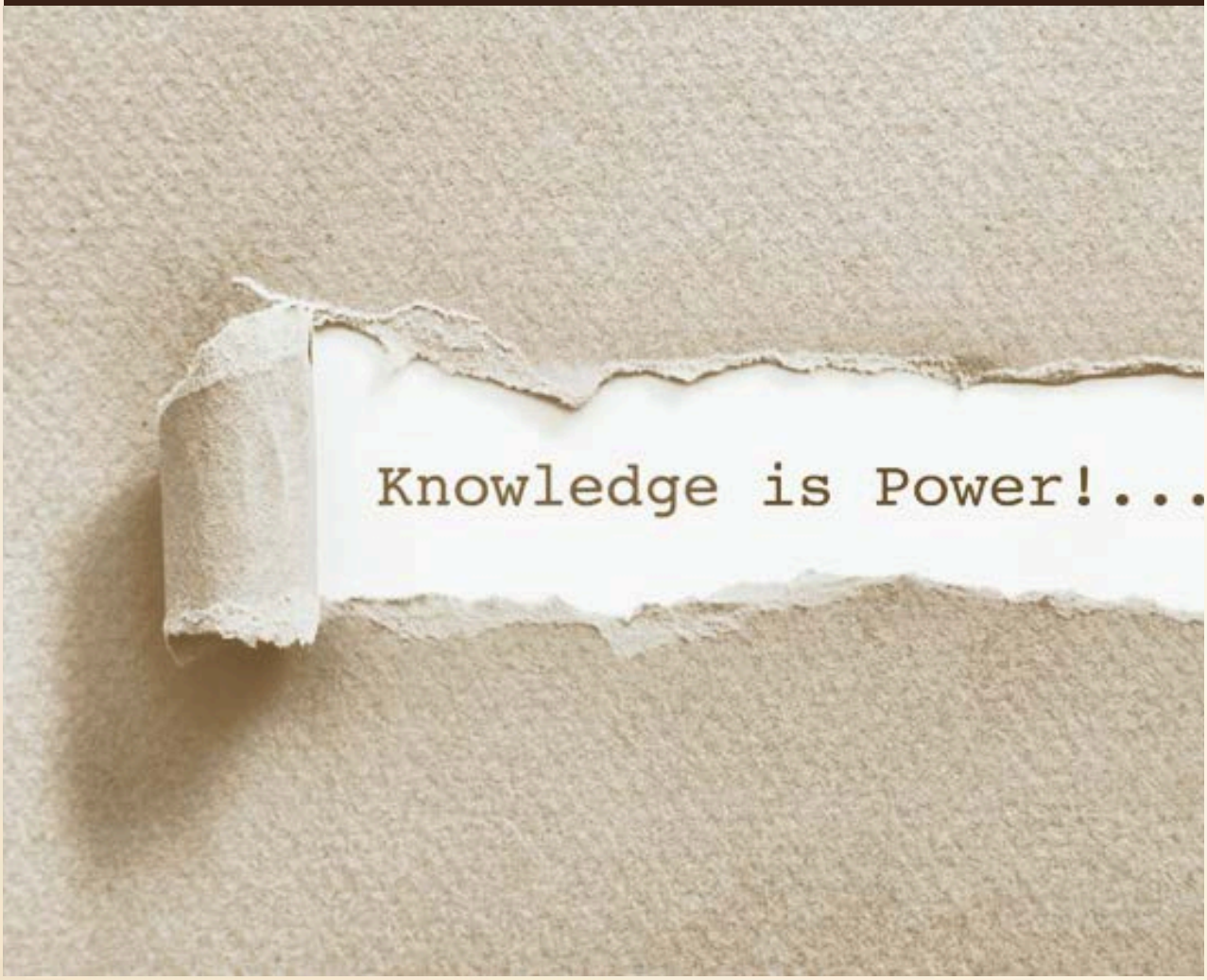
SCI Rookie Book

Spinal cord injury basics for rookie supporters



Spinal Cord Injuries Australia

V1.0 March 2025

A note from Jenni...

I was just going about my life. All was 'as usual' and I was expecting that all would stay the same. Just another day...

In a moment, life turned upside down. My person had a road crash and she was diagnosed with T4 complete paraplegia.

And so, the whirlwind began.

- **Doctors**
- **Nurses**
- **Social Workers**
- **Occupational Therapists**
- **Physiotherapists**
- **Family**
- **Friends**
- **and the rest...**

So much information from so many different directions.

I knew everything they were telling me was important, but I just couldn't take it all in. All at a time when I felt like my person's world, and perhaps my world, had changed forever.

The SCI Rookie Book would have helped me so much in the very early stages, to understand what was happening to my person and relate it to something I actually knew about.

So, I hope this little book helps you at the start of your journey with your person.

Jenni Haydon
SCIA Acute Family Resource Coordinator

Table of contents

Where on earth do I start?

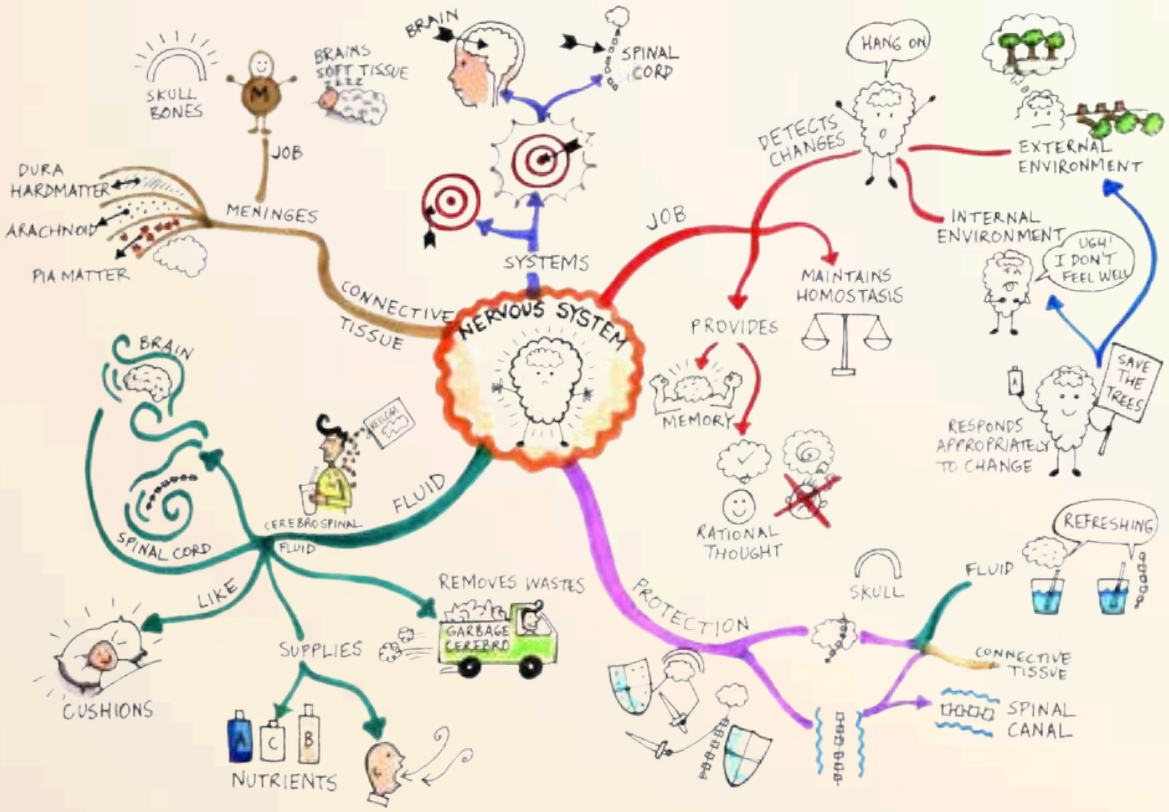
Information overload!

If you can get your head around these 4 things, you will be well on your way to understanding what is happening to your person.

So, let's go through them one by one...

It all starts with the: Nervous System

The Nervous System



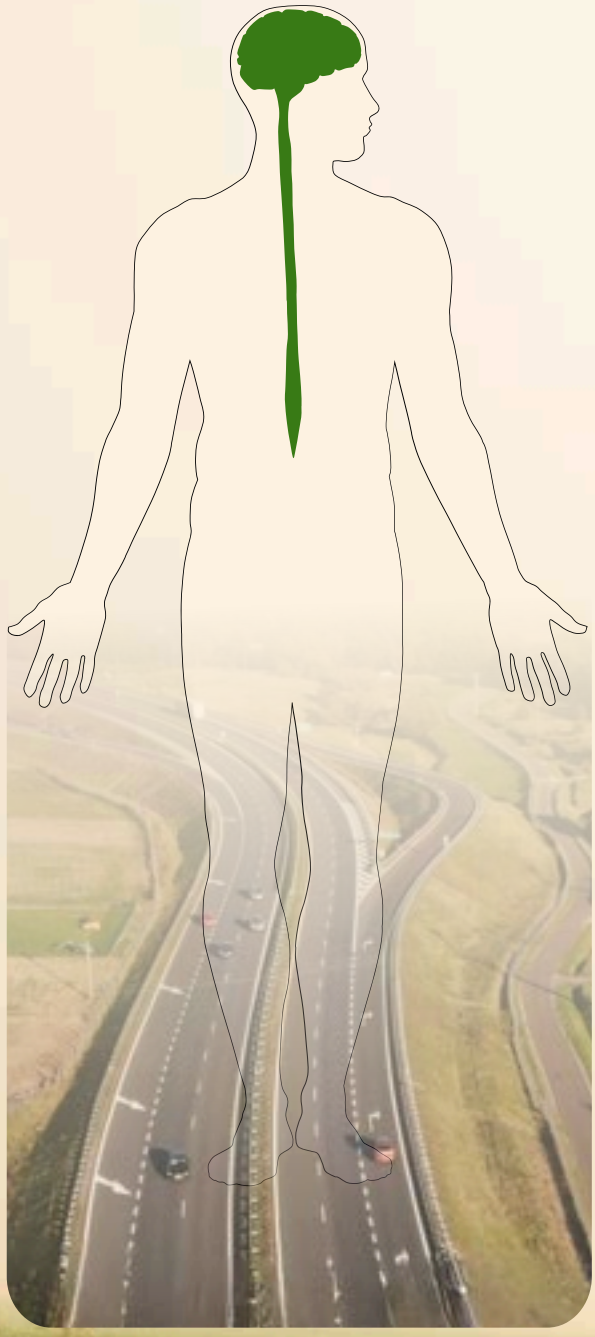
I know, it's a lot!

Let's break it down into 2 easy-to-understand parts.

Central Nervous System

The Nervous System

It's like a major highway that runs from the brain to the lower back. It includes:



The brain and the spinal cord, together they are the body's main transport system.

- **The brain controls most of the functions of the body, including: awareness, movement, thinking, speech and the senses.**
- **The spinal cord carries:**
  - **the motor function messages from the brain to the body, and**
  - **the sensory function messages from the body to the brain.**

Now, imagine couriers driving up and down the highway, constantly delivering and receiving motor and sensory messages.

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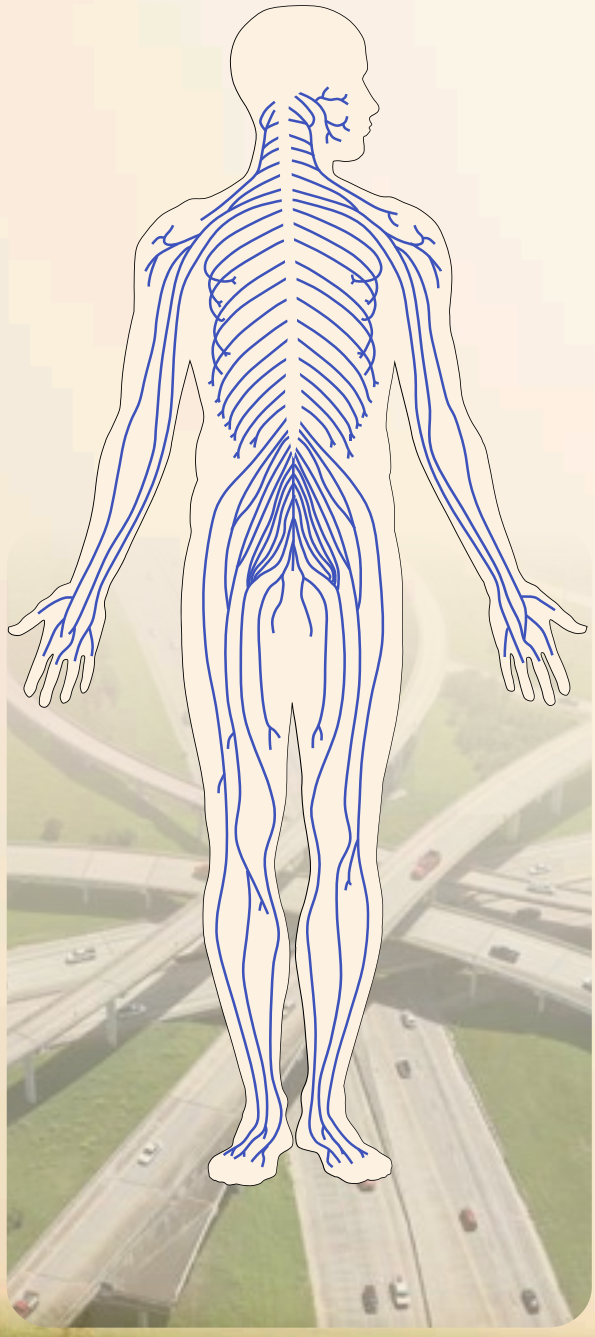
Peripheral Nervous System

The Nervous System

It's like the on and off ramps of that major highway.



- **The couriers will take off ramps off the highway and deliver motor function messages to different parts of the body.**

Examples of motor function messages:

- **bend your elbow**
- **extend your knee**
- **lift your shoulders**

- **The couriers will take on ramps to the major highway and deliver sensory messages from the body to the spinal cord and the brain.**

Examples of sensory messages:

- **that feels cold**
- **that feels numb**
- **that feels sore**

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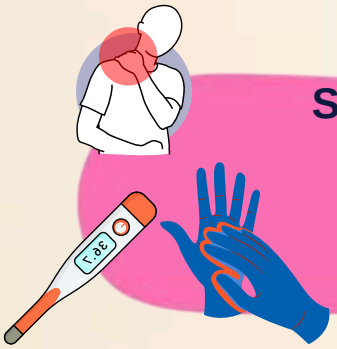
What are all the messages about?



Sensation:

- temperature
- pain
- touch

Movement:

- Your muscles

Unconscious (autonomic) processes e.g.:

- heartbeat, blood pressure, breathing, food digestion, pain, temperature

Now you know...

- The basics of sensory and motor messages and how they are delivered around the body

Spinal Levels - An overview

Level of Injury

Cervical

C1-C4: breathing
C2: head & neck movement
C4-C6: heart rate
C5: wrist & elbow movement
C6: Shoulder movement
C7 -T1: hand & finger movement

Thoracic

T1-T12: sympathetic tone, including temperature regulation
T2: - T12: trunk stability
T11-L2: ejaculation

Lumbar

L2: hip motion
L3: knee extension
L4 - S1: foot motion
L5: knee extension

Sacral

S2-S3: bowel & bladder activity
S2 - S4: sexual function
S5: bowel and bladder activity

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Neurological Level of Injury

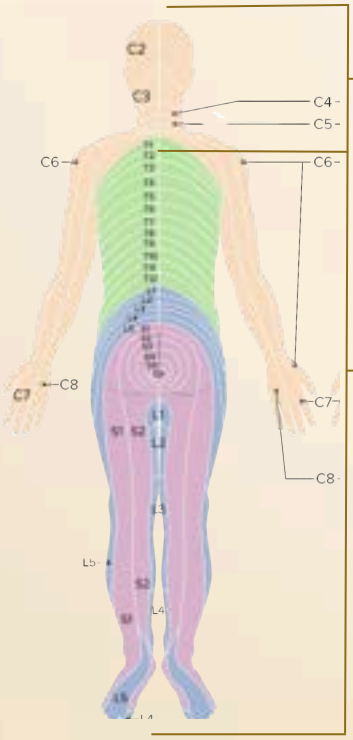
Level of Injury

Your person's neurological level of injury is:

- **The point where sensation and motor function has been disrupted.**

EXAMPLE

Your person has a “T1 injury” or “T1 level”:

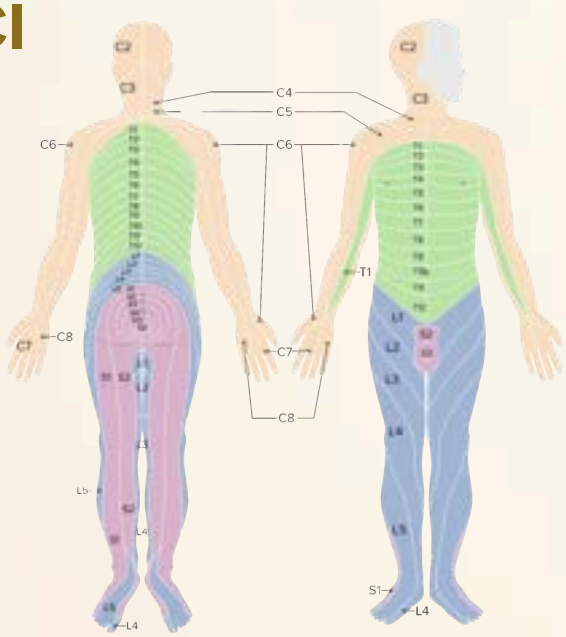


Sensation and motor function in all segments from C1 - T1 are the same as before the injury occurred.

Sensation and motor function in all segments from T2 - S5 have been impacted by the spinal cord injury.

So, let's have a look at each of the levels of injury...

Cervical SCI
C1 - C4

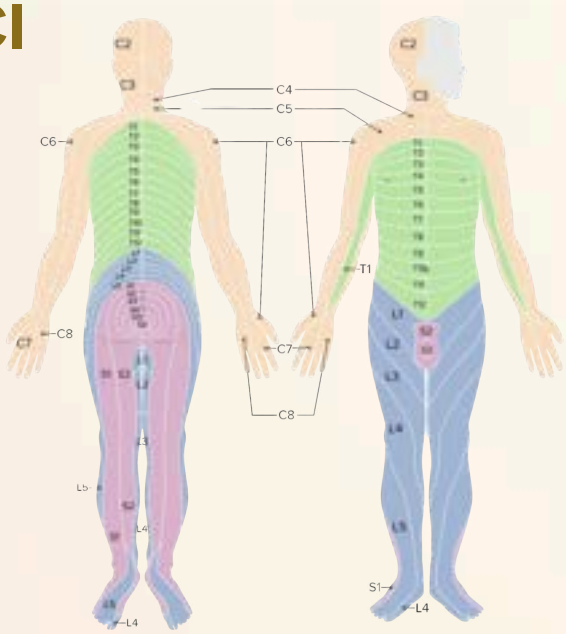


Level of Injury

Sensory and motor function may be impacted below each of these levels of injury:

- **C1 – may affect most sensory and motor functions throughout the body.**
- **C2 – may still have some motion of the neck, while the rest of the body may be paralysed. Sensation in the back of the head, ears, and upper area of the neck may be intact.**
- **C3 – may affect the ability to breathe and may require a ventilator, at least initially.**
- **C4 – may also affect breathing. However, those with a C4 SCI may be able to raise their shoulders and may have sensation in the shoulders, upper back, and upper chest.**

Cervical SCI
C5 - C8



Level of Injury

Sensory and motor function may be impacted below each of these levels of injury:

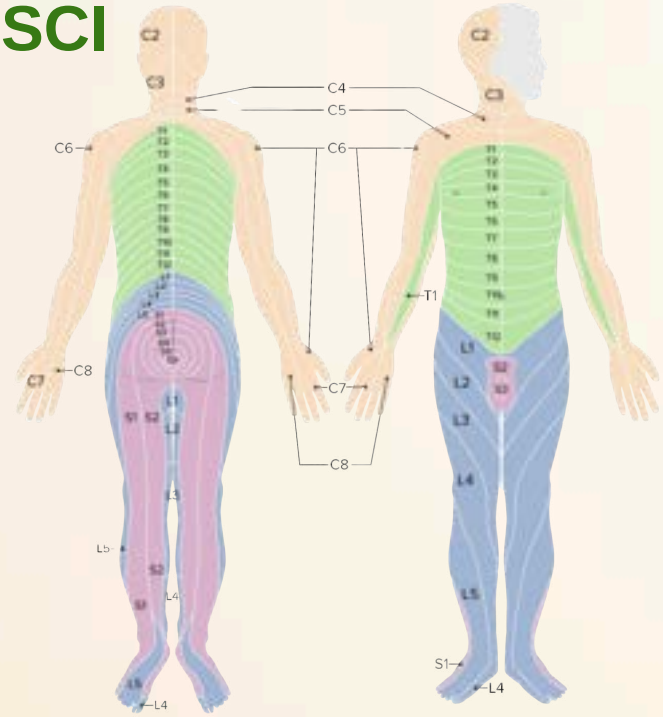
- **C5 – may have sensation at the outer area of the upper arm and the ability to raise the arm to the side and bend the elbows. However, breathing can still be affected.**

- **C6 – may have sensation at the outer forearms down to the thumbs and part of the index fingers may be intact. Wrist extension may be intact, allowing grasping to be possible.**

- **C7 – may have increasing sensation in the hand, including sensation of the middle finger. Those with a C7 SCI may be able to straighten the elbows and bend the wrists.**

- **C8 – may be able to bend the fingers and grasp objects. Sensation and most movement in the hand will be intact at this level of injury.**

Thoracic SCI
T1 - T5

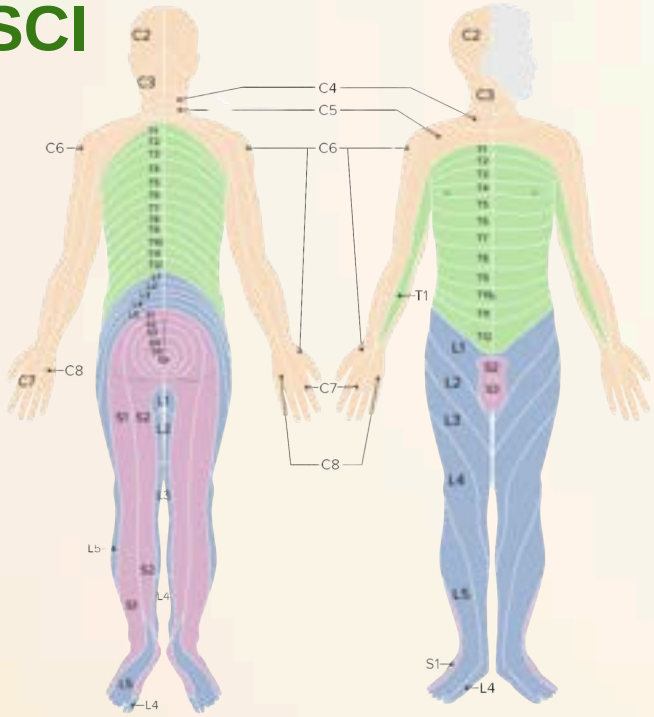


Level of Injury

Sensory and motor function may be impacted below each of these levels of injury:

- **T1 – intact sensation of the inner forearm and the ability to separate your fingers.**
- **T2 – the uppermost chest muscles and sensation near the armpit and upper chest are intact.**
- **T3, T4 and T5 – intact sensation at the back, as well as in the upper, mid, and low chest respectively. Intercostal muscles, which are located between the ribs and play a key role in breathing, are often affected.**

Thoracic SCI
T6 - T12

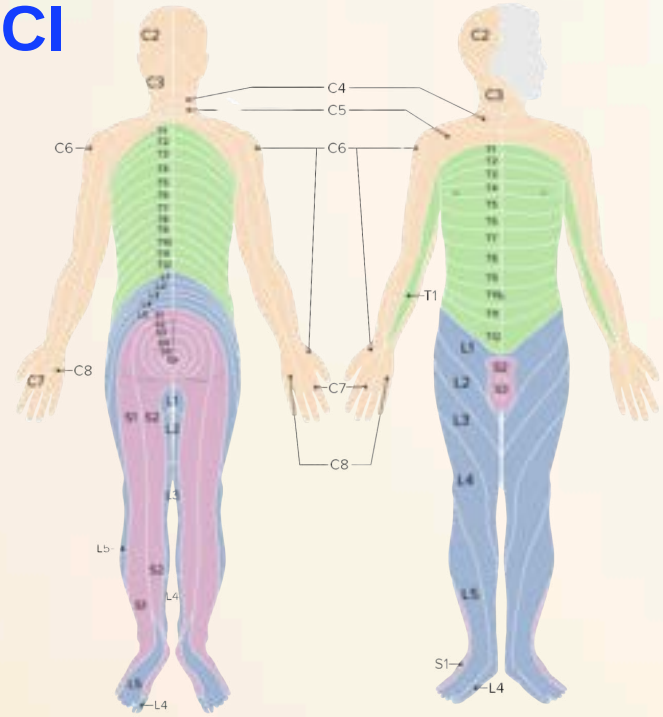


Level of Injury

Sensory and motor function may be impacted below each of these levels of injury:

- **T6 - T12 – may affect the abdominal muscles as well as sensation in the abdomen and low back.**
- **A T6 spinal cord injury may leave sensation intact at the top of the abdomen.**
- **Lower level thoracic injuries result in sensation deficits in progressively lower areas of the abdomen and low back.**

Lumbar SCI
L1 - L3



Level of Injury

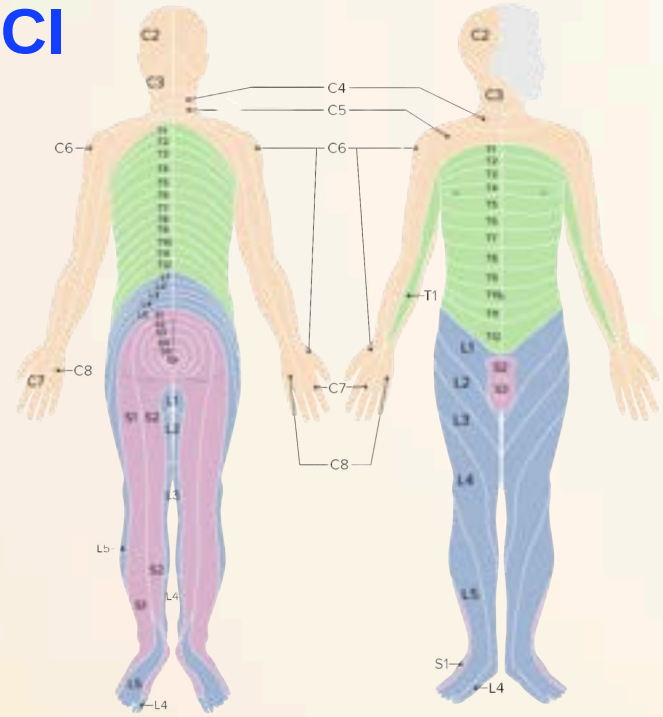
Sensory and motor function may be impacted below each of these levels of injury:

- **L1 – may have sensation at the pelvic region, and may be able to flex the trunk. Those with a L1 spinal cord injury may have minimal hip movement. Functions of the legs may still be affected.**

- **L2 – may be able to use the hip flexors, which are the muscles near the top of the thighs that allow you to raise your upper legs. Sensation of the upper thighs may also be intact.**

- **L3 – may have sensation at the lower thighs and knees and may be able to straighten the knees.**

Lumbar SCI
L4 - L5



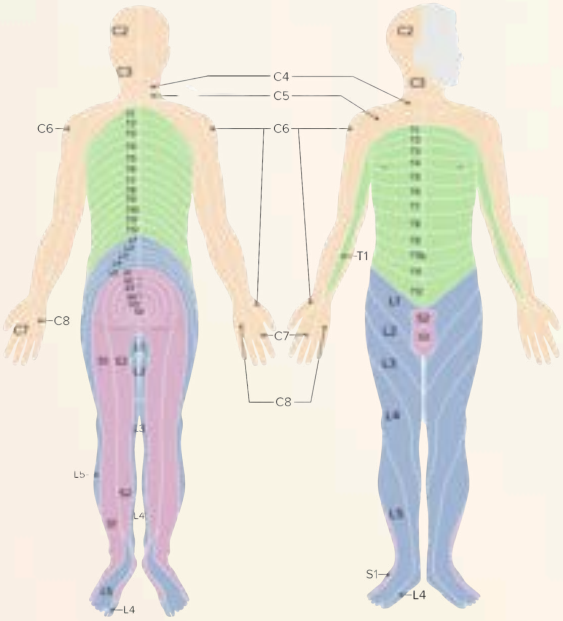
Level of Injury

Sensory and motor function may be impacted below each of these levels of injury:

- **L4 – may be able to lift the foot upwards as well as feel of the front and inner regions of the lower legs.**

- **L5 – may be able to bend and straighten the big toe and may have sensation of the front and outer areas of the lower legs down to the big, second, and middle toes.**

Sacral SCI
S1 - S5



Level of Injury

Sensory and motor function may impacted below each of these levels of injury:

- **S1 – may have sensation at the fourth and pinky toes, heel, and part of the calf. Those with an S1 spinal cord injury may be able to extend the ankle so that the foot points down.**

- **S2 – may have sensation in most areas of the back of the legs, and may have the ability to bend the knees. The S2, S3, and S4 spinal nerves supply the pelvic cavity, which is responsible for sexual, bladder, and bowel-related functions. Therefore, these functions may be more or less affected, depending on the level of injury.**

- **S3 – may have sensation around the medial buttocks.**

- **S4 and S5 – some functions within the perianal area may be left intact.**

Now you know...

- **The basics of sensory and motor messages and how they are delivered around the body**
- **Your person's level of injury e.g. T4**

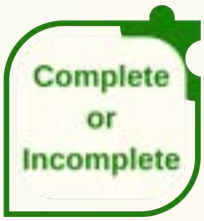
I keep hearing about complete and incomplete...

There are two levels of completeness in spinal cord injuries. Either one will impact the outlook for your person.

It's all about how compromised the sensory, motor and unconscious messages are.

Let's take a look at what that might mean for your person...

Complete SCI

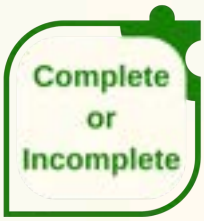


- **A complete SCI is an injury that fully compresses or severs the spinal cord at the level of injury.**
- **People who have a complete SCI have no sensation and no motor function below the level of injury.**
- **So, the higher up on the spinal cord an injury occurs, the more severe the symptoms tend to be.**

Now, imagine the courier is driving along the highway and there is a roadblock ahead.

So, let's relate a complete spinal cord injury to our highway...

Complete SCI



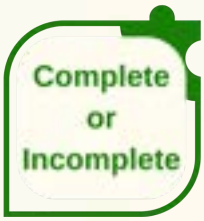
- **This type of roadblock means:**
  - **the road cannot be repaired and will be permanently closed.**
  - **no couriers can pass through the site of the roadblock with sensory, motor or unconscious messages.**
  - **there are no alternative routes for the sensory, motor or unconscious messages.**

- **This means that no motor messages can be delivered below the roadblock site.**

- **No sensory messages can be received above the roadblock site.**

- **If your person has a complete SCI at the lower lumbar region, they will have no sensation and no motor function below their hips and legs.**
- **If your person has T8 complete SCI, they will have no sensation or motor function below the lower abdomen region.**

Incomplete SCI



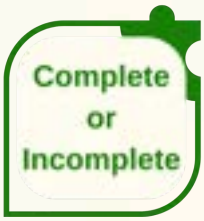
- **An incomplete spinal cord injury means the spinal cord is only partially compressed or injured, so some messages can still pass through the level of injury.**

- **This means your person may still have some function and sensation below the level of their injury.**

Now, imagine the courier is driving along the highway and there is a partial roadblock ahead.

So, let's relate an incomplete spinal cord injury to our highway...

Incomplete SCI



- **This type of roadblock means the road is partially closed. The road will be partially closed either:**
  - **Forever, or**
  - **For a long period, or**
  - **For a short period**

- **Some but not all couriers can pass through the site of the roadblock via detours for motor or sensory messages.**

- **This means some motor function messages will be delivered below the roadblock site.**

- **Some sensory function messages will be received above the roadblock site.**

- **If your person has an incomplete SCI at the lower lumbar region, they could have altered sensation and motor function below their hips and legs.**

ASIA Score?

Now you know...

- **The basics of sensory and motor messages and how they are delivered around the body.**
- **Your person's level of injury e.g. T4.**
- **If their injury is complete or incomplete.**

Are all incomplete injuries the same?

- **The American Spinal Injury Association (ASIA) developed the ASIA Impairment Scale which is an exam which grades the severity, that is the completeness, of a spinal cord injury.**

- **The exam determines:**
  - **sensory levels for right and left sides of the body which were affected by the spinal cord injury**
  - **motor levels for right and left sides of the body which were affected by the spinal cord injury**
  - **the neurological level of the injury**
  - **complete or incomplete injury**

- **And all of the above determines an ASIA Impairment Scale grade or score.**

Impairment Scale Grades

ASIA Score

A

ASIA A - Complete

- No motor function or sensation below the level of injury

B

ASIA B - Sensory Incomplete

- Some sensation below the level of injury
- No motor function below the level of injury

C

ASIA C - Motor incomplete

- Some muscles can move well below the neurological level of injury, but many are not strong enough to lift against gravity

D

ASIA D - Motor Incomplete

- Muscle strength in most muscles below the neurological level of injury are strong enough to lift against gravity.

E

ASIA E - Pre-injury function

- The tested sensation and muscle movements have returned to pre-injury function.
- Impaired feelings or movements might still be present, but cannot be detected with the exam

Now you know...

- The basics of sensory and motor messages and how they are delivered around the body.
- Your person's level of injury e.g. T4.
- If their injury is complete or incomplete.
- Their ASIA score e.g. T4 - ASIA A - which determines the completeness of the injury.

Will my person walk again?

One of the things that may frustrate you the most is trying to get a straight answer to questions like:

- **Will my person walk again?**
- **Will my person need care?**
- **Will my person be able to live independently?**
- **Will my person be able to work?**

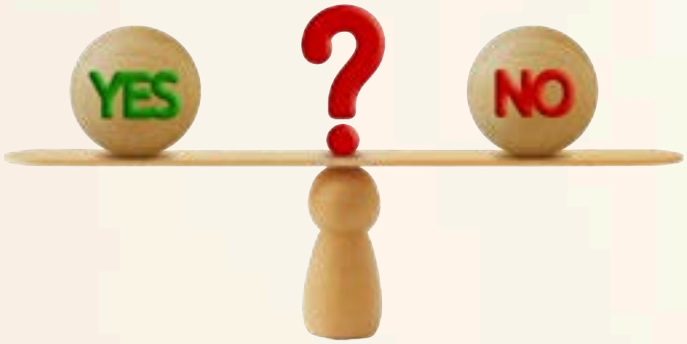
This guide has shown you that every spinal cord injury is unique, the answers to these questions will depend on a whole range of things:

If motor function and/or sensory function have been impacted

At what level the injury occurred

How damaged the spinal cord is

What messages are and are not being delivered and received



- **The answers to questions about the future for your person are rarely black or white.**

- **Your person's early injury level and ASIA score are just clues to their future level of function.**

- **Traumatic spinal cord injuries in particular are unpredictable.**

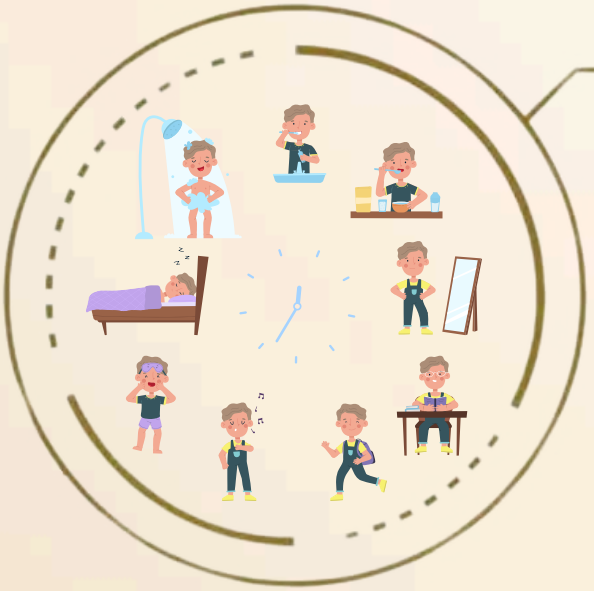
- **When swelling and bruising reduces, your person's level of injury and ASIA score may be different.**
  - **The level of injury could be higher or lower.**
  - **The ASIA score could change.**

- **That is why it's important to focus on what function your person has at this point in time.**

What does all this mean for my person?

icare™ (icare.nsw.gov.au) has developed an excellent resource, Guidance on the support needs of adults with spinal cord injury.

The guide is very comprehensive and can be used for anyone, no matter how they are funded. It will provide you with a breakdown, by injury level, of the following:



Assistance your person may need with daily living activities

Assistive technology that may help your person

Questions your person may want to ask their doctor

What to ask?	Why would I ask this?
• What is my injury level?	• Knowing your injury level helps you understand what motor or sensory functions are impacted.
• Could my injury level change?	• Impact of swelling, bruising and other factors may change your level of injury.
• Is my SCI complete or incomplete?	• Knowing your completeness of injury helps you understand whether there is sensory or motor function below the level of injury.
• Could my completeness change?	• Impact of swelling, bruising and other factors may change your completeness.
• What is my ASIA score?	• This will help to understand, in particular for incomplete injuries, which parts of the sensory and motor functions are impacted.
• Could my ASIA score change?	• Impact of swelling, bruising and other factors may change your ASIA score.
• Knowing my injury level, and my ASIA score, what things can and can't I do?	• This will allow you to focus on where you are at this point in time, remembering that sometimes injury levels and ASIA scores can change. • What motor messages are getting through and what sensory messages are getting through - so what is currently working and what is not.

Who can I talk to?

Can I get practical help, from people with lived experience of spinal cord injury?

You sure can. The recovery journey after a spinal cord injury is incredibly challenging, which is why SCIAs Peer and Family Support program is so critical. The Peer and Family Support team provide free, non-clinical, practical advice and lived experience of physical disability to help people with spinal cord injury and their support people to:

- **Regain independence**
- **Make connections in the community**
- **Practice skills for everyday living**
- **Develop the knowledge needed for everyday living**
- **To feel supported and respected**

Speak to the SCIA Peer & Family Support team on the ward.

SCAN ME

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info@scia.org.au


notes


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This booklet has been written and developed by Spinal Cord Injuries Australia (SCIA).

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