

Understanding Spinal Cord Injury & Functional Goals

Any damage to the spinal cord is a very complex injury. People who are injured are often confused when trying to understand what it means to be a person with a spinal cord injury (SCI). Will I be able to move my hands? Will I walk again? What can I do? Each injury is different and can affect the body in many different ways.

This is a brief summary of the changes that take place after a spinal cord injury. It tells how the spinal cord works and what some of the realistic expectations are for what a person should eventually be able to do following a spinal cord injury. Included is a chart of functional goals for specific levels of injury as well as additional information resources.

The Normal Spinal Cord

The spinal cord is a part of your nervous system. It is the largest nerve in the body. Nerves are cord-like structures made up of many nerve fibers. The spinal cord has many spinal nerve fibers that carry messages between the brain and different parts of the body. The messages may tell a body part to move. Other nerve fibers send and receive messages of feeling or sensation back to the brain from the body, such as heat, cold, or pain. The body also has an autonomic nervous system. It controls the involuntary activities of the body; such as, blood pressure, body temperature, and sweating.

The nerve fibers that make up the communication systems of the body can be compared to a telephone system. The telephone cable (spinal cord) sends messages between the main office (the brain) and individual offices (parts of the body) over the telephone lines (nerve fibers). The spinal cord is the pathway that messages use to travel between the brain and the other parts of the body.

Because the spinal cord is such an important part of our nervous system, it is surrounded and protected by bones called vertebrae. The vertebrae, or backbones, are stacked on top of each other. This is called the vertebral column or the spinal column. The vertebral column is the number one support for the body. The spinal cord runs through the middle of the vertebrae

The spinal cord is about 18 inches long. The cord extends from the base of the brain, down the middle of the back, to about the waist. The bundles of nerve fibers that make up the spinal cord itself are Upper Motor Neurons (UMNs). Spinal nerves that branch off the spinal cord up and down the neck and back are lower motor neurons (LMNs). These nerves exit between each vertebrae and go out to all parts of the body. At the end of the spinal cord, the lower spinal nerve fibers continue down through the spinal canal to the sacrum, or tailbone.

The spinal column is divided into four sections. The top portion is the cervical area. It has eight cervical nerves and seven cervical vertebrae. Moving down the back, the next section is the thoracic area. It includes the chest area and has twelve thoracic vertebrae. The lower back section is the lumbar area and has five lumbar vertebrae. The bottom section has five sacral vertebrae and is the sacral area. The bones in the sacral section are actually fused together into one bone.

The Spinal Cord After an Injury

Damage to the spinal cord can occur from either a traumatic injury or from a disease to the vertebral column. In most spinal cord injuries, the backbone pinches the spinal cord, causing it to become bruised or swollen. Sometimes the injury may tear the spinal cord and/or its nerve fibers. An infection or a disease can result in similar damage.

After a spinal cord injury, all the nerves above the level of injury keep working like they always have. From the point of injury and below, the spinal cord nerves cannot send messages between the brain and parts of the body like they did before the injury.

The doctor examines the individual to understand what damage has been done to the spinal cord. An X-ray shows where the damage occurred to the vertebrae. The doctor does a "pin prick" test to see what feeling the person has all over his body (sensory level). The doctor also asks, "what parts of the body can you move?" and tests the strength of key muscle groups (motor level). These exams are important because they tell what nerves and muscles are working.

Each spinal cord injury is different. A person's injury is described by its level and type.

Level of Injury

The level of injury for a person with SCI is the lowest point on the spinal cord below which there is a decrease or absence of feeling (the sensory level) and/or movement (the motor level).

Tetraplegia [formerly called quadriplegia] generally describes the condition of a person with a spinal cord injury that is at a level from C1 to T1. This individual can experience a loss of feeling and/or movement in their head, neck, shoulder, arms and/or upper chest.

Paraplegia is the general term describing the condition of a person who has lost feeling and/or is not able to move the lower parts of his/her body. The body parts that may be affected are the chest, stomach, hips, legs and feet. An individual with a level from T2 to S5 has paraplegia.

The higher the spinal cord injury is on the vertebral column, or the closer it is to the brain, the more effect it has on how the body moves and what one can feel. More movement, feeling and voluntary control of the body's systems are present with a lower level of injury. For example, a person with a C-5 level of injury has a decrease or loss of feeling and movement below the 5th cervical spinal cord segment. An injury at the T-8 level means the individual has a decrease or loss of feeling and movement below the eighth thoracic spinal cord segment. Someone with a T-8 level of injury would have more feeling and movement than someone with a C-5 level of injury.

Complete or Incomplete Injury

The amount of feeling and movement that an individual has also depends on whether the injury is complete or incomplete. A complete injury means there is no motor or sensory function in the S4 or S5 area, or anal area. If there is evidence of any motor or sensory function in this area, one of three incomplete injury classifications is given.

Some people with an incomplete injury may have feeling, but little or no movement. Others may have movement and little or no feeling. Incomplete spinal injuries differ from one person to another because the amount of damage to each person's nerve fibers is different. This fact makes it impossible to accurately predict how much of an individual's sensory and motor function will return. There is a greater chance of return of some or all of a person's motor and sensory function if an individual is incomplete at the time of injury.

Changes after the Initial Injury

Sometimes the spinal cord is only bruised or swollen after the initial injury. As the swelling goes down, the nerves may begin to work again. There are no tests at this time to tell how many nerves, if any, will begin to work again or when this will occur. This makes it impossible for medical staff to guarantee how much or when function may return.

Some individuals have involuntary movements, such as twitching or shaking. These movements are called spasms. Spasms are not a sign of recovery. A spasm occurs when a wrong message from the nerve causes the muscle to move. The individual often can not control this movement.

In addition to movement and feeling, a spinal cord injury affects how other systems of the body work. An individual with SCI learns new ways to manage his/her bladder and bowel. His/her skin and lungs often need special care and attention to stay healthy. There may also be changes in sexual function.

Functional Goals

Functional goals are a realistic expectation of activities that a person with spinal cord injury eventually should be able to do with a particular level of injury. These goals are set during rehabilitation with the medical team. They help the individual with SCI learn new ways to manage his/her daily activities and stay healthy.

Achievement of functional goals can also be affected by other factors, such as an individual's body type and health related issues. By striving to reach these functional goals, the hope is to give individuals with SCI the opportunity to achieve Maximum Independence.

The chart shows the expected functional goals for a person with a complete injury at a particular level.

Motor and sensory functions improve with lower levels of injury.

