible and achieve the highest level of independence. OT helps you learn how to:

- Care for yourself (for example, bathing and dressing)
- Use assistive devices and adaptive equipment (such as splints, raised toilet seats and shower chairs) to make self-care possible
- Improve arm and hand strength and coordination
- Develop job and lifestyle skills

Physical therapy (PT)

PT focuses on improving your balance, strengthening muscles and coordinating activity. The treatment plan includes learning how to:

- Get in and out of bed
- Transfer between bed, chair, tub, toilet and other sites, using physical aids as needed
- Walk or use a wheelchair
- Direct a caregiver to provide help

OT and PT may happen in private or group settings to prepare you to return to your community.

Speech therapy

Speech and swallowing therapy focuses on improving:

- Eating and swallowing
- Speaking clearly
- Organizing thoughts and understanding speech
- Reading and writing
- Communication methods if you cannot speak or write

Social work/case management

The social worker and case manager work with your family to plan for your care and rehabilitation needs after you leave the hospital and/or rehab center. They provide psychosocial support, and they teach you and your family about community resources and financial support services.

For more information about Northwestern Medicine, please visit our website at nm.org.
Developed by: Northwestern Memorial Hospital Neurosurgery Spine/Orthopedics Nursing, Department of Orthopedics, and Rehabilitation Services

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