

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

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:

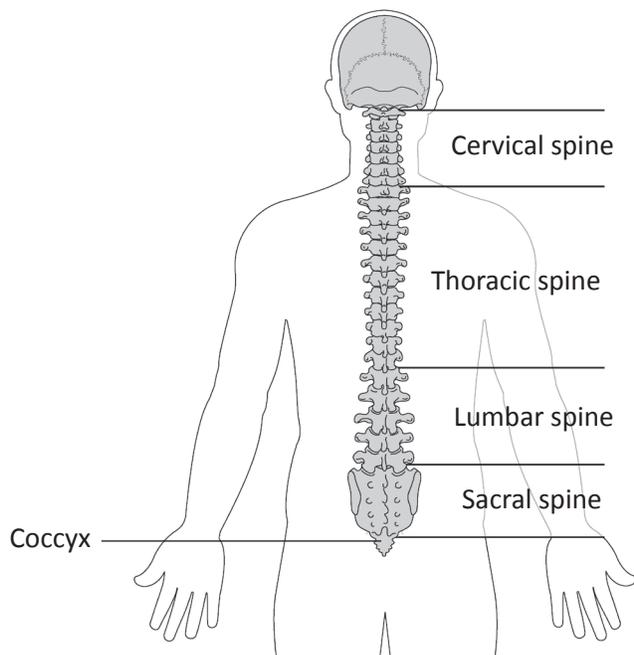
- Intensive care
- Acute care
- Rehabilitation

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 consists of your spinal column and spinal cord, and is divided into 4 areas: cervical, thoracic, lumbar and sacral (Figure 1).

Figure 1. Spine



Your **spinal column** is made up of a group of bones (vertebrae) that surround, support and protect your spinal cord. Between each vertebra is a disc. The disc acts as a shock absorber and prevents your bones from rubbing together.

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

- Touch
- Pain and pressure
- Temperature
- Position

Other signals allow you to 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. For example, the 4th vertebra in your cervical spine is called C4.

Spinal cord injury

The spinal cord can be injured by accidents or trauma, sports injuries, infections, tumors, bone diseases or a decreased blood supply. When the spinal cord is damaged, it may cause changes in the ability to:

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

The type and degree of damage depends on:

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

A **sudden** (acute) SCI is caused by a trauma that results in a bruise, partial injury or complete injury to the spinal cord. Most acute injuries occur in areas 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 the level the injury, 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

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. Some nerve signals are still sent between the brain and the rest of the body. 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. Chest and abdominal muscles may be affected. If the breathing muscles are affected, a breathing machine may be needed. The feeling and function that remains depends on whether the injury was partial or complete.

Care and treatment

Tests

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

- *Myelogram*: Shows the location of the injury.
- *CT scan*: Shows the type of injury to the spinal cord.
- *Somatosensory evoked potential (SSEP)*: Helps to 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. Two or more bones in the spine are joined together (fused), so there is no movement between them. The goals of this operation are to:

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

Spinal fusion may not always be able to 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 are used to keep your spine from twisting and moving out of place while healing. Orthoses are usually used after an injury or after surgery 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. Braces are generally worn 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*: Made of cloth and foam, this collar provides light support and comfort to the back of the neck and under the chin. It does not prevent movement. Rather, it reminds the person wearing it to limit side-to-side and front-to-back head movement.

- **Hard or rigid cervical collar:** Made of plastic, this collar restricts side-to-side and front-to-back head movement. It supports the back of the neck, base of the head and under the chin. Examples include the Philadelphia[®], Aspen[®] and Miami J[®] collars.
- **Poster-type brace:** Made of aluminum and plastic, this brace consists of 3 parts (head, chin and chest pieces). It supports the cervical spine and restricts movement. A sternal occipital mandibular immobilizer (SOMI) brace is an example of this type of brace.
- **Halo brace:** This brace is for people who require the most cervical support. The halo consists of a metal ring around the head. The halo is held in place with metal pins and is secured to 2 metal rods attached to a vest worn around the chest.
- **Cervical-thoracic orthosis (CTO):** This brace extends from the chin to the chest and 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 specially custom-molded to fit the body. The TLSO prevents twisting and bending at the waist. It fits snugly around the chest and back and extends from the upper chest to the sacral area. The front and back pieces are attached with velcro.

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 closely monitor you and develop a plan to ensure you receive excellent care and treatment. This team includes:

- Physicians who specialize in SCIs (neurosurgery, orthopedics 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 medication treatments.
- Registered dietitians who help ensure you receive adequate nutrition to help healing.
- Chaplains who provide spiritual support to you and your family.
- Social workers and case managers who provide you and your family with assistance and resources regarding financial and insurance issues, home care and after-hospital rehabilitation services.

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

- Breathing support through a breathing tube and machine (ventilator), as needed.
- Monitoring of vital signs such as heart rate, blood pressure and breathing.
- Testing of the areas affected by the injury (feeling, movement).
- Positioning with special beds or traction to keep the spine straight and help it heal.

Medicines

Medicines that are used in the ICU include:

- **Steroids**, which reduce the swelling that surrounds the injured area of the spinal cord. This may help reduce or relieve paralysis.
- **Pain medicines** may include:
 - Narcotic medications (Dilaudid®, morphine, Norco®, Vicodin®).
 - Nonsteroidal anti-inflammatory medications (NSAIDs, such as Toradol®, Motrin®, Advil®), which help reduce inflammation that can cause pain.
 - Antispasmodic medications (baclofen, Flexeril®, Valium®), which help prevent painful spasms or spasticity that can cause muscles to become stiff and interfere with movement.
 - Neuropathic pain medicines, which help treat pain caused by nerve damage (Neurontin®, Lyrica®).
- **Nutrition supplements** may be given to help healing.
- **Insulin** is used to treat high blood glucose levels. This is a common side effect of steroids.
- **Bowel medicines** 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**—known as deep vein thrombosis (DVT) and pulmonary embolus (PE). Some treatments to prevent blood clots include:
 - Sequential compression devices (SCDs), which are placed on the legs to help the blood circulate. The sleeves gently massage the legs.
 - Anticoagulation (“blood thinner”) medicines.
 - Range of motion exercises, which may be done to ease muscle movement and promote blood flow.
 - Inferior vena cava (IVC) filter, which is a tiny filter placed in a large vein, which keeps blood clots from traveling to the lungs. This is used in people who are at higher risk of getting blood clots.
- **Stomach/stress ulcers**—Medicines may be given to protect the stomach lining or decrease the acid in the stomach.

- **Pneumonia**—Turning, coughing and deep breathing exercises along with other treatments are used to help to prevent pneumonia. Sometimes antibiotics are needed. People who need a breathing machine for long periods will also receive special care to prevent and treat pneumonia.
- **Bladder (urinary tract) infections (UTI)**—Infections caused by catheters in the bladder to drain urine are treated with antibiotics.
- **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 often inspects the skin. Pressure sores can be prevented if a person:
 - Is turned every 2 hours
 - Lies on a special bed
 - Sits for short periods of time on special pads (when out of bed)

These actions are started in the hospital and must continue as long as a person is unable to change positions on their 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

Sores are treated by removing the sources of pressure and applying special dressings to help healing.

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 level of injury. It may last for several hours to days. The true extent of the injury may not be known until the spinal shock has passed.

Another possible effect of SCI is known as **autonomic dysreflexia**. This may occur 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. The healthcare team is skilled in recognizing and treating this condition.

Acute care

When you no longer need intensive care, you will be transferred to an acute care unit in the hospital. The healthcare team who provides your care is specially trained in the care of patients with SCIs.

This care and treatment includes:

- Monitoring your condition
- Providing patient and family education
- Providing physical and occupational therapy

- Assessing your rehabilitation needs
- Developing a discharge plan
- Preventing complications

The length of your hospital stay depends on where the spine is injured, what other injuries occurred and any complications. When ready, you will be transferred to a rehabilitation center, center for extended care or to your home.

Rehabilitation

SCI rehabilitation (rehab) therapy begins as soon as possible after your injury. This often means therapy will begin in the ICU. Rehab continues until your goals have been met and you return to the community. The goal of rehab is to regain the most function possible. The rehab process begins when you are evaluated by a physiatrist in the acute care unit. A physiatrist is a physician who is also a rehabilitation specialist. The physiatrist works with your rehab team to decide what type of therapy is best for you.

The rehab team may consist of:

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

Rehab is not limited to a single area. Therapy may occur 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.

You are urged and expected 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 and 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 occur 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 are unable to speak or write

Rehabilitation psychology

The psychologist evaluates your response to your injury and provides counseling to you and your family.

Social work/case management

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

Therapeutic recreation

This activity supports rehab goals by using leisure interests, hobbies and social activities to help you improve function. It can also enhance your emotional well-being and quality of life.

Vocational rehabilitation

If available, vocational rehab may offer services to help you return to school or work.