



NZ Spinal Cord Injury Registry  
Te Rēhita Whara Aho Tuaiwi ā-Motu

New Zealand  
Spinal Cord Injury Registry

# Annual Summary Report 2022

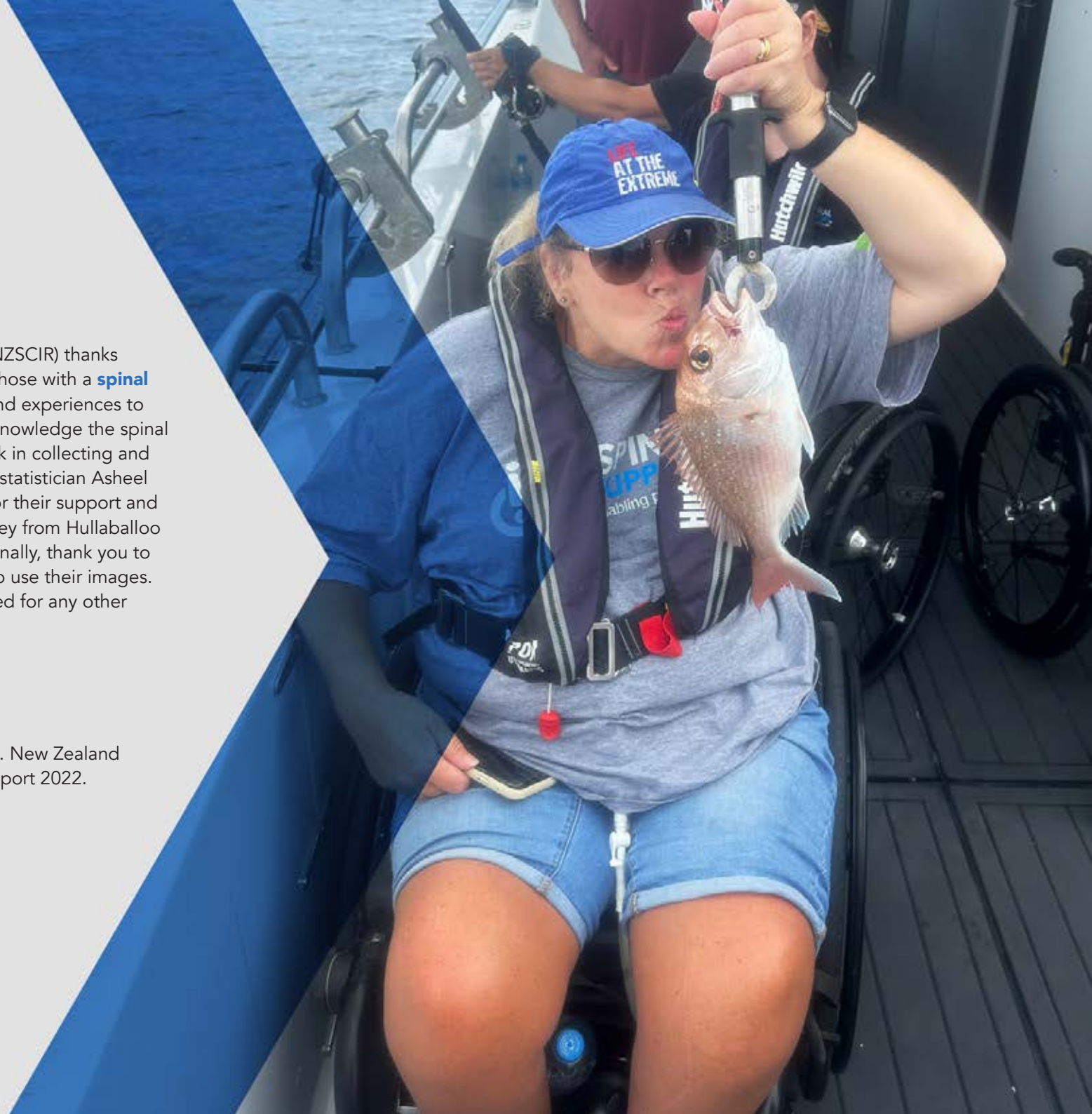
In partnership with



The New Zealand Spinal Cord Injury Registry (NZSCIR) thanks participants who are enrolled in the NZSCIR – those with a **spinal cord injury** (SCI) – for contributing their time and experiences to the registry. The NZSCIR would also like to acknowledge the spinal service clinicians and coordinators for their work in collecting and inputting data into the registry. Thanks also to statistician Asheel Ramanlal and the Praxis Spinal Cord Institute for their support and expertise in developing this report, and Jo Kinley from Hullabaloo Design for her bringing our vision to life. And finally, thank you to the inspiring individuals who have allowed us to use their images. We ask that these images are not copied or used for any other purpose.

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# About this report

The NZSCIR Annual Report 2022 is an overview of the data collected from 233 NZSCIR participants who sustained either a new **traumatic spinal cord injury** (tSCI) in 2022 or were admitted to either **Supra-regional Spinal Service** 1 January - 31 December 2022 with a new **non-traumatic spinal cord dysfunction/injury** (NTSCI).

Supra-regional Spinal Services are provided at Christchurch Hospital and the Burwood Spinal Unit (BSU) in the Waitaha Canterbury District, and at Middlemore Hospital and the Auckland Spinal Rehabilitation Unit (ASRU) in the Counties Manukau District. The journey for each participant is recorded through their adult acute care, rehabilitation and community follow-up.

Data forming the 2022 calendar year again included a COVID-19 enforced lockdown period affecting the Auckland catchment, resulting in 15 participants not being approached for NZSCIR consent. The 2022 lockdown did not affect the Waitaha Canterbury District and the consenting process continued as normal. As a result, consent rates appear to be returning to pre-COVID levels.

This report includes information about participant demographics, type of SCI and its causes, length of hospital stay, functional outcomes and secondary complications after SCI. This year additional service-specific demographic information has been added to identify site variations. This report serves as a brief descriptive account that may inform research, clinical practice, policy and programme planning. In particular, data from the NZSCIR aims to support decision makers to develop strategies to improve SCI care services.

Strict statistical rules have been applied to protect individuals from being identified. Raw numbers (n) have been kept where applicable. However, raw numbers have been removed where there are less than five persons in a group, and a percentage only has been used.

The NZSCIR governance group welcomes feedback or questions on this report. Please contact any of the NZSCIR Coordinators at [NZSCIR@cdhb.health.nz](mailto:NZSCIR@cdhb.health.nz) or [NZSCIR@middlemore.co.nz](mailto:NZSCIR@middlemore.co.nz)

More information about NZSCIR is available from [www.nzscir.nz](http://www.nzscir.nz)

Certain terms are bolded throughout this report. Definitions can be found in the glossary on page 14.

# Spinal cord injury & the NZSCIR

## Spinal cord injury

The cause of the spinal cord damage determines if it is a traumatic injury or non-traumatic spinal cord dysfunction/injury. An injury sustained from a physical impact, such as a fall or motor vehicle crash, is referred to as a traumatic spinal cord injury (tSCI). If an injury occurs in other ways, such as from degeneration, infection or cancer, it is referred to as non-traumatic spinal cord dysfunction/injury (NTSCI).

## About the NZSCIR

The NZSCIR (established August 2016) is jointly funded by the Accident Compensation Corporation and Te Whatu Ora Health NZ, in partnership with the Praxis Spinal Cord Institute.

Data collected from the NZSCIR supports improvements to services and clinical practice; and provides a database for research. These three activities help enable the best outcomes to be achieved for people with SCI.

A governance group which represents consumers, researchers, clinicians, funders and managers ensures the efficient and effective operation of the NZSCIR. The NZSCIR governance group is currently undergoing development of a Māori Advisory Committee to help provide guidance and tikanga to outline strategic priorities for Māori. Four Registry Coordinators, two employed at each Supra-regional Spinal Service, provide the day to day management of the NZSCIR. The NZ Spinal Trust also provides some administrative support to the NZSCIR.

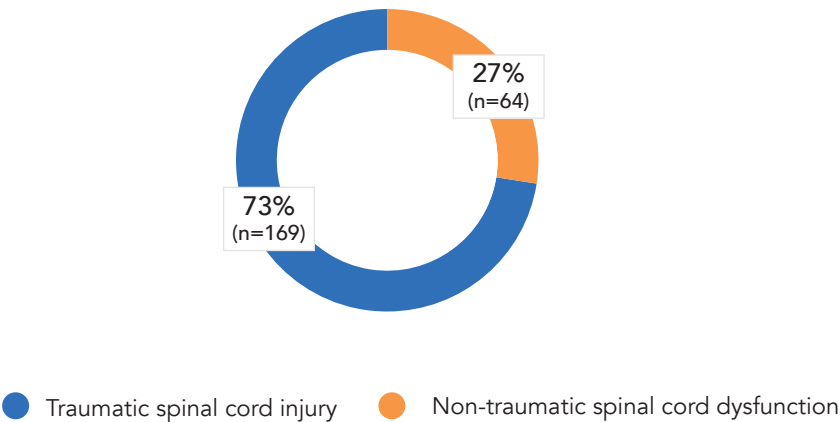
The NZSCIR has Health and Disability Ethics Committee approval, enabling collection and carefully managed use of a non-consented minimal data set. Data collected beyond this, including follow-up data, is subject to consent.

# What are the causes of spinal cord injuries?

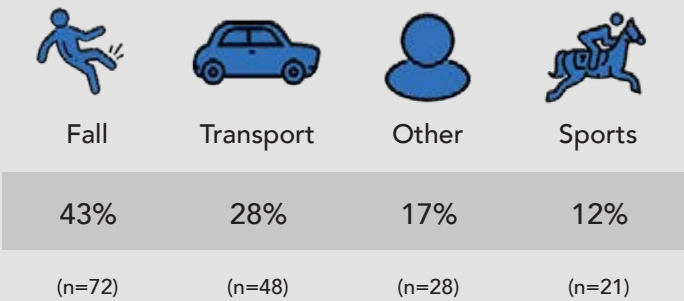
Prior to the establishment of NZSCIR, the NZ incidence of SCI was estimated at 30 per million, with approximately half related to a tSCI. The World Health Organization estimates the incidence of SCI is between 40 to 80 cases per million<sup>1</sup>. Based on 2022 NZSCIR data, incidence in NZ is currently 45 per million, a slight increase from 41 per million in 2021 and similar to 44 per million in 2020.

NZSCIR data across 2017-2022 calendar years found, 66-73% of spinal cord injuries are tSCI injuries.

NZSCIR participants by SCI type 2022 (n=233)



Traumatic spinal cord injury causes (n=169)



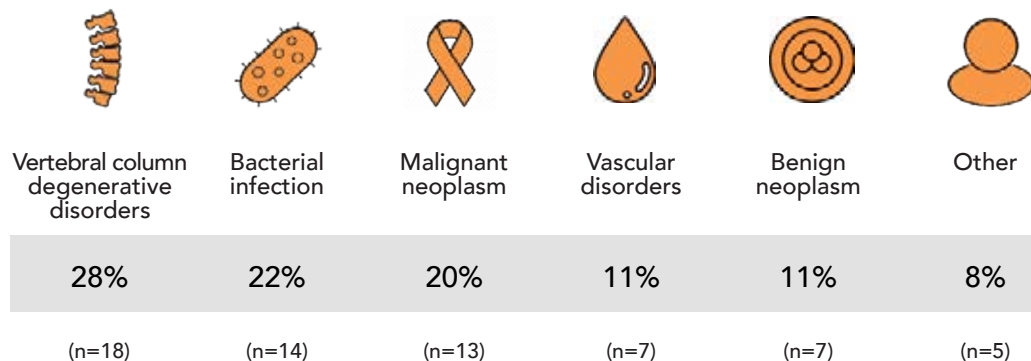
Falls continue to be the most common cause of tSCI in 2022. An injury related to a fall can be caused by anything from a slip to a fall from a height. In the age group 0-30 years, only 19% of tSCI injuries were due to falls. This increased dramatically to 89% in the >76 year group. Falls remain the leading cause of tSCI for all age categories 46 years and above.

Transport is the leading cause of SCI in those under the age of 45 years. This is consistent with the last three year's data.

The "Other" tSCI category relates to assault, deterioration of function post-surgery, or other non-classified causes.

At 12%, sporting/leisure injuries are the same as last year. A third of sporting injuries were from wheeled non-motorsports (mountain biking/cycling), and another third were water-related (accidents in the surf, in pools or rivers). The remaining third were from aero sports, horse-related, acrobatic and team ball sports.

## Non-traumatic spinal cord dysfunction causes (n=64)



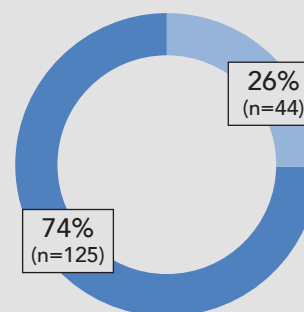
Disorders relating to degeneration of the spine were the most common cause of NTSCI (28%, down from 33% in 2021). The spinal cord is protected by the spinal column. Deterioration of the spinal column, including discs, ligaments, joints or bones, can lead to this type of spinal cord damage.

The second leading cause of NTSCI was bacterial infection, such as discitis, making up 22% of NTSCI causes. **Malignant neoplasms** (including cancer) accounted for 20% of NTSCI, slightly down from 2021. Vascular (such as haemorrhage or lack of blood flow) and benign neoplasms were both the fourth highest cause of NTSCI at 11% each. "Other" NTSCI causes could include conditions such as fungal infections, inflammatory/auto-immune diseases or benign tumours.

## What does the population look like?

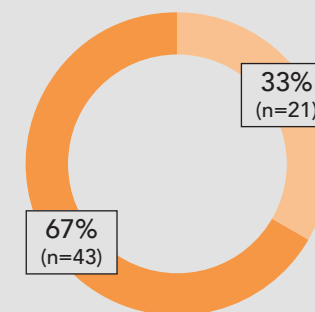
In 2022, males accounted for 74% of persons with a tSCI. This proportion is consistent for the tSCI population since the Registry began in 2016. Females accounted for 33% of those with NTSCI, which is slightly less than last year, but consistent with previous years' data. Females have always shown a slightly higher ratio in the NTSCI cohort than tSCI, since we began collecting data in 2016.

**Traumatic spinal cord injury by gender (n=169)**



● Male ● Female

**Non-traumatic spinal cord dysfunction by gender (n=64)**



● Male ● Female

People may choose more than one ethnicity, and these are then prioritised for reporting, as per Te Whatu Ora Health NZ guidelines.<sup>2</sup> Using these guidelines, most participants were of European descent for both those with tSCI (56%) and NTSCI (58%).

For the tSCI population, 22% identified as Māori, followed by 12% identifying as Pacific Peoples. Pacific Peoples include Samoan, Tongan, Niuean, Cook Island Māori, Fijian and Ni-Vanuatu. For the NTSCI population, Pacific Peoples were the second largest ethnic population (17%), followed by the “Other” category (13%). “Other” includes Asian, Middle Eastern, Latin American and African ethnicities. Māori make up 9% of the NTSCI population. This is approximately half of the 2021 figure (17%).

Pacific Peoples have the highest incidence of SCI in the NZSCIR. Incidence is calculated using the total number of those identifying as Pasifika with a new SCI this year, divided by the number of Pasifika living in NZ in 2022, multiplied by 1 million. Pacific Peoples have a SCI incidence of 74 per million, compared to 49 per million for Māori, and 36 per million for European. “Other” ethnicities, as described above, have a SCI incidence of 25 per million.

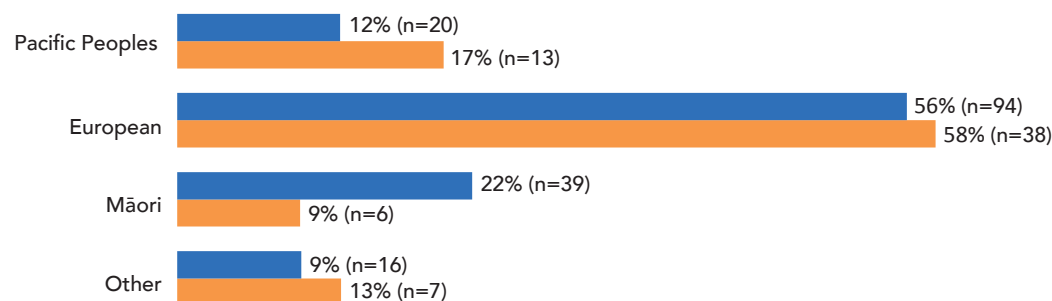
This year we have also shown prioritised ethnicity by service to highlight the differences between the two catchment areas, across all types of SCI. Although European continues to be the most prevalent ethnicity at both services (56%), these numbers vary substantially, with Christchurch having 70% of people identifying as European, while Auckland has just 44%. Māori make up the second highest population at both sites, with 22% in Auckland and 16% in Christchurch. This is followed by Pacific Peoples, being 18% of those admitted in Auckland and 10% in Christchurch. This shows the Auckland service has 40% of their admissions identifying as Māori or Pasifika, in comparison to 26% in Christchurch. The “Other” category makes up 16% in Auckland and only 4% in Christchurch.

The average age of all NZSCIR participants was 53.5 years old, down from 55 years the past two years.

Of those with tSCI, there was an increase in those aged 31-45 years (up from 17% to 24%), and a slight decrease in those over 76 years, compared with 2021 (14% down to 11%). The number of people with NTSCI tends to steadily increase with age, peaking at age 61-75 years. This trend has been consistent, since the registry began, over six years ago.

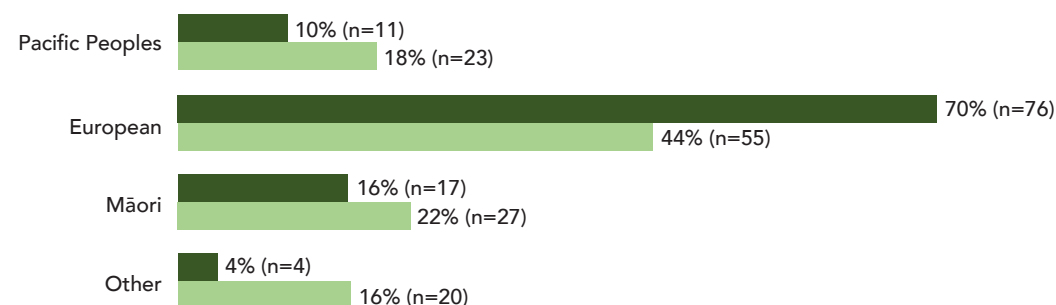
This year, age categories are grouped differently due to low NTSCI numbers in the younger categories. For those with tSCI, 19% (n=32) were aged 0-30 years; whilst 23% (n=39) were aged 31-45 years.

## Prioritised ethnicity by SCI type (n=233)



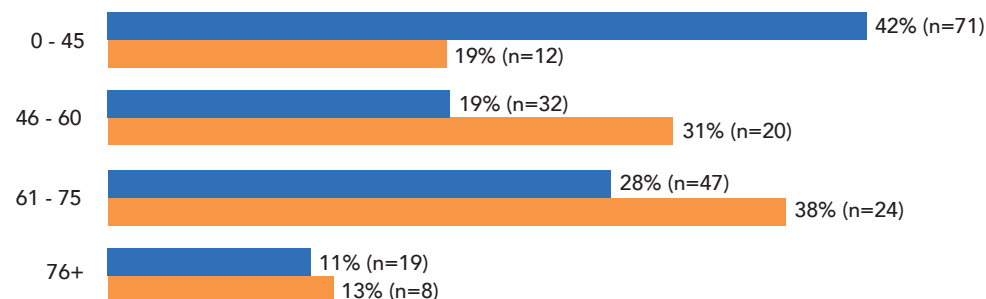
● Traumatic spinal cord injury ● Non-traumatic spinal cord dysfunction

## Prioritised ethnicity by enrolling facility (n=233)



● Burwood Spinal Unit (BSU) ● Auckland Spinal Rehabilitation Unit (ASRU)

## Age group by SCI type (n=233)



● Traumatic spinal cord injury ● Non-traumatic spinal cord dysfunction

# What is the severity and level of injury?

The spinal cord has four regions: **cervical**, **thoracic**, **lumbar** and **sacral**. The level of injury identifies the lowest level of the spinal cord (from the head) that has normal movement and sensation. In the graphs shown, people are grouped into those with tetraplegia and those with paraplegia, based on their level of injury. Someone with **tetraplegia** has their arms, breathing muscles, trunks and legs affected, as a result of a neck injury. Someone with **paraplegia** has their trunk and/or legs affected from an injury to their spinal cord below the neck region (thoracic, lumbar or sacral). All those people with a SCI may have bowel, bladder and sexual function affected. People with **incomplete** injuries at any level may be able to stand or walk, depending on how their spinal cord was affected (see grades below).

Those with a tSCI are more likely to have tetraplegia (67%), whilst those with a NTSCI are more likely to have paraplegia (67%). This trend has been consistent since NZSCIR records began in 2016.

Participants' severity and level of injury are routinely assessed throughout their recovery using the American Spinal Injury Association (ASIA) standardised assessment form at one of the two Supra-regional Spinal Services. The severity is graded in the categories below.

The extent of a participant's SCI is defined by the ASIA Impairment Scale (AIS).

**Grade A:** Impairment is **complete**; no motor or sensory function below injury level.

**Grade B:** Impairment is incomplete; sensory function, but not motor function, is preserved below the neurologic level (the first normal level above the level of injury) and some sensation is preserved in the sacral segments S4 and S5.

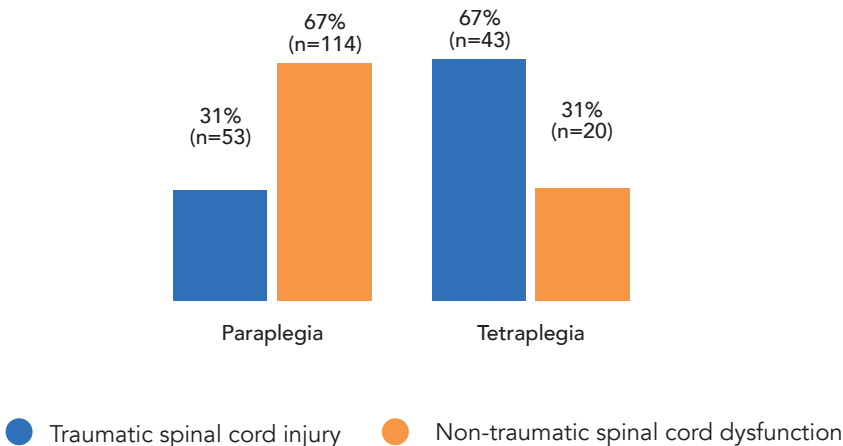
**Grade C:** Impairment is incomplete; motor function is preserved below the neurologic level, but more than half of the key muscles below the neurologic level have a muscle grade less than 3 (i.e. Insufficient strength to move against gravity).

**Grade D:** Impairment is incomplete; motor function is preserved below the neurologic level, and at least half of the key muscles below the neurologic level have a muscle grade of 3 or more (i.e. the joints can be moved against gravity).

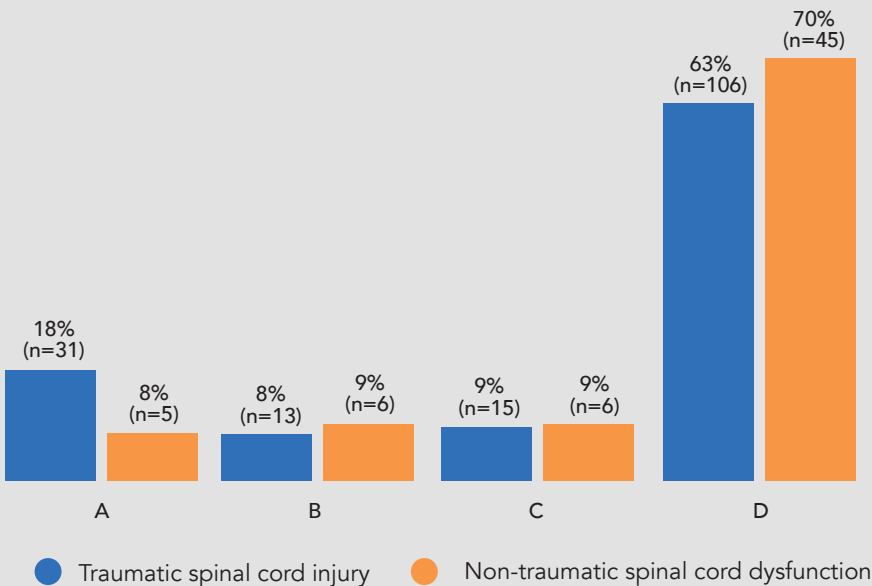
**Grade E:** Participant's functions are normal; all motor and sensory functions are unhindered.

AIS D remains the most common SCI classification in NZ and has the highest predictability for independent mobility one-year post-SCI<sup>3</sup>. In the severity graph shown, data from 2% (NTSCI) and 4% (tSCI) were excluded because a full assessment could not be completed.

Last known level of SCI



Last known severity of SCI





# What are the length of hospital stays?

NZSCIR captures length of stay (LOS) in acute and rehabilitation settings.

The median LOS across both sites in 2022 (not shown on the graphs) was 18 days in acute care (same as 2021) and 67 days in the rehabilitation service (up from 61 in 2021). Nationally, the median LOS in rehabilitation for people with tetraplegia was 75 days in 2022, up eight days from 67 in 2021. The median LOS for those with paraplegia was 61 days, up from 55 days in 2021, which was up from 47.5 days in 2020.

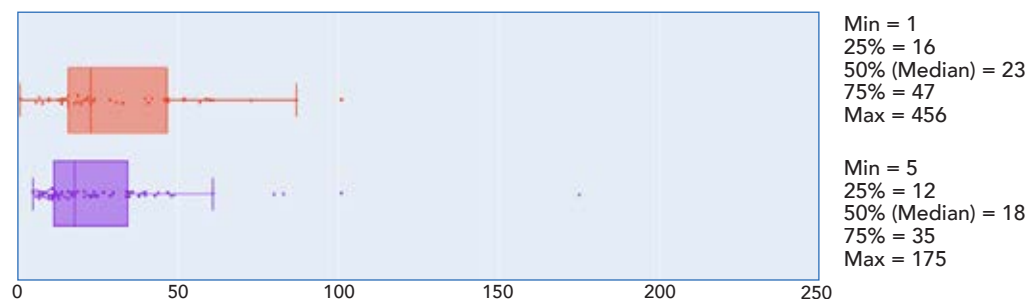
There continues to be a noticeable difference between sites for LOS, especially in the rehab settings. At ASRU, participants stayed slightly longer in acute than those at BSU (median six days longer for those with paraplegia and four days longer for those with tetraplegia). Conversely, participants at BSU had a longer rehabilitation stay (median 20 days longer for those with paraplegia and two days longer for those with tetraplegia).

Medians are one way to show the middle point of data, but it is important to look at the whole range to understand the full picture. The box and whisker graphs to the right show these ranges. Interestingly, the variation in rehab LOS is greater for all participants attending BSU, as shown by the larger spread of points on the BSU rehab graph here.

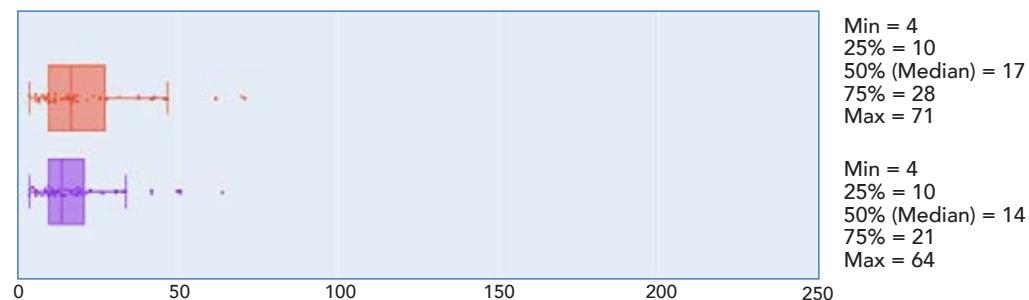
Please note, some LOS outliers do not appear on the graphs, due to their impact on scaling, but are included in calculations.



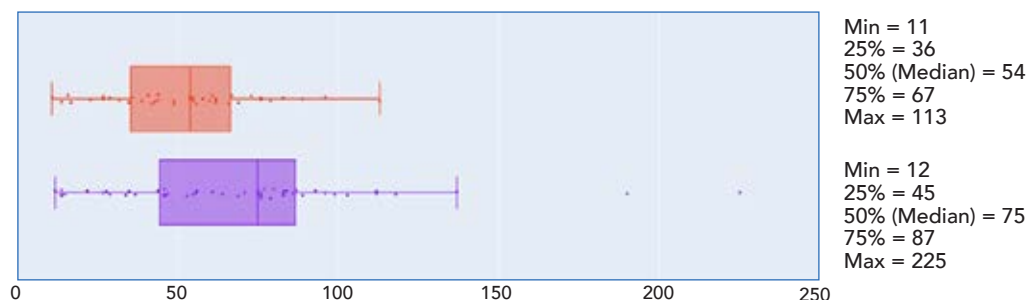
## ASRU Acute: 2022 LOS (days) distributions



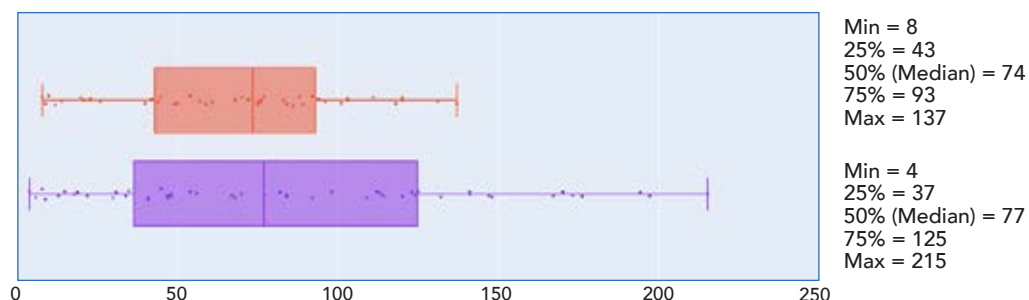
## BSU Acute: 2022 LOS (days) distributions



## ASRU Rehab: 2022 LOS (days) distributions



## BSU Rehab: 2022 LOS (days) distributions



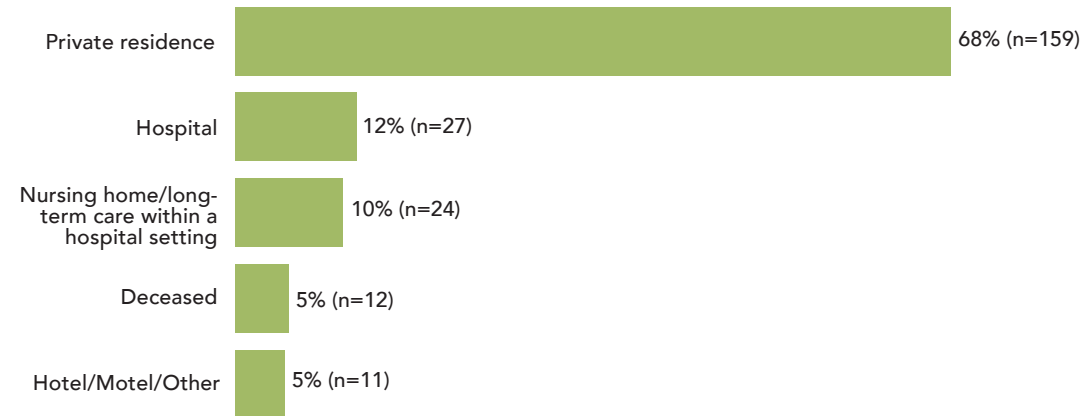
● Paraplegia ● Tetraplegia

# Where do people go after discharge from hospital?

A private residence in the community was the most common location for discharged participants. 'Hospital' indicates ongoing rehabilitation and discharge planning post-Supra Regional Spinal Service admission. Discharge destinations remain similar over the past six years, varying by a maximum of 6%.

"Other" includes groups with numbers too small to report on, such as those discharged to a hotel/motel, no permanent discharge destination or a correctional institute.

## Discharge destinations (tSCI & NTSCI)

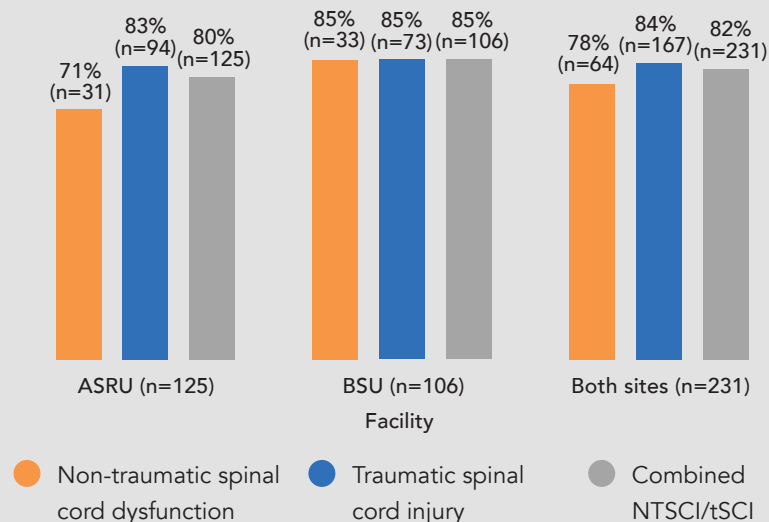


# How many people have surgery and how many walk 100m on discharge?

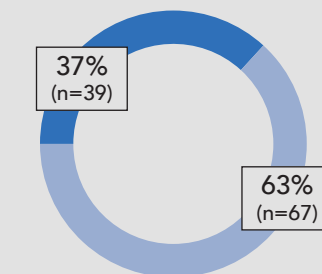
Surgery rates for all participants in 2022 were slightly higher in Christchurch (85%) compared with Auckland (80%). Christchurch had a 15% higher surgical rate for tSCI compared to last year, (85% vs 70%), whereas Auckland's tSCI rates remained the same as 2021 (83%). Christchurch continued to have higher rates of surgery for NTSCI compared with Auckland (85% vs 71%), similar to 2021 data.

On discharge, based on complete records of 142 participants (NTSCI and tSCI), 35% were independently walking in the community. This is classified as someone who is able to walk 100m outdoors unsupervised, with or without a mobility aid. For those consented participants with a ntSCI (n=36), 28% were walking independently on discharge, similar to 2021 (32%). There was an 8% increase in those people with a tSCI who walked independently on discharge compared to 2021 (37% vs 29%) based on the complete records of 106 participants.

## Surgery rates by site and SCI

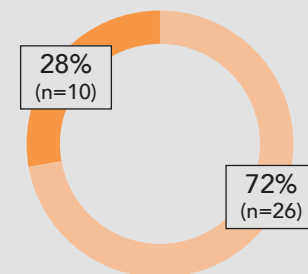


## Mobility on rehab discharge Traumatic spinal cord injury (n=106)



- Independently walking
- Not independently walking

## Mobility on rehab discharge Non-traumatic spinal cord dysfunction (n=36)



- Independently walking
- Not independently walking

# How often do secondary complications occur in acute and/or rehabilitation care?

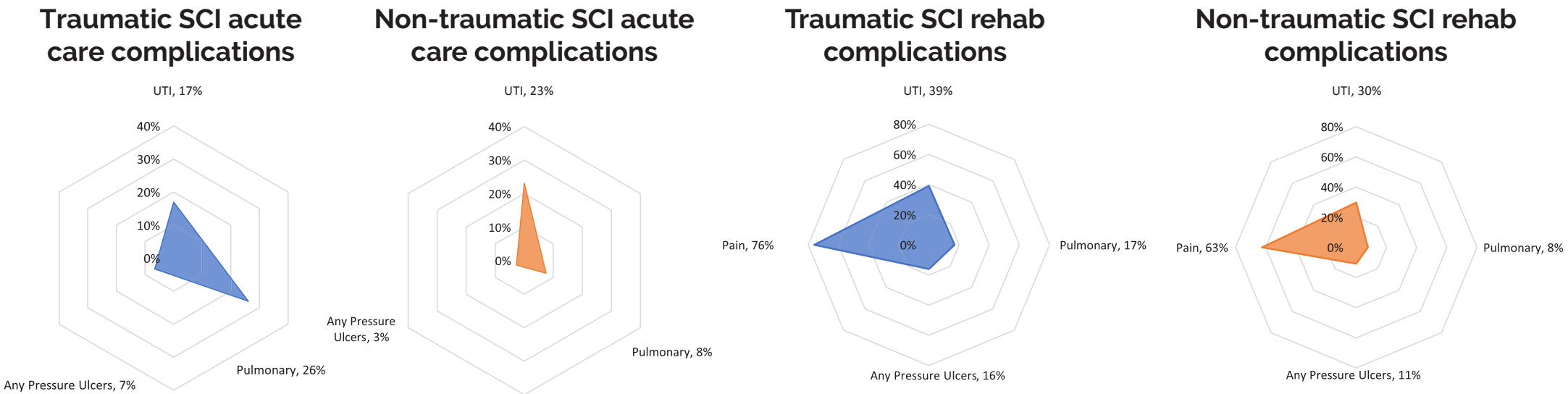
**Pain** on discharge to the community was the most commonly reported secondary complication. 76% of tSCI participants reported experiencing pain on rehab discharge, whilst 63% of those with NTSCI reported pain on discharge. This showed a slight increase from 2021 for tSCI, but a 16% decrease in reported pain on discharge for those with a ntSCI.

**Urinary tract infections** (UTI) had a 19% incidence rate during acute stay (combined tSCI and NTSCI) and a 37% incidence rate occurring during rehabilitation. Information is based on the records of 145 acute and 142 rehab participants with complete UTI data.

**Respiratory complications** occurred in 21% of participants during the acute phase (tSCI 26%; NTSCI 8%), and 14% during rehabilitation (tSCI 17%; NTSCI 8%). Those with tSCI were much more likely to have acute respiratory complications compared to those with NTSCI (based on 151 acute records). Of these acute respiratory complications in those with tSCI, almost two thirds (62%) were pneumonia. 39% of the respiratory complications reported in rehab for those with tSCI were obstructive sleep apnea, whilst pneumonia rates dropped to 33% of all respiratory complications.

**Pressure injuries** occurred during acute care for 6% of participants, based on the records of 143 tSCI and NTSCI participants. In the rehabilitation phase, pressure injuries occurred for 14% of participants. These numbers are similar to last year.

Pre-SCI **co-morbidities** reported were similar between the tSCI and NTSCI participants. The most common co-morbidities were high blood pressure, followed by diabetes, and asthma. For those with a tSCI, depression/mood problems were next in ranking, whilst osteoarthritis was higher in persons with NTSCI than those with tSCI.



# NZSCIR provides important information

This report represents the sixth complete calendar year of data from the NZSCIR. The data collected through the NZSCIR helps connect clinicians, researchers, health care administrators and people living with SCI. It provides much needed information to promote advancements in care and evidence-based practices to improve outcomes for those living with SCI. Data continues to be used by Hatu Hone St John NZ, supra-spinal services and researchers. Dashboards (see below) are an interactive analysis tool well-utilised at both services. A quality improvement project with St John uses data to confirm that the right people are getting to the right service as soon as possible. With six calendar years now available, the NZSCIR is currently commissioning a five-year comparative report (2018-2022).

After operating for six years, the NZSCIR governance group has reviewed the data points collected. The review was undertaken by the Burwood Academy Trust (BAT) at the beginning of 2023.

This has helped determine whether the right data continues to be collected and where adjustments can be made. This is an important step to ensure data remains current, accurate, useful and aligned with data collection by our international partner, the Praxis Institute.

Another area of focus for the NZSCIR in the coming year is to improve community follow-up data collection and use. More resource has allowed increased effort contacting participants in the community to complete questionnaires at 18mths and 5 years post-admission. A pathway allowing new contributions from those not yet enrolled in the registry is underway. People who have had a SCI prior to the establishment of the registry in Aug 2016, may participate in the NZSCIR (as long as SCI criteria, as defined by the NZSCIR) is met.





# Denominators for report summaries

Note: NZSCIR collects an expanded full data set for participants who consented (n=149, 64%) and a minimal data set for those who were not consented (n=84, 36%). During the 2022 lockdown in Auckland, those participants admitted to the Auckland facilities were not approached for full data set consent. Participants were approached if still an inpatient once the lockdown lifted.

There are a potential two extra acute consented data sets in 2022, above the 149 recorded. These were due to participants withdrawing consent once in rehab. Participants were deemed to have complete data if key expected admission and discharge data had been entered into the database. The NZSCIR data used for this report were extracted on 26 July 2023.



## Data collected from 233 new injuries between 1 January 2022 and 31 December 2022 (or NTSCI admission to rehab between these dates).

Number of participants represented in each data summary:

Traumatic SCI and non-traumatic SCI: 233

Mechanism and cause of Injury: 233

Gender/ Ethnicity/ Age: 233

Pre-existing conditions: 151

Severity and level of injury: AIS 228 and level of injury 230

Surgical intervention rates: 231 (ASRU n=126; BSU n=105)

Walking in the community: 137

Length of stay: 233

Discharge destination: 233

### Complications during acute care:

UTI: 145

Respiratory: 151

Pressure injuries: 143

### Complications during rehabilitation:

Pain: 128

UTI: 142

Respiratory: 145

Pressure injuries: 143

# Glossary

**Cervical spine** – The upper seven vertebrae, located in the neck (C1–C7). The nerves in this area control head and neck movement, the diaphragm, deltoids, biceps, and muscles controlling the wrist and hands.

**Complete injury** – An injury where there is no sensory and motor function (inability to feel or move) preserved in the last nerves leaving the spinal cord (sacral 4th and 5th nerves). This usually results in a total lack of sensory and motor function below the level of the injury.

**Incomplete injury** – An injury where there is some sensory or motor function (ability to feel, touch or move) below the level of the injury. This must include the last nerves leaving the spinal cord (sacral 4th and 5th nerves).

**Independently walking in the community** – Classified by physiotherapists as someone who is able to walk 100m outdoors unsupervised, with or without mobility aids.

**Lumbar spine** – The five vertebrae in the lower back (L1–L5). Injury to this area damages the very lowermost tip of the spinal cord (known as the conus medullaris) or the cauda equina which results in decreased control of hips and legs, as well as bladder, bowel and sexual function.

**Malignant neoplasms** – A cancerous tumour. An uncontrolled, abnormal growth of tissue that can spread to other parts of the body.

**Non-traumatic spinal cord dysfunction/injury (NTSCI)** – A spinal cord injury that occurs as a result of a medical cause such as degeneration, infection or cancer.

**Paraplegia** – Complete or partial loss of sensation and/or movement in the legs and often in part of, or the entire trunk. Can affect breathing muscles. It is caused by an injury to the spinal cord in the thoracic (trunk) region or below, including cauda equina. May have bowel, bladder and sexual function affected.

**Pressure injuries** – Tissue injured by pressure and/or shear forces.

**Respiratory complications** – Includes pneumonia, venothromboembolic events (including pulmonary embolus [PE] and deep vein thrombosis [DVT]), obstructive sleep apnea and other respiratory conditions.

**Sacral spine** – The five fused vertebrae located in the pelvic area (S1 – S5). As with lumbar injuries, damage to the sacral nerves can result in decreased control of hips, legs, bladder, bowel and sexual function.

**Supra-regional spinal service/facility** – NZ has two supra-regional spinal services and four facilities. Waitaha Canterbury District: Christchurch Hospital (acute) and Burwood Spinal Unit (acute/rehabilitation). Counties Manukau District: Middlemore Hospital (acute) and Auckland Spinal Rehabilitation Unit (rehabilitation).

**Spinal cord injury (SCI)** – Damage to the spinal cord resulting in impairment of muscle function, sensation and/or autonomic function (bowel, bladder and sexual function).

**Tetraplegia or Quadriplegia** – Complete or partial loss of sensation and/or movement in the arms, and typically in the trunk and legs. Usually affects breathing muscles. May have bowel, bladder and sexual function affected. It is caused by an injury to the spinal cord in the neck.

**Thoracic spine** – The twelve vertebrae that extend through the chest area (T1–T12). The nerves in this area control chest and abdominal muscles.

**Traumatic spinal cord injury (tSCI)** – A spinal cord injury that occurs as a result of trauma such as a fall, a motor vehicle crash or sporting injury.

**Urinary Tract Infection (UTI)** – A bacterial infection of the urinary tract, treated with antibiotics.





## References

1. World Health Organisation, 19 November 2013, Spinal cord injury, [www.who.int/news-room/fact-sheets/detail/spinal-cord-injury](http://www.who.int/news-room/fact-sheets/detail/spinal-cord-injury). Retrieved November 2021.
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