



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

New Zealand
Spinal Cord Injury Registry

Annual Summary Report 2021

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.

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Contents

About this report	4
Spinal cord injury and the Registry.....	4
Causes of spinal cord injuries	5
Population details.....	6
Severity and levels of injury	8
Length of hospital stays.....	9
Where people go after discharge from hospital	10
How many people have surgery and how many walk 100m on discharge.....	10
Secondary complications	11
NZSCIR provides important information	12
Denominators for report summaries.....	13
Glossary.....	14
References	15
Contact.....	16

About this report

The NZSCIR Annual Report 2021 is an overview of the data collected from 209 NZSCIR participants who sustained either a new **traumatic SCI** (tSCI) in 2021 or were admitted to either **Supra-regional Spinal Service** 1 January - 31 December 2021 with a new **non-traumatic SCI** (NTSCI).

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

Data forming the 2021 calendar year includes a time where COVID-19 enforced lockdown periods, when participants were not approached for NZSCIR consent, preventing full collection of data. As a result, approximately 10% more participants had only the minimal data set collected in both 2020 and 2021, compared to previous years.

This report includes information about participant demographics, type of SCI and its causes, length of hospital stay, functional outcomes and secondary complications after SCI. It 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.

The NZSCIR governance group welcomes feedback or questions on this report. Please contact either NZSCIR Coordinator at NZSCIR@cdhb.health.nz or NZSCIR@middlemore.co.nz

More information about NZSCIR is available from 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. An injury sustained from a physical impact, such as a fall or motor vehicle crash, is referred to as a traumatic SCI. If an injury occurs in other ways, such as from degeneration, infection or cancer, it is referred to as non-traumatic spinal cord dysfunction.

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. Two Registry Coordinators, one 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.

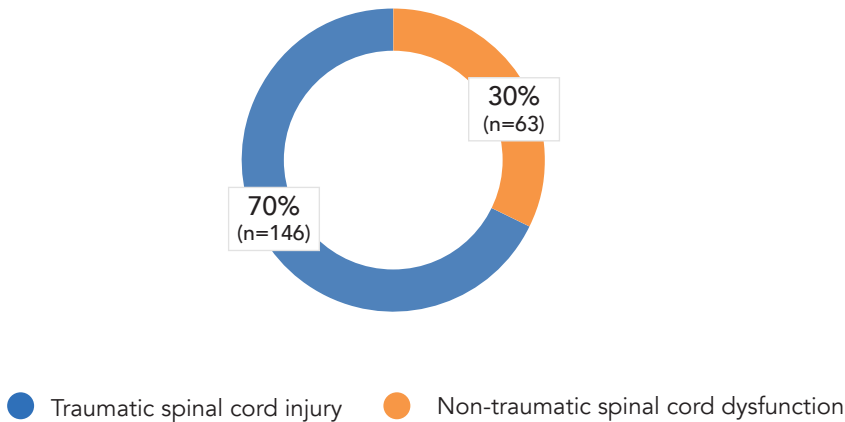
The NZSCIR has Health and Disability Ethics Committee approval, enabling collection and carefully managed use of a non-consented minimal data set. Data collected beyond this, including follow-up data, is subject to consent.

What are the causes of spinal cord injuries?

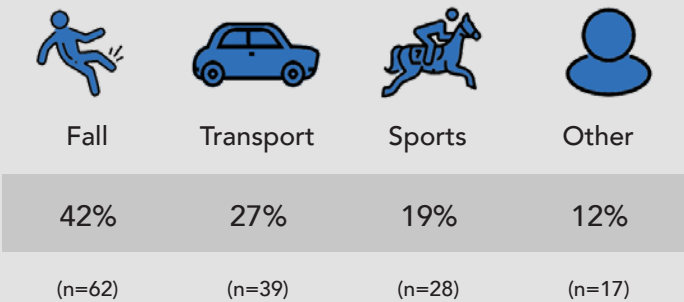
Prior to the establishment of NZSCIR, the NZ incidence of SCI was estimated at 30 per million, with approximately half related to a traumatic injury. The World Health Organization estimates the incidence of SCI is between 40 to 80 cases per million¹. Based on 2021 NZSCIR data, incidence in NZ is currently 41 per million, a slight reduction from 44 per million in 2020.

NZSCIR data across 2017-2021 calendar years found, 66-70% of spinal cord injuries are traumatic injuries.

NZSCIR participants by SCI type 2021 (n=209)



Traumatic spinal cord injury causes (n=146)

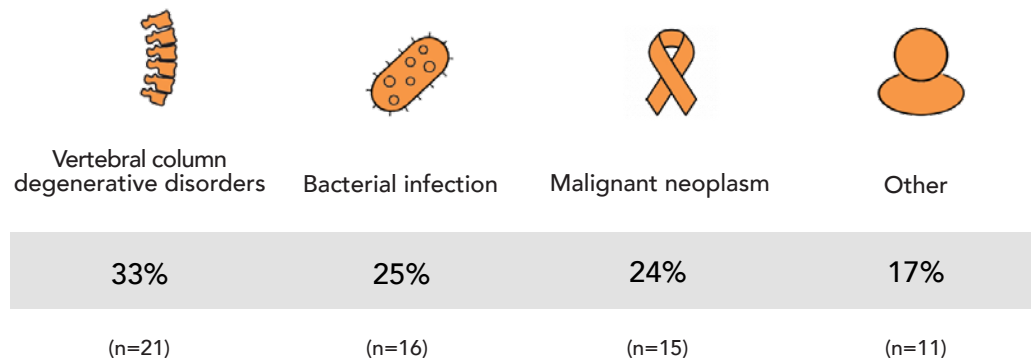


Falls continue to be the most common cause of traumatic injury in 2021. This remains the leading cause since the NZSCIR data collection began in 2016. An injury related to a fall can be caused by anything from a slip to a fall from a height. In the age group 0-30 years, only 10% of traumatic injuries were due to falls. This increased dramatically to 79% in the >76 years 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 which is consistent with 2019/2020 data. There was an increase in sporting/leisure injuries in 2021, up to 19% from 14% last year. 25% of sporting injuries were from wheeled non-motorsports (mountain biking/cycling), which is a downward trend from last year. 18% of sporting injuries were water-related (accidents in the surf, in pools or rivers) and 14% of sporting injuries in 2021 were horse-related. Team ball sports returned to the top four sporting causes for the first time since 2018, accounting for 14% of sporting injuries..

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

Non-traumatic spinal cord dysfunction causes (n=63)



The spinal cord is protected by the spinal column. Deterioration of the spinal column, including discs, ligaments, joints or bones, can lead to spinal cord damage. Disorders relating to degeneration of the spine were the most common cause of non-traumatic dysfunction (33%, up from 23% in 2020).

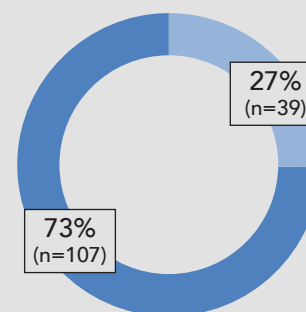
The second leading cause of non-traumatic dysfunction was bacterial infection, such as discitis, making up 25% of NTSCI causes, an increase from 14% in 2020.

Malignant neoplasms (including cancer) accounted for 24% of NTSCI, similar to 2020. "Other" causes may include vascular (such as haemorrhage or lack of blood flow), fungal infections, inflammatory or auto-immune diseases.

What does the population look like?

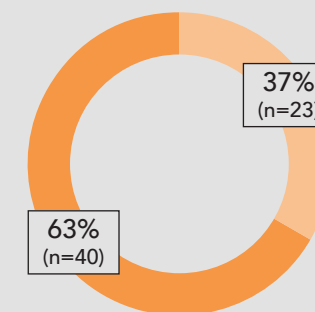
In 2021, males accounted for 73% of persons with a traumatic SCI. This proportion is consistent for the tSCI population since the NZSCIR began in 2016. There is a slight increase in the proportion of females who had a non-traumatic SCI, with 37% compared to 33% in 2020.

Traumatic spinal cord injury by gender (n=146)



● Male ● Female

Non-traumatic spinal cord dysfunction by gender (n=63)



● Male ● Female

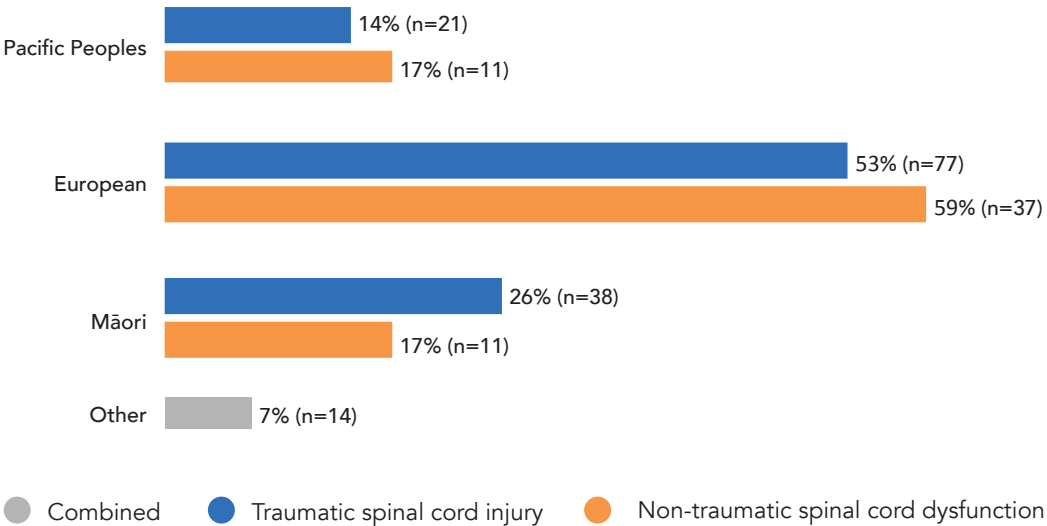
People may choose more than one ethnicity, and these are then prioritised for reporting, as per Te Whatu Ora Health NZ guidelines.² Using these guidelines, most participants were of European descent for both traumatic SCI (53%) and NTSCI (59%).

For the traumatic SCI population, 26% identified as Māori, followed by 14% identifying as Pacific Peoples. Pacific Peoples include Samoan, Tongan, Nuiean and Cook Island Māori.

For the Non-traumatic dysfunction population, Pacific Peoples and Māori are equal second-highest ethnicity with 17% of the population.

Other (which includes Asian, Middle Eastern, Latin American and African ethnicities) has to be grouped across all SCI types due to low numbers (<5).

Prioritised ethnicity by SCI type

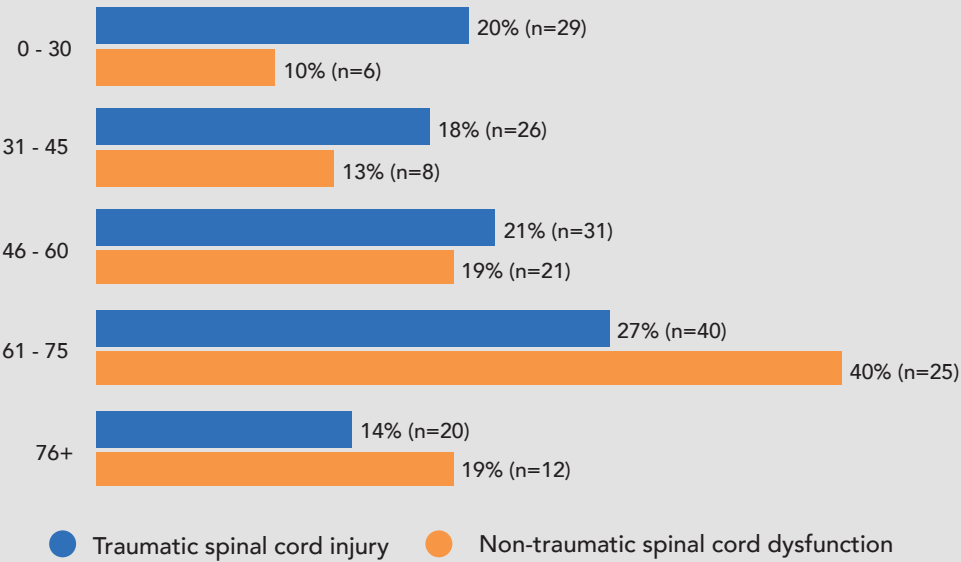


The average age of all NZSCIR participants was 55 years old (same as 2020).

Of those with tSCI, there was a slight increase in numbers for those under 45 years as well as those over 76 years, compared with 2020.

The number of people with NTSCI tends to steadily increase with age, peaking at age 61-75 years. This trend has been consistent over the past five years.

Age group by SCI type



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 tetraplegia and 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 an 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 (62%), whilst those with a NTSCI are more likely to have paraplegia (61%). 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 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 American Spinal Injury Association (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.

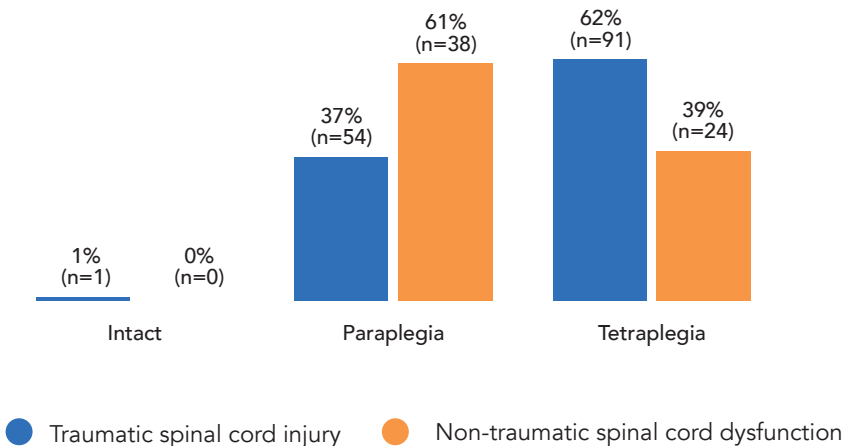
Grade C: Impairment is incomplete; motor function is preserved below the neurologic level, but more than half of the key muscles below the neurologic level have a muscle grade less than 3 (i.e. Insufficient strength to move against gravity).

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).

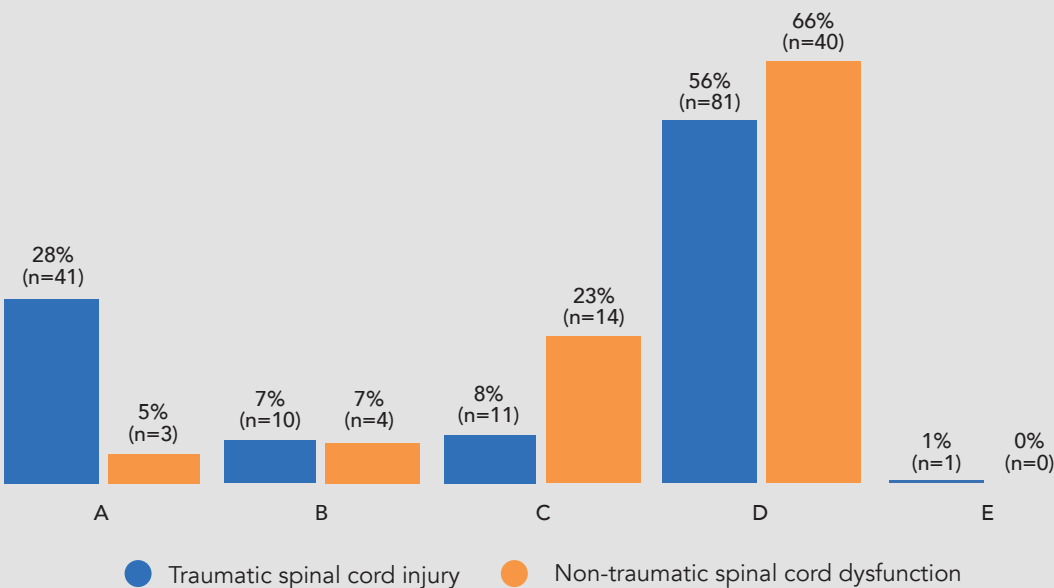
Grade E: Participant's functions are normal; all motor and sensory functions are unhindered.

AIS D remains the most common SCI classification in NZ and has the highest predictability for independent mobility one year post-SCI³. In the severity graph shown, data from 2% of all participants were excluded because a full assessment could not be completed.

Level of SCI on rehab discharge



Severity on rehab discharge



What are the length of hospital stays?

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

The median length of stay across both sites in 2021 (not shown on the graphs) was 18 days in acute care (up from 16 days in 2020) and 61 days in the rehabilitation service (same as in 2020). Nationally, the median LOS in rehabilitation for people with tetraplegia was 67 days in 2021, similar to 68 days in 2020. The median LOS for those with paraplegia was 55 days, up from 47.5 days in 2020.

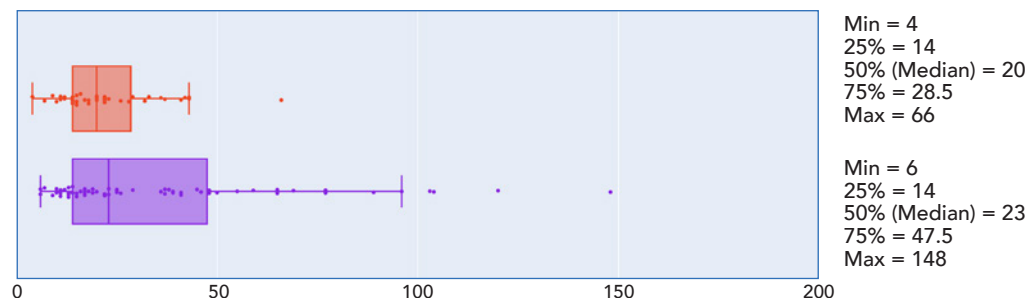
There was a noticeable difference between sites for LOS across both acute and rehabilitation settings, similar to 2020.

At ASRU, participants stayed longer in acute services than those at BSU (median 7.5 days longer for those with paraplegia and four days longer for those with tetraplegia). Conversely, participants at BSU had a longer rehabilitation stay (median 20.5 days longer for those with paraplegia and three days longer for those with tetraplegia).

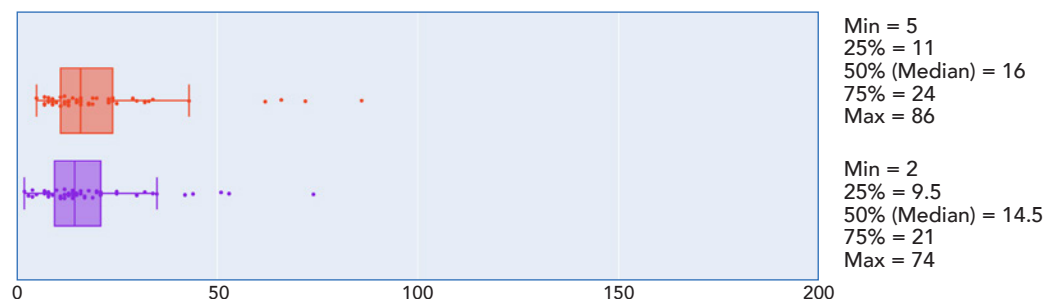
Medians are one way to show the middle point of data, but it is important to look at the whole range to understand the full picture. The box and whisker graphs to the right show these ranges. Interestingly, the variation in rehabilitation LOS is greater for all participants attending BSU, as shown by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



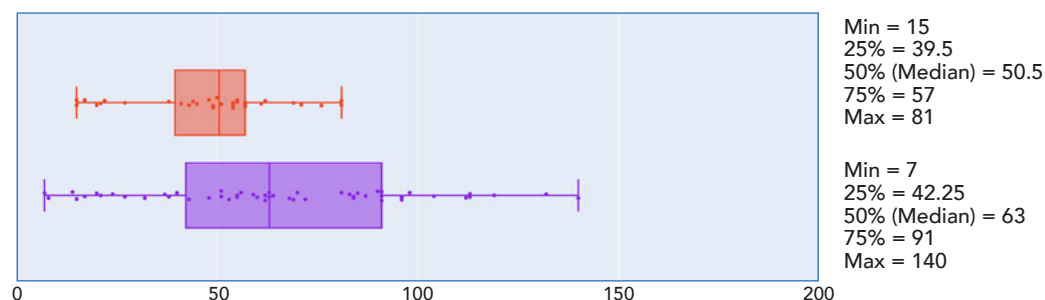
ASRU Acute: 2021 LOS (days) distributions



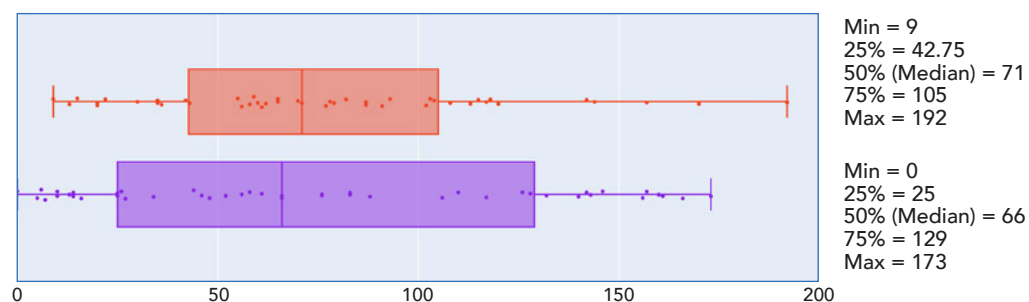
BSU Acute: 2021 LOS (days) distributions



ASRU Rehab: 2021 LOS (days) distributions



BSU Rehab: 2021 LOS (days) distributions



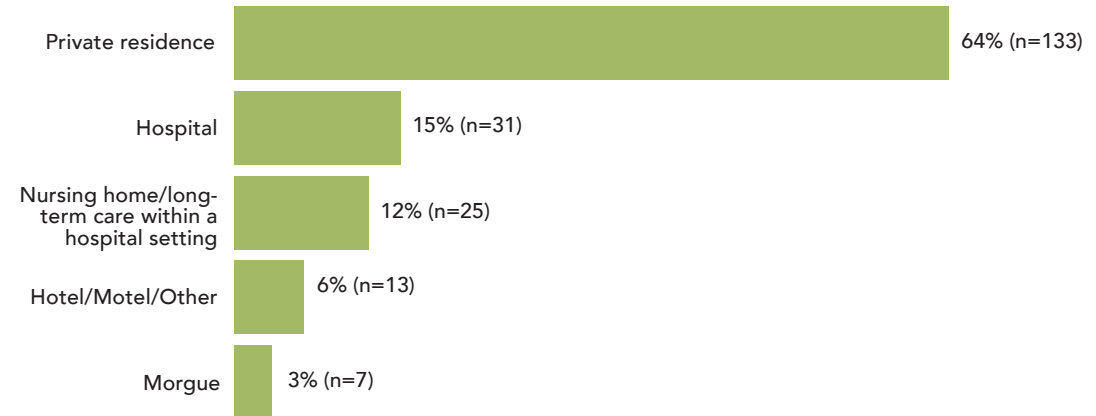
● Paraplegia ● Tetraplegia

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 two years, varying by a maximum of 2%.

'Other' includes groups with numbers too small to report on, such as those discharged to a hotel/motel/group living arrangement/or no permanent discharge destination.

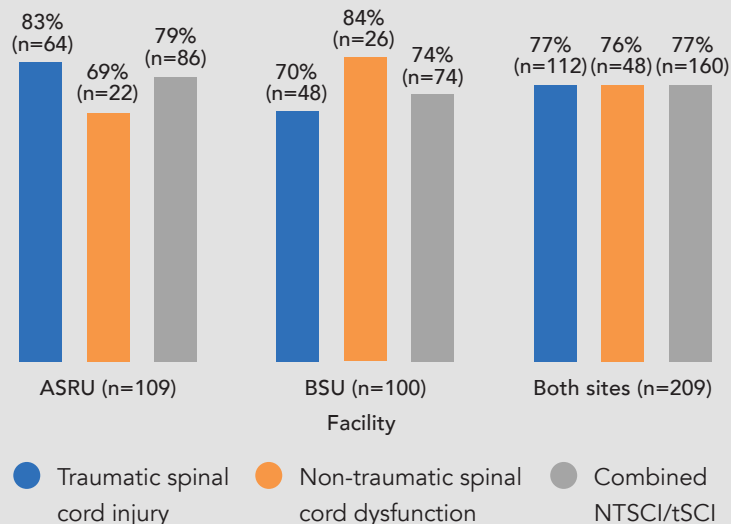
Discharge destinations (tSCI & NTSCI)



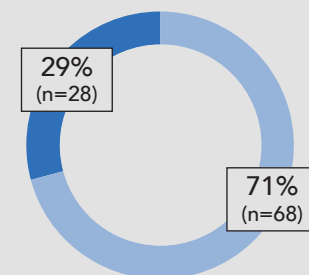
How many people have surgery and how many walk 100m on discharge?

Across both sites, rates of surgery in 2021 were comparable, independent of tSCI versus NTSCI cause (77% vs 76%). However, if we look at the sites independently, the rates of surgery for traumatic SCI are higher in the ASRU catchment compared with BSU (83% vs 70%). Conversely, the rates of surgery for NTSCI are higher in the BSU catchment than ASRU (84% vs 69%). On discharge, based on complete records of 137 participants (NTSCI and tSCI), 30% 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. There is only a marginal difference in rates of those walking independently on discharge between those with NTSCI and tSCI (32% vs 29%). These figures vary from last year which showed NTSCI at 48% and tSCI at 35%.

Surgery rates by site and SCI

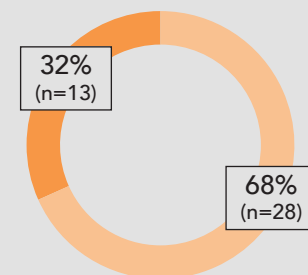


Mobility on rehab discharge Traumatic spinal cord injury (n=96)



- Independently walking
- Not independently walking

Mobility on rehab discharge Non-traumatic spinal cord dysfunction (n=41)



- 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. 73% of tSCI participants reported experiencing pain on rehabilitation discharge, whilst 79% of those with NTSCI reported pain on discharge, which showed increases from 2020 reports.

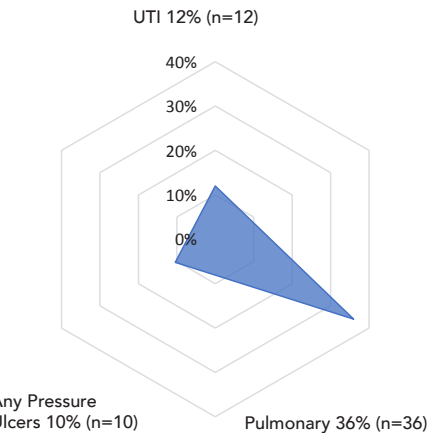
Urinary tract infections (UTI), treated with antibiotics, had a 14% incidence rate occurring during acute stay and a 39% incidence rate occurring during rehabilitation. Information is based on the records of 139 acute and 136 rehabilitation participants with complete UTI data.

Respiratory complications occurred in 30% of participants during the acute phase (tSCI 36%; NTSCI 15%), and 18% during rehabilitation (tSCI 16%; NTSCI 23%). Those with tSCI were much more likely to have acute respiratory complications compared to those with NTSCI (based on 141 acute records). Of these acute respiratory complications in tSCI, almost half (45%) were pneumonia. Obstructive sleep apnoea accounted for 37% of the rehabilitation respiratory complications reported for tSCI participants, whilst pneumonia rates dropped to 32% in rehab.

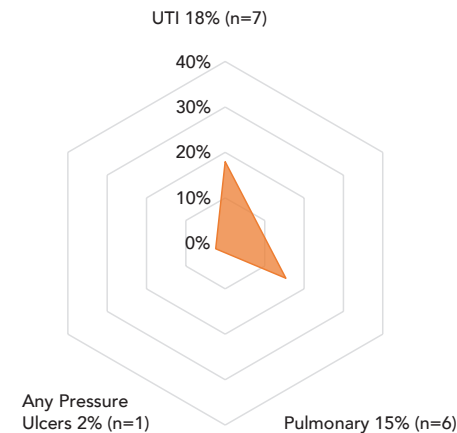
Pressure injuries occurred during acute care in 8% of cases, based on the records of 137 tSCI and NTSCI participants. Pressure injuries occurred during rehabilitation in 15% of cases, also based on the records of 137 participants. These numbers are lower than last year's 10% and 20%, respectively.

Pre-injury **co-morbidities** reported were similar between the traumatic and non-traumatic SCI participants. The most common co-morbidities were high blood pressure, followed by osteoarthritis, diabetes and depression.

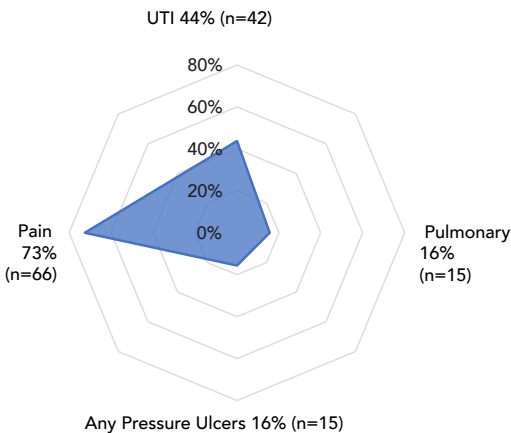
Traumatic SCI acute care complications



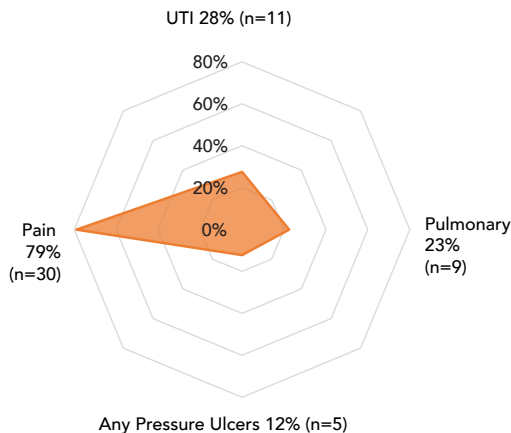
Non-traumatic SCI acute care complications



Traumatic SCI rehab complications



Non-traumatic SCI rehab complications



NZSCIR provides important information

This report represents the fifth 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.

With five calendar years now available, the NZSCIR plans to commission a five-year comparative report. After five years, the NZSCIR governance group is also reviewing the data points collected. This will help determine whether the right data continues to be collected and where adjustments can be made. This is an important step to ensure data gathered remains current and aligned with data collection by our international partner, the Praxis Institute.

Dashboards (as below) continue to be developed ensuring data can be visualised, cleaned and analysed to gain insights into NZ's SCI population. Dashboard data is also made available to clinicians at both Supra-Regional Spinal Services to further improvements at these services.

Other areas of focus for the NZSCIR in the coming year are to improve the focus on the Community follow-up data collection; to introduce a pathway that enables contribution of those with a SCI who have not been involved with a Supra-Regional Spinal Service to participate in the NZSCIR (as long as criteria for a SCI, as defined by the NZSCIR, is met); and to further its focus on its Te Ao Māori partnerships.



Denominators for report summaries

NZSCIR collects an expanded full data set for participants who consent (n=141, 67%) and a minimal data set for those whom consent was not gained (n=68, 33%). Consents were up slightly from 2020 (65%) due to COVID restrictions. During lockdown, participants were not approached for consent for the full data set. Participants were approached if still an inpatient once the lockdown lifted. 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 27 July 2022.



Data collected from 209 persons with new injuries between 1 January 2021 and 31 December 2021 (or those with a first NTSCI rehabilitation admission between these dates).

Number of participants represented in each data summary:

Traumatic SCI vs non-traumatic SCI: 209

Mechanism and cause of Injury: 209

Gender/ Ethnicity/ Age: 209

Pre-existing conditions: 140

Severity and level of injury: AIS 205 and level of injury 208

Surgical intervention rates: 209 (ASRU n=109; BSU n=100)

Walking in the community: 137

Length of stay: 209

Discharge destination: 209

Complications during acute care:

UTI: 139

Respiratory: 141

Pressure injuries: 137

Complications during rehabilitation:

Pain: 131

UTI: 136

Respiratory: 136

Pressure injuries: 137

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. 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. 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. Retrieved November 2021.
2. Ministry of Health HISO 10001:2017 Ethnicity Data Protocols. September 2017. Ministry of Health. www.health.govt.nz/publication/hiso-100012017-ethnicity-data-protocols. Retrieved May 2021.
3. Roberts, T. T., Leonard, G. R., & Cepela, D. J. (2017). Classifications In Brief: American Spinal Injury Association (ASIA) Impairment Scale. Clinical orthopaedics and related research, 475(5), 1499–1504. doi.org/10.1007/s11999-016-5133-4



NZSCIR is sponsored by the Accident Compensation Corporation and Te Whatu Ora Health NZ

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