

New Zealand Trauma Registry  
& National Trauma Network

# Annual Report

## 2021/22

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## Our Tohu

Designed by artist Jim Wiki (Te Aupōuri), the Tohu for the National Trauma Network is the pīwakawaka (fantail).

The pīwakawaka symbolises the guardian who stays with us during care and rehabilitation, and guides our patients and whānau through the spectrum of life and death. The main kōwhaiwhai in the body depicts the strength a person needs in dealing with injury while the wings convey the support of whānau. The two koru at the base of the tail feathers symbolise the joining of whānau and services. The weaving pattern in the middle tail feathers depicts the strength in binding together all parts of whānau and the trauma system.

# Foreword

This is the 7th annual report of the National Trauma Network and includes current statistics on major trauma in NZ.

As the report documents, major trauma incidence has now reverted to pre-COVID levels with overall numbers dropping slightly from the peak of last year. Overall case fatality rates have continued to fall and now represent 7.4% of patients admitted to hospital after major trauma. Decreases in the numbers of patients suffering major trauma have been seen in every age group except those in the paediatric range (0-14 years) where a significant spike has occurred on the background of small increases in the last few years. Inequity remains a significant feature of trauma presentations and outcomes with Māori males in particular having not only much higher incidences, particularly following road related incidents, but also variations in processes of care. Regional variation in process and outcome also exists, with geography and hospital configuration playing a role.

Quality improvement is based on ensuring unnecessary variation is limited and this report includes information on a number of significant quality improvement activities. Traumatic brain injury (TBI) is a major feature both of mortality and long term morbidity in major trauma patients. In various subgroups there is evidence of variations in care which may be contributing to less than optimal outcomes. A quality improvement initiative addressing processes of care for serious TBI patients is described in this report and has the potential to improve outcomes for this group of patients in coming years.

A more immediate benefit has been seen from a quality improvement activity addressing critical haemorrhage. Using a bundle of care approach, the percentage of patients dying from critical haemorrhage has halved in the past year with many such patients recovering with good outcomes.

All the information in this report is a collaborative effort of large number of people. This includes those providing clinical care and collecting data in (previously DHB) trauma hospitals, prehospital care providers on the ground and in the air, and those involved in rehabilitation. The Network is supported by the ACC, Waka Kotahi, the Ministry of Health and Te Whatu Ora. Delivery of the quality improvement projects and analysis of the data which allows this report is provided by the Health Quality and Safety Commission. Together, the National Trauma Network allows a coordinated approach to the delivery of care for the most severely injured trauma patients and drives improvements as described in this report.

**Ian Civil**  
National Clinical Director

**Siobhan Isles**  
National Programme Director

January 2023



# Executive Summary

This summary highlights the work covered in the three parts of this report: the activities of the New Zealand Trauma Registry, quality improvement priorities and developments in trauma networks.

## New Zealand Trauma Registry

Case fatality rate

**7.4%**

down from 8% last year



Deaths from haemorrhage

**5.6%**

down from 12.3% last year



Trauma calls

**52%**

down from 54% last year



Tertiary survey

**56%**

up from 50% last year



## Patients with serious traumatic brain injury

Definitive hospital first

**81%**

up from 80% last year



Managed in a neuroscience centre

**71%**

no change



Trauma call

**46%**

down from 48%



CT scan under 2 hours

**68%**

down from 71%





## Quality improvement priorities

Our quality improvement priorities were critical haemorrhage, serious traumatic brain injury (sTBI) and rehabilitation.

### Critical haemorrhage

The critical haemorrhage project published a bundle of care, which modified the massive haemorrhage protocol and introduced the 'Code Crimson' notification system. By the end of the year, 54% of hospitals had put the protocol in place and a further 13% were in final stages of implementation. The remainder were in planning phase.

Deaths from critical haemorrhage fell to 5.6%.

### sTBI

Engagement with a range of clinicians and managers found broad agreement that a defined cohort of sTBI patients should be treated in a neuroscience centre to benefit from the multidisciplinary expertise of clinicians who manage these patients often. With this change to the transfer policy, more sTBI patients will be managed in a neuroscience centre in the future.

Screening for post-traumatic amnesia (PTA) was introduced as a new data item in the New Zealand Trauma Registry. Collaboratives are planned to increase assessment of trauma patients for PTA.

Measures of processes of care such as time to CT, trauma call on arrival, and providing definitive care in a neuroscience centre are yet to improve.

### Rehabilitation

Nine collaboratives have been successfully completed and their results published. These collaboratives focused on TBI, care coordination and patient experience and most have resulted in measurable improvements. Several initiatives were identified for national roll-out.



Photo: Stuff Ltd

## Trauma networks

### Governance

Governance arrangements have matured, with the focus of the Governance Group now aligned to Te Whatu Ora | Health New Zealand and Te Aka Whai Ora | Māori Health Authority.

The Northern, Midland and Central regional trauma networks have continued to strengthen and deliver key work focused on regional issues. The South Island network has been dissolved although individual hospitals have undertaken important initiatives.

### Service excellence

Christchurch Hospital, as the country's largest trauma service, began admitting trauma service.

The National Trauma Research and Audit Committee was established.

Trauma Team Training was delivered in more sites and funding was secured for a third course in each acute hospital.

The National Trauma Network has published a report on Māori experience of trauma. It has also developed and published simple guidance for trauma services to better support their Māori patients.

### Enablers

The New Zealand Trauma Registry has performed well.

Patient-reported outcome measures from the 6-month and 12-month surveys have been completed and analysed.

Trauma nurse workforce resources have improved in several hospitals. However, the ratio of resources to caseload varies widely across the country. The first nationwide forum for allied health clinicians was held.

### Research and analytics

Members of the National Trauma Network have published findings from four significant studies.

- The Study of Road Trauma Evidence and Data (SORTED) provides accurate and comprehensive injury data and has been included in the Road to Zero action plan.
- A study of disability-adjusted life years of major trauma patients showed a 12% reduction in the cost of health loss per case over the past three years.
- A comparison of sTBI patterns of injury and outcomes in Norway and New Zealand showed New Zealand has higher case fatality rates, particularly for those in the paediatric and elderly groups.
- A study of the prevalence of psychoactive drugs in an emergency department detected at least one drug in nearly six out of ten patients. The drugs most commonly detected were cannabis, alcohol, anti-depressants and methamphetamine.



# Cooper's story

Four-year old Cooper was at a friend's birthday party at their house in Glen Murray, where the children were riding junior motorbikes. Another rider clipped the wheels of Cooper's motorbike, and the handlebar was pushed into Cooper's back. Cooper's parents drove him to the nearest health facility 40 minutes away because ambulance support was not an immediate option, and after six hours and two more transfers, Cooper arrived at Starship Hospital.

A scan showed extensive internal bleeding. Cooper needed four units of donated blood on the day of the incident due to a serious (Grade 5) injury to his left kidney. At first, his kidney damage was treated non-operatively. However, because of the major internal bleeding, staff decided on surgery to place a stent and a wider catheter to help remove the blood and clots from the damaged kidney. After 18 days in hospital, he was discharged home. Three months later, a follow-up operation to remove the stent confirmed that the left kidney was no longer functioning.

The emotional and financial toll on Cooper's family has been immense. At the time of injury they went into survival mode to get Cooper to medical care. As soon as they got in the first ambulance, the paramedics took over and everything fell into place. Cooper's mother stayed at Starship while his father drove an hour from home each day to visit because they lived just within the funding boundary so did not qualify for the 'out of town' financial support. Their business had to stop for a time while they cared for Cooper and their one-year-old had to move in with his grandparents. While Cooper's parents were fortunate to have the support of extended family and friends, the emotion is still raw today.

Cooper has just started school. Although he is an otherwise well and healthy child, he has been advised not to play contact sports. His parents are slowly picking up the pieces of their lives but will be forever grateful for the compassion and support they have received from the ambulance and Starship staff as well as from their family and friends during this extremely tough time.



- ▶ Patterns of injury
- ▶ Outcomes
- ▶ Processes of care

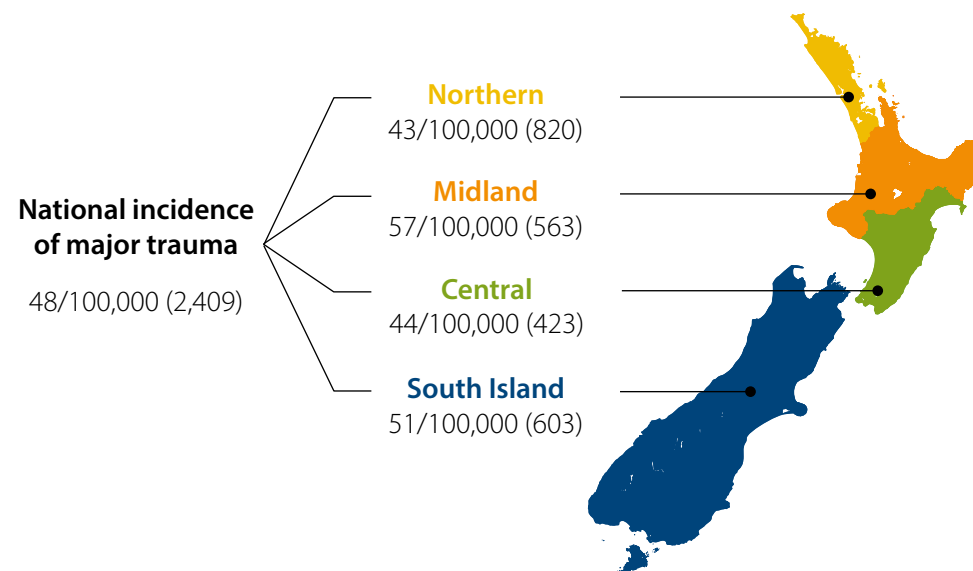
# Part 1: New Zealand Trauma Registry (NZTR) report

## Patterns of injury

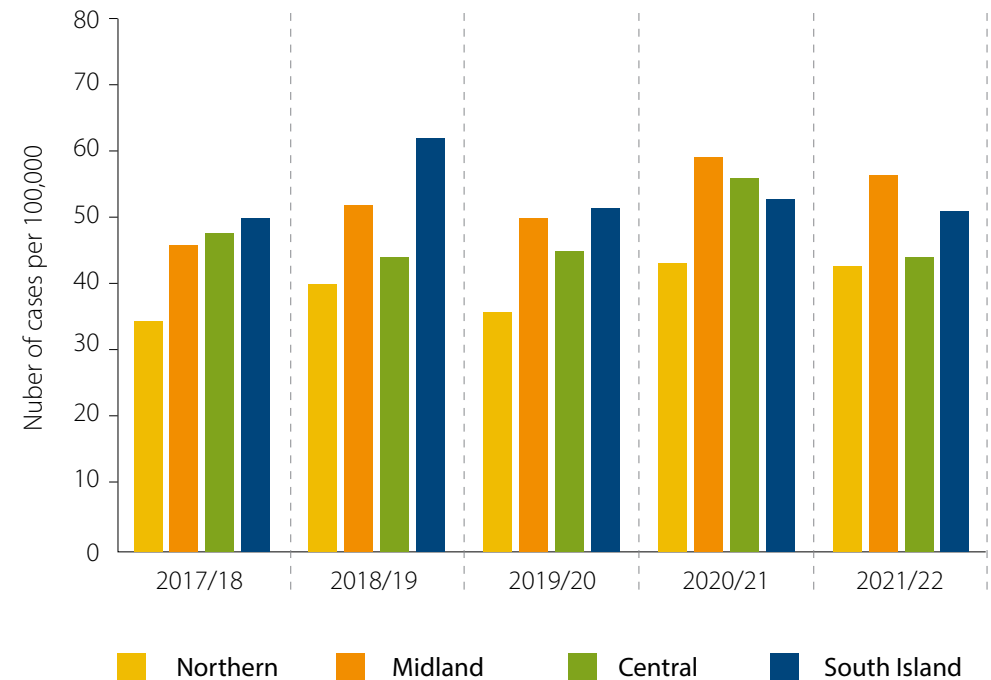
### Incidence

In 2021/22 Aotearoa New Zealand had 2,409 major trauma cases, a decrease of 5% from the previous year and an increase of 2% from the last pre-COVID year, 2018/19. The Central Region saw the greatest decrease in incidence rates, from 56 per 100,000 people last year to 44 per 100,000 people.

Incidence rate (caseload) of major trauma per 100,000 people by region, 2020/21












Incidence rate of major trauma per 100,000 people by region, 2017/18–2021/22





- ▶ Patterns of injury
- ▶ Outcomes
- ▶ Processes of care

### Number (percent) of major trauma cases by mechanism of injury and region, 2021/22

	Number and percentage of injuries								
	 Falls	 Struck by/ collision with object or person	 Other	 All Transport	 Car	 Motorcycle	 Pedal cycle	 Pedestrian	 Quad bike/ other
Northern	272 (33%)	89 (11%)	91 (11%)	368 (45%)	154 (19%)	123 (15%)	39 (5%)	41 (5%)	11 (1%)
Midland	161 (29%)	46 (8%)	52 (9%)	304 (54%)	147 (26%)	76 (13%)	45 (8%)	15 (3%)	21 (4%)
Central	129 (30%)	39 (9%)	47 (11%)	208 (49%)	81 (19%)	53 (13%)	41 (10%)	16 (4%)	17 (4%)
South Island	217 (36%)	27 (4%)	77 (13%)	282 (47%)	118 (20%)	62 (10%)	67 (11%)	16 (3%)	19 (3%)
National	780 (32%)	201 (8%)	267 (11%)	1,162 (48%)	500 (21%)	314 (13%)	192 (8%)	88 (4%)	68 (3%)

### Patterns of injury

The raw number of transport injuries has fallen. As a proportion, transport injuries have also fallen from 52% in 2019/20, to 50% in 2020/21 and 48% in 2021/22. Compared with last year, the proportion of incidents caused by falls has remained the same, while struck by/collision with person or object injuries have increased slightly.

- ▶ Patterns of injury
- ▶ Outcomes
- ▶ Processes of care

## Gender, injury severity score (ISS), type of injury, and injury intent

Almost three-quarters (72%) of major trauma cases were male, consistent with gender patterns over previous years. Injuries inflicted by others were 15% higher than last year and 33% higher than in 2019/20.

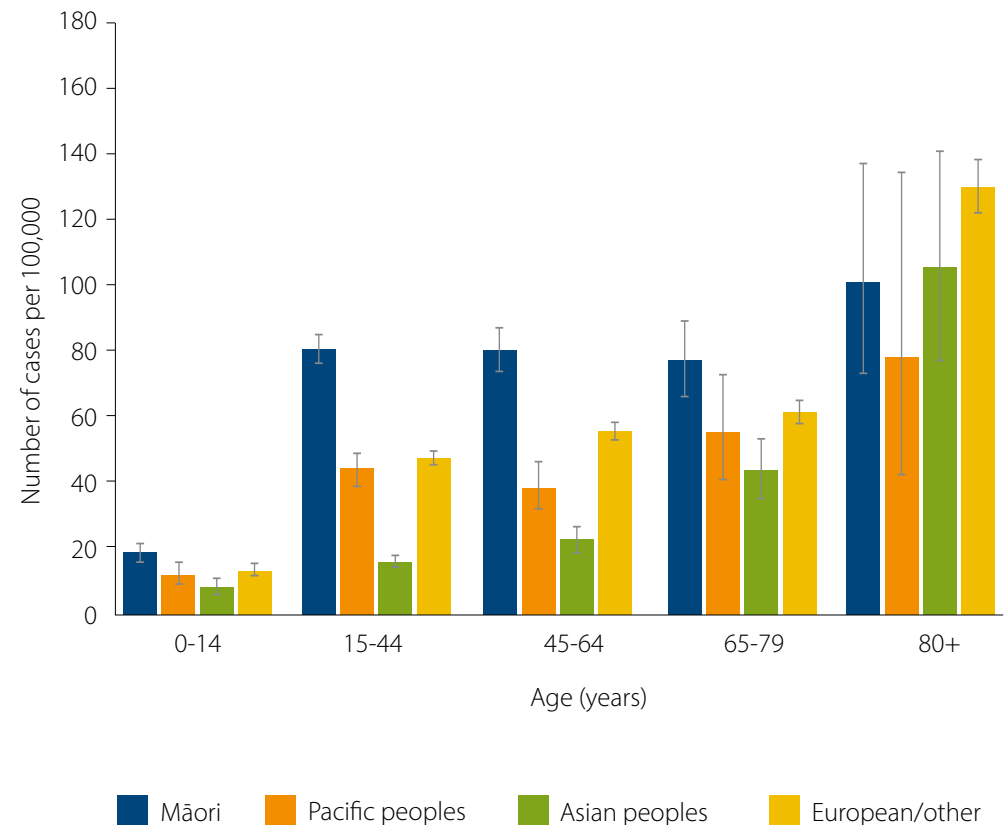
### Number (percent) of major trauma incidents by gender, injury intent, type of injury, and injury severity score, 2019/20–2021/22

	2019/20 N = 2,188	2020/21 N = 2,544	2021/22 N = 2,410
<b>Gender</b>			
Female	615 (28%)	696 (27%)	669 (28%)
Male	1,573 (72%)	1,848 (73%)	1,741 (72%)
<b>Intent</b>			
By other	172 (8%)	200 (8%)	230 (10%)
Self-inflicted	48 (2%)	66 (3%)	58 (2%)
Unintentional	1,954 (89%)	2,246 (88%)	2,076 (86%)
Unknown	14 (1%)	32 (1%)	46 (2%)
<b>Type</b>			
Blunt	2,068 (94%)	2,420 (95%)	2,296 (95%)
Burns	40 (2%)	21 (1%)	25 (1%)
Penetrating	80 (4%)	103 (4%)	89 (4%)
<b>Injury severity score</b>			
13–24	1,623 (74%)	1,946 (76%)	1,778 (74%)
25–44	521 (24%)	561 (22%)	593 (25%)
45+	44 (2%)	37 (1%)	39 (2%)

## Ethnicity and age

Incidence rates of major trauma per 100,000 people generally increase with age, although the rates for Māori are similar across age groups from 15–44 years to 65–79 years.

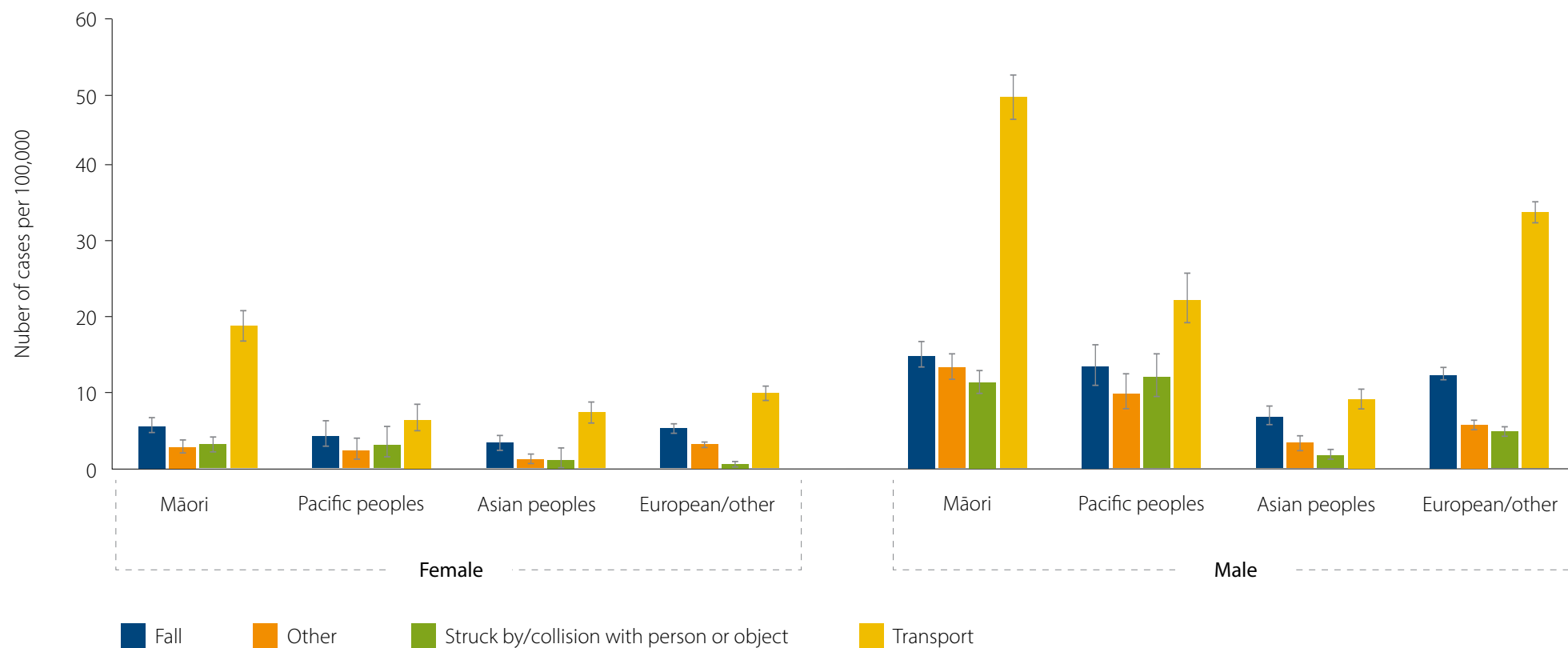
### Annual major trauma incidence rate per 100,000 people by age group and ethnicity, 2017/18–2021/22



- ▶ Patterns of injury
- ▶ Outcomes
- ▶ Processes of care

The age-standardised incidence rate of trauma caused by transport for Māori males was 50 per 100,000 people, double the overall transport incidence rate. Māori males were also disproportionately affected by trauma involving the other mechanisms of injury.

**Age-standardised rates of major trauma per 100,000 people by gender, ethnicity, and mechanism of injury, 2017/18–2021/22**



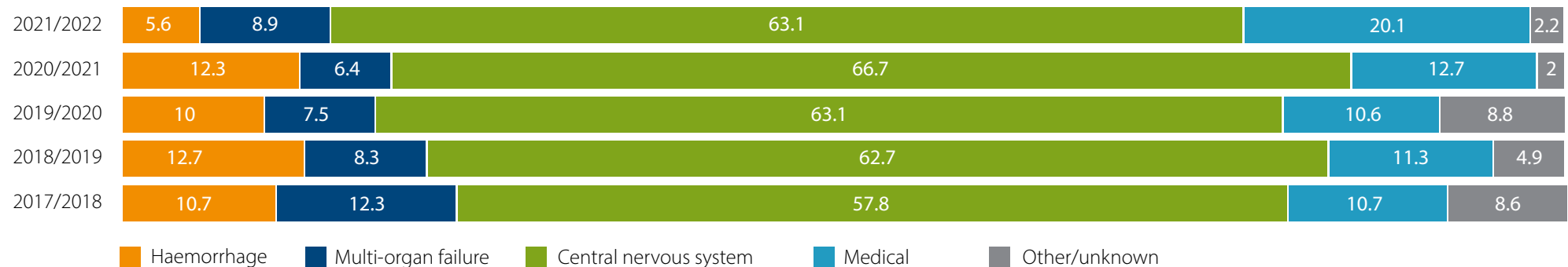
We must continue to improve our understanding of the risk factors that cause variation in trauma rates between gender and ethnic groups, with the aim of reducing these rates.

- ▶ Patterns of injury
- ▶ Outcomes
- ▶ Processes of care

## Outcomes

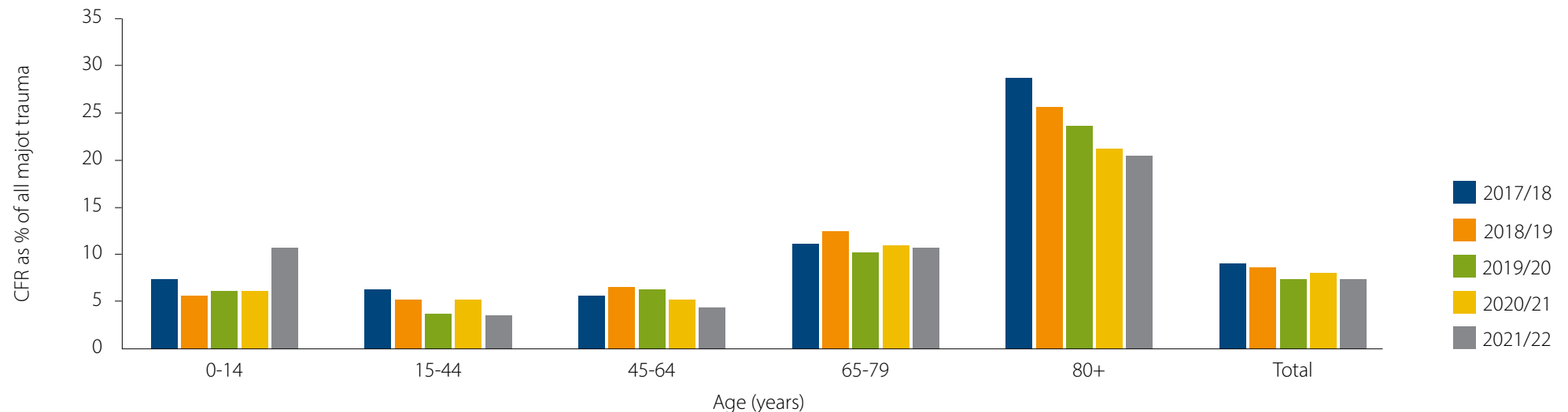
This year 179 people died from major trauma and the case fatality rate (CFR) was 7.4%. The proportion of deaths caused by haemorrhage has significantly decreased (from 12.3% of deaths in 2020/21 to 5.6% in 2021/22, two-proportion test,  $p = 0.019$ ) and is currently at its lowest since the nationally complete registry began (discussed further under 'Critical haemorrhage' in Part 2). This decrease has occurred alongside an increase in the proportion of medical deaths (from 12.7% of all deaths in 2020/21 to 20.1% in 2021/22) and multiple-organ failure deaths (from 6.4% of all deaths in 2020/21 to 8.9% in 2021/22).

### Percent of deaths by cause, 2017/18–2021/22



Despite the high incidence rate for the population aged 80+ years, the CFR has declined steadily in this group over the last five years. At the same time, the CFR in the group aged 0–14 years has nearly doubled. Although numbers are very small, the data shows this increase is largely due to intentional injury.

### Case fatality rate by age group, 2017/18–2021/22

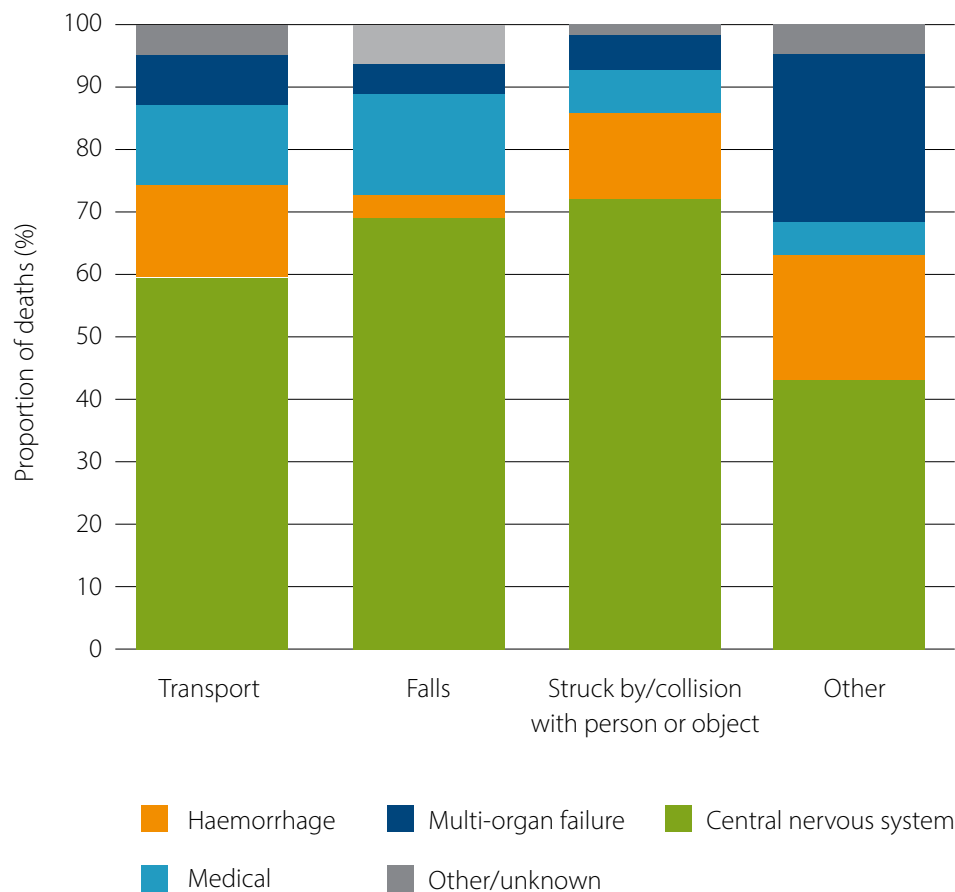




- ▶ Patterns of injury
- ▶ Outcomes
- ▶ Processes of care

Across all mechanisms of injury, the majority of deaths were attributed to CNS. Deaths due to haemorrhage featured in transport, or following a strike by or collision with a person or object, or other causes, but less so in falls.

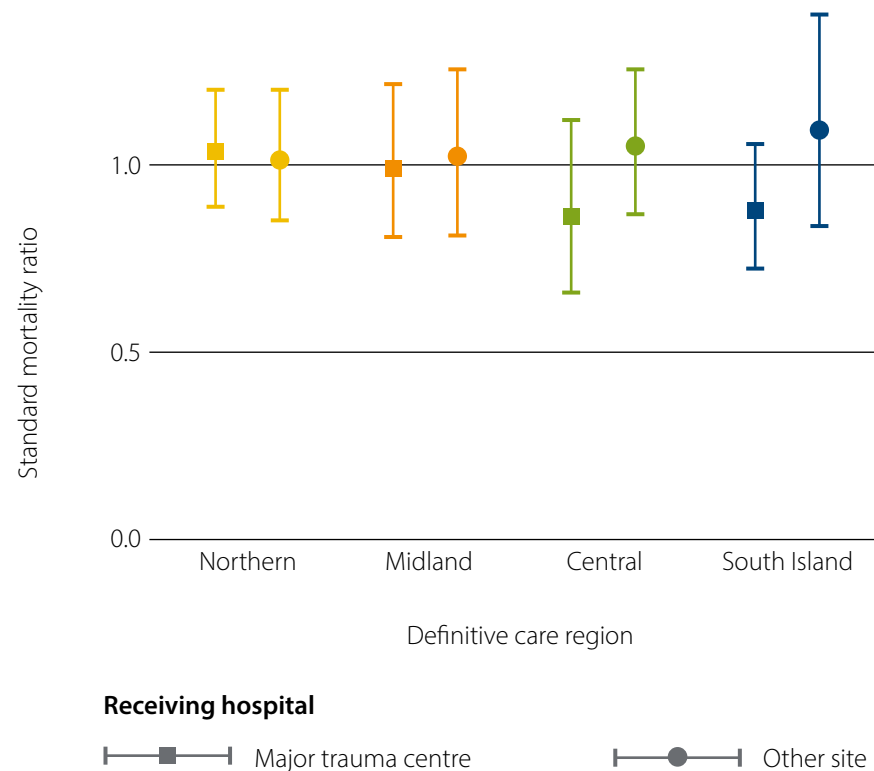
**Proportion of deaths by type of death and mechanism of injury, 2017/18–2021/22**



**Risk adjusted mortality**

This year we have presented the standardised mortality ratio by region. This view emphasises the systems at play in trauma care, which are wider than individual hospitals. All regions have similar outcomes for mortality. For patients who are first cared for in a major trauma centre, their outcomes are the same or better on average than patients arriving at other facilities. Some differences are apparent in the Central and South Island regions, although none of the differences are statistically significant, indicating there is more variation within these groups than between them. However, it may be worth further exploring why these differences occur to better understand differences in process that may exist between regions.

**Standardised mortality ratio by region and type of receiving hospital, 2017/18 – 2021/22**



- ▶ Patterns of injury
- ▶ Outcomes
- ▶ Processes of care



- ▶ Patterns of injury
- ▶ Outcomes
- ▶ Processes of care

## Processes of care

### Direct transport to definitive care hospital

Ideally, patients would be transferred from the scene of injury directly to the hospital that is able to provide definitive care. In some situations, however, this does not occur because geography makes it difficult, the patient has time-critical injuries or the nature of their injuries is not diagnosed. As a result, some patients are first transported to a nearby hospital and only later transferred for definitive care.

This year, 81% of major trauma patients were transported directly to their definitive care hospital, a proportion consistent with previous years. In the Northern and Central regions, the proportion of patients transported direct to definitive care increased. Across regions, among patients that were transferred, the median time to definitive care was 11 hours, but this time varies between regions.

### Percentage of patients who were directly transported to definitive care, 2017/18–2021/22

Region	2017/18	2018/19	2019/20	2020/21	2021/22
Northern	73%	76%	74%	77%	78%
Midland	82%	78%	81%	80%	81%
Central	79%	82%	78%	81%	83%
South Island	84%	87%	82%	84%	84%
National	79%	81%	79%	80%	81%

### Median time (hours) from incident to arrival at definitive care, 2021/22

Region	Direct from scene	With transfer
Northern	1.5	11.0
Midland	1.8	9.2
Central	1.5	15.2
South Island	1.9	15.7
National	1.7	11.2



- ▶ Patterns of injury
- ▶ Outcomes
- ▶ Processes of care

## Trauma call on arrival

A hospital trauma call is a systematic response to an incoming or recently arrived patient who is recognised as having serious or complex trauma. It is a feature of contemporary trauma systems that mobilises more clinicians to the Emergency Department. Just over half (52%) of major trauma patients received a trauma call on arrival at their first care facility, a decrease from 54% in 2020/21. The proportion of trauma calls increases for patients with higher ISS. Across the country, the arrival of a patient with an ISS of 45 or greater prompted a trauma call 90% of the time.

Trauma team activation reduced the time between the patient's arrival at hospital and receiving a CT scan. Median time until index CT was halved when a trauma call had been made (57 minutes with a trauma call compared with 118 minutes without). The difference is greatest in larger tertiary hospitals, emphasising the importance of activating trauma calls in all centres.

### Percentage of patients with a trauma call by size of hospital, 2021/22

Size of hospital	Percent of patients
Small secondary	34%
Medium/large secondary	45%
Tertiary	61%
<b>National</b>	<b>52%</b>

### Median time until index CT scan with and without a trauma call, 2021/22

Size of hospital	Without trauma call (minutes)	With trauma call (minutes)	Difference
Small secondary	98	80	-18%
Medium/large secondary	101	59	-42%
Tertiary	143	55	-62%
<b>National</b>	<b>118</b>	<b>57</b>	<b>-52%</b>

### Percentage of patients with a trauma call by ISS, 2019/20–2021/22

	ISS category	Percentage with trauma call
National	13–24	49%
	25–44	61%
	45+	90%

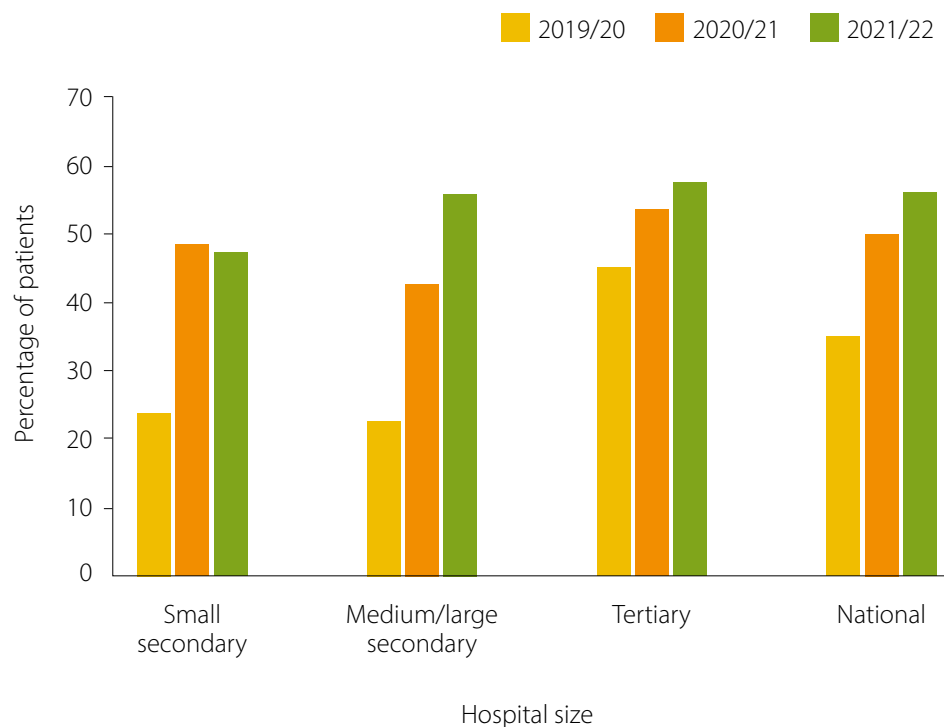


- ▶ Patterns of injury
- ▶ Outcomes
- ▶ Processes of care

## Tertiary survey

Tertiary surveys are conducted to identify injuries that earlier evaluations may have missed. Although only a little over half (56%) of major trauma patients received a tertiary survey in 2021/22, this proportion has increased steadily since tertiary survey data collection began in 2019/20.

### Percentage of patients with a tertiary survey by size of hospital, 2019/20–2021/22



## Blood alcohol collected on arrival

Blood alcohol levels inform epidemiology of major trauma. In major trauma patients aged 15 years and over, 65% had their blood alcohol collected at their first hospital. Incidents involving transport were collected at the highest rate (78%) and falls at the lowest rate (46%). The percentage also varies considerably by region. Such variation indicates staff made judgements as to whether or not to measure blood alcohol levels.

### Percentage of patients with blood alcohol concentration recorded at first hospital by age and region, 2021/22

Age group (years)	Northern	Midland	Central	South Island	National
15–44	89%	73%	78%	74%	79%
45–64	83%	65%	69%	62%	71%
65–79	67%	57%	49%	44%	54%
80+	40%	41%	29%	18%	33%
<b>Total</b>	<b>74%</b>	<b>62%</b>	<b>63%</b>	<b>55%</b>	<b>65%</b>

### Percentage of patients with blood alcohol concentration recorded at first hospital by mechanism of injury, 2021/22

Mechanism	Northern	Midland	Central	South Island	National
Transport	89%	74%	77%	71%	78%
Fall	60%	45%	42%	32%	46%
Struck by/collision with person or object	81%	51%	71%	48%	66%
Other	82%	69%	63%	70%	72%

- ▶ Patterns of injury
- ▶ Outcomes
- ▶ Processes of care



Photo: Stuff Ltd



- ▶ Critical haemorrhage
- ▶ STBI
- ▶ Rehabilitation

## Part 2: Quality improvement priorities

Critical haemorrhage, serious traumatic brain injury (sTBI) and rehabilitation were three priorities to focus on in the Strategic Plan 2017/18–2022/23. With our partners at the Health Quality & Safety Commission, we report on progress in each of these areas.

### Critical haemorrhage

All patients who present to hospital with critical haemorrhage should survive. Dr Kerry Gunn led the critical haemorrhage project with the aim of eliminating avoidable deaths.

The project developed a bundle of care that focused on modifying the massive haemorrhage protocol and introduced a 'Code Crimson' notification system. Through this system, critical decision-makers were made aware of the arrival of a patient with critical haemorrhage. They could then attend the emergency department and rapidly determine what actions should happen to effectively stop the haemorrhage and to put in place appropriate resuscitative strategies.

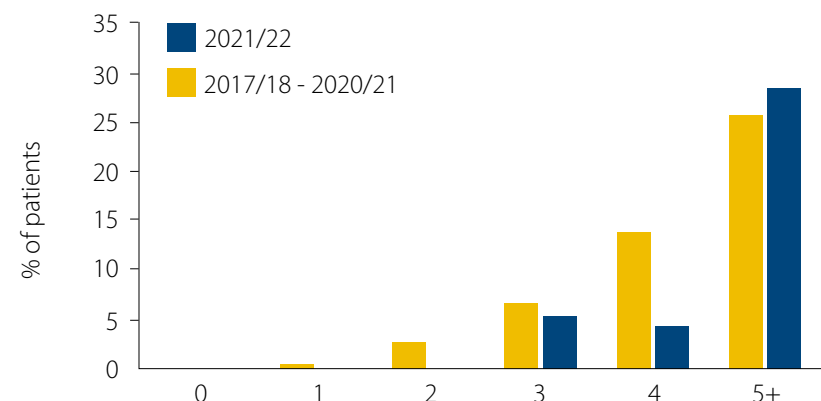
Clinicians in each hospital have worked towards implementing the bundle of care. The 12-month site survey indicated 54% of hospitals had a formalised activation protocol and another 13% were in the final stages of implementation. The remaining 33% were in the early planning stage. All sites had a massive transfusion protocol in place, which for many involved adjusting existing protocols to enhance and standardise local processes. Teams also maintained their skills by undertaking simulation training through the Trauma Team Training course.

As a result of this activity, haemorrhage death rates fell to 5.6% this year.

To stratify the caseload so that we could establish whether those with critical haemorrhage in other years were any more or less likely to die from haemorrhage, we developed the haemorrhage risk index (HRI) using a combination of anatomical injury and physiological markers. In previous years, about two-thirds of patients with major trauma had an HRI score of 0, meaning they had almost no risk of death from haemorrhage. This proportion was similar in the 2021/22 year, as was the proportion of patients at each score along the HRI, indicating that the proportion of patients at risk of death from haemorrhage in 2021/22 was not lower than in previous years. This analysis showed that

caseload differences from year to year could not explain the drop in death rates: fewer patients with higher HRI scores died from haemorrhage in 2021/22 than in previous years, and no marked shift to other causes of death occurred this year.

#### Percentage of caseload who died from haemorrhage by haemorrhage risk index score, 2021/22 compared with 2017/18–2020/21



Because New Zealand has a low number of haemorrhage deaths from major trauma overall, we will need to see a downward trend over several years to be confident that service improvements are effectively preventing avoidable death from haemorrhage.

- ▶ Critical haemorrhage
- ▶ STBI
- ▶ Rehabilitation

## Serious traumatic brain injury

Just over 30% of the major trauma caseload have sTBI and the consequences can be long-lasting and significant for individuals and their whānau. To address this priority area, we established two workstreams – sTBI acute care and sTBI rehabilitation – led by intensivist Dr David Knight.

### sTBI acute care

Most patients with sTBI should be treated in a tertiary hospital that has a neuroscience capability. Whether or not a patient with sTBI needs neurosurgery, admitting them to a neuroscience centre provides them with access to care from a multidisciplinary team who manages complex patients with neuropathology frequently.

We have developed a new transfer guidance that major trauma patients with a Glasgow Coma Scale (GCS) score of less than 9 and an abnormal CT should be transferred to a neuroscience centre. This policy excludes patients with non-survivable brain injuries. In addition, where patients have extracranial injuries requiring immediate management, they should receive that in the closest trauma hospital in the first instance.

In preparing to implement this policy, the quality improvement team visited all neuroscience centres and established broad agreement that the defined group of sTBI patients should be treated in these centres no matter whether they needed neurosurgery or not. The team also visited non-neuroscience centres to identify current issues, describe our proposed solution and review local barriers to adopting the acute sTBI guidance.

A national guidance document has been written and distributed to trauma teams across New Zealand for consultation. Case reviews of patients who are not transferred to neuroscience centres even though they meet the policy criteria will help us to identify further opportunities for improvement.

### Assessing acute sTBI

To be classified as having sTBI, patients must have a head injury with severity of 3 or higher on the Abbreviated Injury Scale (AIS). Isolated sTBI cases have only a serious injury to the head, while complex sTBI patients have an injury to another body region with AIS severity of 3 or higher as well as their head injury. The AIS score is used to calculate the injury severity score (ISS), which is a derived score. The higher the ISS, the greater the risk to life.

AIS scoring is the most accurate tool to assess the severity of anatomical injury. It is based on diagnostic imaging, however, which makes it more difficult to use to assess potential sTBI before a patient reaches hospital and in early hospital treatment. In such cases, the GCS is used to assess patient consciousness using motor, verbal and eye-opening responses. The scale ranges from entirely unresponsive (3) to normal responses (15). Typically, the GCS will be lower when a patient has experienced a head injury, is in shock or has another reason for impaired cognition such as alcohol or drug use.

sTBI patients were significantly more likely to have cognitive impairment at the scene of injury than other patients. However, almost half of patients with sTBI had minimal impairment in consciousness at scene (49% GCS 14-15). By contrast, 12% of patients without sTBI had impaired consciousness at scene (GCS 3-13).

### Percentage of patients showing pre-hospital impaired consciousness by sTBI type, 2017/18–2021/22

sTBI group	GCS < 14	GCS < 9
All sTBI	51%	27%
Complex sTBI	58%	37%
Isolated sTBI	47%	22%
No sTBI	12%	4%

These results demonstrate the challenge involved in identifying sTBI patients before they reach a hospital.



- ▶ Critical haemorrhage
- ▶ STBI
- ▶ Rehabilitation

## Characteristics

Although they have similar injury severity, patients with isolated sTBI had a case fatality rate more than three times (12.9%) that of patients with no sTBI (3.9%). This difference highlights how much having sTBI increases risk to life. The case fatality rate was even higher for patients with complex sTBI (14.9%), although they also tended to have a higher ISS (median 29 compared with 17 for isolated sTBI and non-sTBI patients).

### Characteristics of sTBI injuries, 2021/22

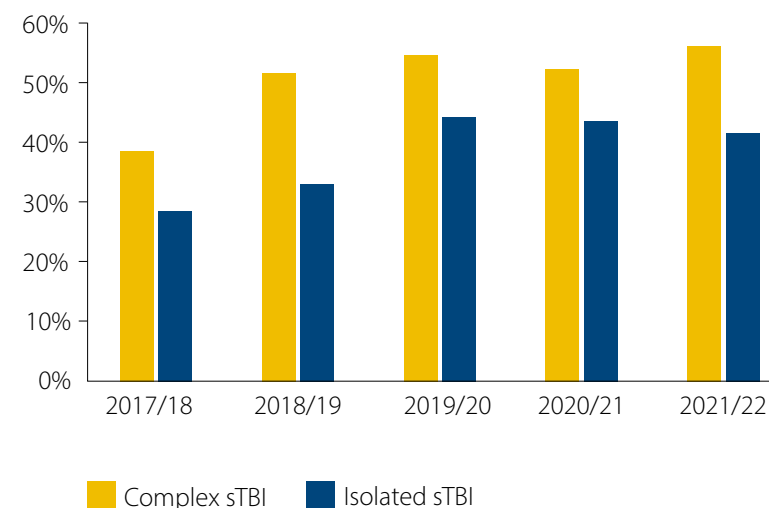
	Complex sTBI	Isolated sTBI	No sTBI
Caseload (%)	248 (10%)	618 (26%)	1,544 (64%)
Median (mean) age	46 (46)	51 (50)	50 (49)
Case fatality rate	14.9%	12.9%	3.9%
Median (mean) ISS	29 (29.8)	17 (20.1)	17 (18.8)
Neuroscience centre for definitive care	73%	70%	N/A
Trauma call on arrival	75%	34%	56%
Median minutes until index CT	59.5	80	78
Less than 2 hours until CT	79%	64%	63%

## Processes of care

### Scene

For sTBI cases involving severe cognitive impairment, the proportion who were intubated pre-hospital has gradually increased since 2017/18. This year, 57% of complex sTBI and 42% of isolated cases were intubated before they reached hospital.

### Proportion of sTBI cases with a GCS score less than 9 who were intubated pre-hospital, 2017/18–2021/22



- ▶ Critical haemorrhage
- ▶ STBI
- ▶ Rehabilitation



## Hospital care

Patients with sTBI benefit from the bundle of care commonly available in neuroscience centres, whether or not they need neurosurgical intervention. Ideally therefore, most sTBI patients would receive care in these centres and have access to specialised nursing and allied health resources. This year, 75% of complex sTBI and 72% of isolated sTBI patients were transported to a neuroscience centre. Conversely, 25% of complex sTBI and 28% of isolated sTBI patients received care in a non-neuroscience hospital that is unlikely to have the nursing and allied health resources familiar with managing sTBI patients.

The proportion of patients with sTBIs receiving definitive care at neuroscience centres remained the same as last year. However, changes occurred in relation to ethnicity. Pacific peoples with sTBI were less likely to have definitive care at a neuroscience centre compared with other ethnicities, following a trend of a steadily declining proportion over the last four years. Pacific and Māori peoples were also least likely to go to a neuroscience centre as their first hospital, with the result that – if they were transferred – the time before they arrived at the centre for definitive care was much longer than for other ethnic groups. This year, overall only 50% of patients with sTBI were transported directly to a neuroscience centre, and that percentage fell to only 36% for Pacific peoples and 44% for Māori.

### Percentage of patients with sTBI at a neuroscience centre as their first hospital and definitive care hospital by ethnicity, 2021/22

Ethnicity	Direct to neuroscience centre	Neuroscience centre for definitive care
Māori	44%	74%
Pacific peoples	36%	61%
Asian peoples	66%	79%
European/other	53%	70%
<b>Total</b>	<b>50%</b>	<b>71%</b>

- ▶ Critical haemorrhage
- ▶ STBI
- ▶ Rehabilitation

## Arrival at hospital

The initiation of a trauma call when a major trauma patient arrives at the first hospital decreases the time before they receive an index CT, from which it is possible to make brain injury diagnoses. Cases with isolated sTBIs had the lowest proportion of trauma calls on arrival, at 34%, while 75% of cases with complex sTBIs initiated a trauma call.

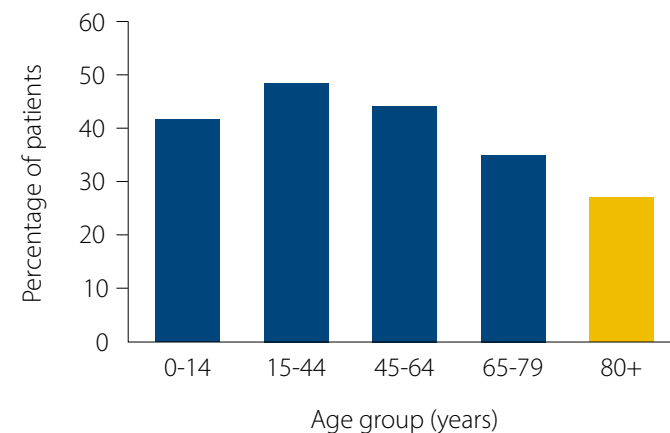
Patients with impaired consciousness had a shorter median time between arrival at the hospital to index CT. This year, cases with complex sTBIs had the shortest median time to index CT (59.5 minutes), while the time for patients with isolated sTBI to index CT (80 minutes) was similar to non-sTBI cases (78 minutes).

Over half of people aged over 80 years who were involved in major trauma had an sTBI. Despite this, elderly people had much lower rates of impaired consciousness: only 27% of patients aged over 80 years with an sTBI had a GCS less than 15, which is the lowest proportion of all age groups. While it is recognised that older people with sTBIs often have normal GCS, GCS remains the main tool for assessing head injuries and making CT scans happen more quickly. Indeed, compared with other age groups people over 65 years had to wait longer for their index CT, and those over 80 years had to wait the longest. Considering the increased risk to life associated with sTBI, there is room for improvement in early recognition of severe head injuries. Mechanism of injury should be considered alongside GCS to assess the potential of head injury.

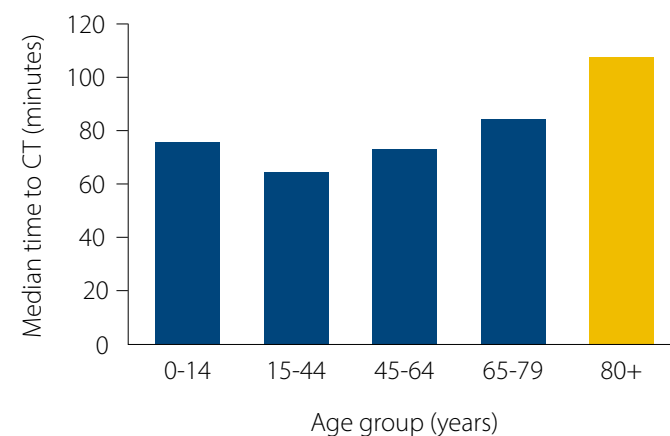
## Median time to index CT by level of cognitive impairment, 2017/18–2021/22

Scene GCS indicates:	Median time to CT
Impaired consciousness	52
No impaired consciousness	82

## Percentage of patients with impaired consciousness at scene (GCS < 14) by age group, 2017/18–2021/22



## Median minutes until index CT by age group, 2017/18–2021/22



- ▶ Critical haemorrhage
- ▶ STBI
- ▶ Rehabilitation

## sTBI rehabilitation

All people admitted to hospital following major trauma should be assessed for post-traumatic amnesia (PTA) before they are discharged. The length of PTA is a predictor of impaired functional outcome and indicates the type of rehabilitation a person will require in their recovery.

New Zealand hospitals vary in their practice of who they assess for the presence of TBI following trauma, whether they make these assessments during weekends and the accuracy of these assessments. When surveyed, 35% of trauma services estimated that patients were frequently discharged home without an appropriate TBI assessment. If a diagnosis of PTA is missed while a person is in hospital, it is more difficult for that person to receive the rehabilitation they need. This can lead to delays in their functional recovery, as well as impacting their return to work and their overall quality of life.



## Opportunities for improvement

The analysis points to the following opportunities to improve the processes of care for sTBI patients.

### Pre-hospital

The increasing proportion of patients intubated before they reach hospital is a positive sign and further increase is desirable. While noting that identifying sTBI patients in the pre-hospital environment is challenging, we are looking for more patients with actual or suspected sTBI to be transported directly to a neuroscience centre, where safe and feasible.

### Referral hospital

Before the health reforms, the health service with district health board boundaries created many barriers to transferring patients between hospitals. Among these barriers were population-based funding and the process for funding inter-district flow and tertiary care. With the national health service that the reforms have created, these kinds of barriers should diminish, allowing improvement work to focus on the clinical barriers instead. In this context, the goals are for a neuroscience centre to undertake most of the early clinical work and CT scans to recognise sTBI patients and how they can benefit from the journey of care, and trauma services can lead these improvements.

### Neuroscience centre

To date, no evaluation has been made of the quality of care within neuroscience centres or the variation between them. The current goal is to get the right patients to the right hospitals. Future work will look at the processes and outcomes within neuroscience centres and make comparisons both within New Zealand and with international jurisdictions.



- ▶ Critical haemorrhage
- ▶ STBI
- ▶ Rehabilitation



- ▶ Critical haemorrhage
- ▶ STBI
- ▶ Rehabilitation

## Rehabilitation

Screening for PTA is a simple process and is essential to identify those patients who may benefit from specialised rehabilitation services. Whether a PTA screen has been done or not is now included on the national minimum dataset for trauma, and it is desirable to screen all major trauma patients for the presence of a brain injury. Planning has begun for collaboratives to implement PTA screening in trauma hospitals.

Rehabilitation is a priority because it is an important way for trauma patients to achieve functional independence and to understand the long-term outcomes after they are discharged from hospital. Taking a collaborative approach, nine multidisciplinary teams focused on their chosen service issues to find local solutions. All collaborative projects involved consumer input and had a strong equity approach.

The following are highlights from the four collaboratives that focused on rehabilitation.

- **Whangarei:** The collaborative resulted in the completion rate for Accident Compensation Corporation (ACC) Early Cover improved from 0% to 68%. As a result, ACC became aware of major trauma patients early during their time in hospital, which triggered an escalated rehabilitation process with an assigned recovery coordinator.
- **Palmerston North:** The collaborative developed and implemented a major trauma rehabilitation pathway, involving extensive allied health assessment before discharge from hospital. This resulted in 100% of major trauma patients completing this pathway soon after their admission.

- **Wellington:** The collaborative introduced a standardised approach to rehabilitation, which meant patients received more allied health input. It also provided an information booklet for patients and their whānau, and introduced a standardised discharge checklist.
- **Nelson:** The collaborative developed a multidisciplinary electronic discharge checklist with input from medical, nursing and allied health staff.

The following are highlights from the five collaboratives focusing on TBI.

- **Dunedin:** The collaborative developed and implemented the whāia te ora framework. This framework consisted of whanaungatanga, the completion of te whare tapa whā, referral to kaupapa Māori services, and engagement with ACC and Whānau Ora for Māori sTBI patients.
- **ABI and Active+:** For patients with mild TBI, time between hospital discharge and the start of community rehabilitation reduced from 12 days to 1 day by removing the requirement for ACC preapproval, co-designing a referral form and providing education sessions to hospital staff.
- **Auckland:** The collaborative developed an integrated allied health assessment and completed it for 88% of moderate to severe TBI patients. Allied health provided input into the electronic discharge summary to support post-discharge communication. Handover to TBI inpatient rehabilitation services was timely in 90% of cases, with clinicians providing very favourable feedback.

- **Middlemore:** The collaborative developed an e-learning tool to support capability across nursing and allied health services in undertaking an accurate PTA assessment using the Westmead and Abbreviated Westmead tools.
- **Taranaki:** The collaborative developed an information leaflet with advice for patients discharged from hospital with a TBI. The completion rate of the discharge advice part of the TBI pathway increased from 17% to 36% for all TBI patients, and from 0% to 30% for Māori.

In the final evaluation, teams reported that the collaborative process had increased their knowledge of quality improvement science within trauma rehabilitation.

The collaboratives have resulted in vastly improved processes for major trauma patients. Detailed reports of this work are being written up as case studies and will be disseminated across New Zealand to share the innovations and excellent outcomes this work has produced.



- ▶ National Trauma Network
- ▶ Northern Region
- ▶ Midland Region
- ▶ South Island



# Part 3: Network reports

- ▶ National Trauma Network
- ▶ Northern Region
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## National Trauma Network

The aims of the National Trauma Network are to reduce mortality, improve the level of disability of those that survive, and create system efficiencies. The focus of the Network is on pre-hospital care, acute hospital care, and rehabilitation, as well as on informing injury prevention initiatives.

This report describes the progress made against the four areas described in the Strategic Plan 2017/18–2022/23.

### Governance

The National Trauma Network Governance Group has oversight of all Network activities. The Group has representation from senior clinical and management executives from ACC, Te Whatu Ora | Health New Zealand, Ministry of Health and Waka Kotahi, and includes consumer and Māori engagement. The focus over the past year has been on developing the Strategic Plan 2023–27 and alignment of Network activities to the new health structure.

The work of the New Zealand Trauma Registry Data Governance Group has continued to ensure the use of registry data is ethical and appropriate.

### Service excellence

Part 2 has described progress against the three priority areas of critical haemorrhage, sTBI and rehabilitation. Here we focus on progress against other initiatives.

#### Admitting trauma services

A feature of contemporary trauma care is that major trauma patients are admitted under a trauma service that can manage the complex injuries that many major trauma patients have. A trauma service should be a requirement in all tertiary hospitals and some of the larger secondary hospitals.

Christchurch Hospital began an admitting trauma service this year. Planning is under way for a service to begin at Wellington Hospital. If that initiative is successful, all except one of New Zealand's tertiary hospitals will have an admitting service in place.

#### National Trauma Research and Audit Committee

The National Trauma Research and Audit Committee was formed as a mechanism to review the processes of care and outcomes in specific areas. With paediatric trauma as its first priority, the Committee produced an in-depth report from the New Zealand Trauma Registry, describing the patterns and outcomes of paediatric trauma in New Zealand. Following the report, all hospitals reviewed all of their paediatric cases who were admitted to an intensive care unit (with or without ventilation).

### Trauma Team Training

National roll-out of a high-fidelity simulation course for trauma teams has had some delays due to COVID-19, making an extension to the current contract necessary. The courses are jointly funded by Te Whatu Ora and Waka Kotahi, and this year Waka Kotahi approved funding for a third course in each hospital. New scenarios have been developed, including a paediatric road trauma and an adult cyclist. Feedback from course participants has been positive and the courses often result in identification of latent threats to equipment, processes and communication. Instructors are trained to help trauma teams to debrief and improve team communication.

#### Māori experiences of major trauma

Following the publication of the Whānau Māori Experiences of Major Trauma Care and Rehabilitation report, work has progressed on developing practical and simple guidance for trauma teams to engage Māori patients and their whānau. The guidance includes a pepeha (introduction) and underlines the importance of whakawhanaungatanga (establishing relationships) while the patient is in hospital. It also emphasises the importance of whānau in supporting their injured family member through the acute phase and rehabilitation. The guidance is being progressively shared across trauma services.

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## Enablers

Each of the following elements of the National Trauma Network contributes to its effective performance.

### New Zealand Trauma Registry

The New Zealand Trauma Registry is performing well as a single web-based software platform.

The focus on achieving consistent AIS coding continues, with quarterly exercises that use real case notes as well as regular refresher courses.

### Patient-reported outcome measures (PROMs)

PROMs involve interviewing patients at 6, 12 and 24 months post-injury using validated assessment tools to understand any changes in their functional performance. The purpose of assessing PROMs is to understand unwarranted variation in outcomes across the country and between patient groups. This analysis provides insight into long-term outcomes beyond our current understanding of whether someone survived or not.

The 6-month and 12-month collections have been completed this year and the results are being analysed. For the first time, we are able to see how the functional performance of major trauma patients compares with the New Zealand baseline, and in time we hope to compare the data with other trauma jurisdictions and our own past performance. The participation rate was 89% of those patients who we were able to contact.

### Workforce

The capacity of the trauma nurse workforce continues to improve: the number of full-time equivalent (FTE) trauma nurses has increased from 7 in 2015 to 18 this year. However, the resource to caseload ratio continues to vary widely. This is concerning because the lower-resourced

hospitals are not able to undertake the necessary case management and quality improvement activities. At their annual meeting this year, the trauma nurses had an opportunity to network and learn from each other about successful initiatives.

The allied health workforce is another important enabler of trauma care. This year saw the first forum of allied health clinicians, which brought together representatives from across the country. The outcomes of the meeting were a shared understanding of the issues impacting trauma rehabilitation and a commitment to work together.

## Research

Members of the National Trauma Network published four significant pieces of research this year. For details of the publications, see Appendix B.

### Study of Road Trauma Evidence and Data (SORTED).

The report on two years data of all transport-related injuries on New Zealand roads has been completed and is now available on the Ministry of Transport website. The study links data across multiple health and transport datasets to provide an accurate and comprehensive view of road trauma in New Zealand. Importantly, it identifies the gaps in current understanding, particularly around motorcycle and bicycle injuries, making an important contribution to injury prevention initiatives. SORTED has been included in the Government's Road to Zero strategy to reduce deaths and serious injury on our roads.

### Disability-adjusted life years.

This study, authored by Gabbe and colleagues and published in the New Zealand Medical Journal, aimed to quantify the burden and the cost of health loss after a person is hospitalised due to major trauma. While

the case-mix remained relatively consistent across the Registry's three years of data, in-hospital mortality declined from 9.2% to 7.3% over the same period. In total, the estimated cost of health loss was an average of \$341 million per year. The cost of health loss per patient fell from \$162,000 to \$143,000 over the three years.

### Comparison of severe traumatic brain injury (sTBI) patterns and outcomes between Norway and New Zealand.

Severe TBI is common among trauma patients. The study by Weber and colleagues, published in the World Journal of Surgery, compared patterns of TBI between the Norwegian and New Zealand trauma registries. The New Zealand cohort was significantly younger and more likely to be injured in road traffic crashes than their Norwegian counterparts. The case fatality rates were also higher in New Zealand than Norway across all age groups, including children aged 0–9 years. Preventative measures such as improving road safety and reducing the risk of falls can help reduce the number of patients suffering sTBI.

### Prevalence of psychoactive drugs in trauma patients.

This study looked at patients who presented to an emergency department and received a trauma call response. It took an anonymised blood sample from each patient and tested it to judicial standards. As Isles and colleagues report, the tests detected one or more psychoactive drugs in six out of ten patients. Cannabis, alcohol, anti-depressants and methamphetamine were the most common drugs. Prevalence varied by age, sex and cause of injury, but not by time of day or day of the week. This study was unique as it proved the feasibility of an approach that limits bias to obtain an accurate reflection of drug prevalence.



- ▶ National Trauma Network
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## Northern Region

The Northern Regional Trauma Network (NRTN) supports the entire journey of major trauma patients, and has a well established and broad membership spanning trauma services including population health interests. This ensures equity and Te Tiriti principles are considered in all the NRTN's work.

Structured regional clinical case audits occur at the bimonthly NRTN meeting. Quarterly regional clinical case reviews also occur for potentially preventable deaths, all major trauma deaths due to haemorrhage and pre-hospital deaths attended by ambulance services. Areas for quality improvement are identified and actioned, for both local and regional pathways, to improve patient outcomes.

The NRTN identifies three key work streams biennially.



### Improving outcomes for patients with moderate brain injury

The NRTN has been pleased to roll out a regional communication and follow-up pathway that connects Emergency Medicine clinicians directly to Neurosurgeons for patients with moderate TBI. This is now used across the region in all hospitals without neuroscience services. The use of this pathway has also been subject to clinical audit, and recommendations have been made to improve its use.

The NRTN is also currently auditing the management of inpatients with moderate traumatic brain injuries across the region against a set of standards from the Region's agreed Management of Moderate TBIs in a Non-Neurosurgical Centre clinical pathway.

### Improving the quality of rehabilitation for patients suffering major trauma

The NRTN continues to work on improving access to rehabilitation for patients suffering from major trauma in the Northern region. The NRTN has worked hard to embed the previously agreed core standards across the region. It has identified a group of key stakeholders and has engaged with them in a combination of onsite visits and virtual meetings. Enhanced pathways for accessing care across the region have been agreed with ACC. The NRTN has agreed to author a rehabilitation model of care for trauma patients in consultation with key stakeholders.

### Increasing trauma team member skills by creating education opportunities

An online Resuscitative Thoracotomy Refresher Training Course has been developed and rolled out. The ACC Incentive Fund has supported nurse education with multiple nurses attending Trauma Nurse Coordinator

Care (TNCC) and Emergency Management of Severe Burns (EMSB) courses. The NRTN sponsored the Starship Paediatric Trauma Education Evening for the fifth consecutive year. It now draws an audience of over 300 in-person and virtual attendances from across New Zealand and Australia.

### Supporting national initiatives

The NRTN has worked hard to ensure the success of national major trauma projects.

We are pleased that the Code Crimson pathway has now been rolled out across all hospitals in the region as part of the National critical haemorrhage project.

### Other achievements

The NRTN continues to work on a wide variety of projects with some examples such as;

Improving the transfer of patients for definitive care through development of

- A regional electronic Trauma Form which is being trialled across all hospitals.
- A regional electronic Tertiary Form currently being rolled out.

Establishing a Regional Registrar Trauma Forum for trainees with an interest in major trauma. The NRTN provides oversight, support, and encourages regionally led research and has two trainee members from this group.

The NRTN looks forward to identifying further key work streams next year, implementing the use of a clinical dashboard and continuing to improve outcomes for patients and their whanau.

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## Midland Region – Te Manawa Taki

This was a tumultuous year for Te Manawa Taki. Trauma events dipped slightly during lockdowns before rebounding strongly to put more pressure on our systems.



With general staff shortages across the sector, we have been challenged to stick to our mission and ensure our facilities and clinical partners provide consistently high levels of care to trauma patients and whānau. Yet we achieved this through the extraordinary efforts of our trauma teams and their networks.

Despite the challenges, it was encouraging to once again see that teams made rapid and successful use of the regional pre-hospital transfer matrix and inter-hospital plans to rationalise patient flows during crises.

Implementation of the Code Red resuscitation protocol has transformed early management of our severely injured patients at risk of death by exsanguination or sTBI. This protocol has shortened the time for resuscitation and definitive intervention for those facilities that have adopted it. The initiative is consistent with the national quality improvement project for critical haemorrhage and sTBI management, and continues to save lives.

Using ACC funding, Te Manawa Taki delivered two Trauma Care After Resuscitation (TCAR) courses. These courses consist of a combination of online modules and Zoom sessions run by the regional trauma nurses. The TCAR courses cover a wide range of pathophysiological and nursing concepts and were specifically created to meet the learning needs of inpatient trauma nurses. They have been well received by participants and their regional format has encouraged inter-regional communication and collaboration. Encouraged by the positive feedback, Te Manawa Taki is planning another four courses for 2022.

The NetworkZ programme and the Waikato Trauma Team Training course were delivered to many of our facilities.

Both highlighted the importance of teamwork within the resuscitation team and across departments.

Te Manawa Taki implemented a detailed chest injury management pathway. It resulted in several local variations based on capacity and capability, to help streamline processes for vulnerable trauma patients.

Towards the end of the year, additional nursing resource was approved in the Bay of Plenty, leading to the appointment of a second trauma nurse. This has given the service newfound energy and the ability to refocus on patient care, staff education, quality improvement initiatives and in-person engagement. With the executive leading the way, the goal will be to improve resource in other Te Manawa Taki facilities so that they too are better able to provide these kinds of services to their communities.

The ongoing lockdowns and associated visiting restrictions made it more difficult for whānau to support their loved ones. Recognising how important whānau are to the process of recovery, we tried to mitigate this by arranging online family meetings and using online video calling.

As an established clinical network, we are well positioned to adapt to and integrate into the future health system as Te Whatu Ora | Health New Zealand and Te Aka Whai Ora | Māori Health Authority take shape. We look forward to further collaborations with the National Trauma Network and ACC to improve delivery of care. We remain fully committed to the national health strategy focused on people – on patients, on communities and on our kaimahi | health care workforce.

- ▶ National Trauma Network
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## Central Region

In the Central Region, trauma activities and volumes appear to have returned to normal following the COVID-19 pandemic. However, overall hospital activities remain strained and often result in delays in admitting trauma patient from emergency departments.

The strategic trauma group established last year finalised our region's strategic plan for 2021–24 and the regional chief executives have signed it off. This has been a very useful document to guide our activities. It has resulted in a number of positive initiatives across domains, including in injury prevention, pre-hospital care, acute care and rehabilitation.

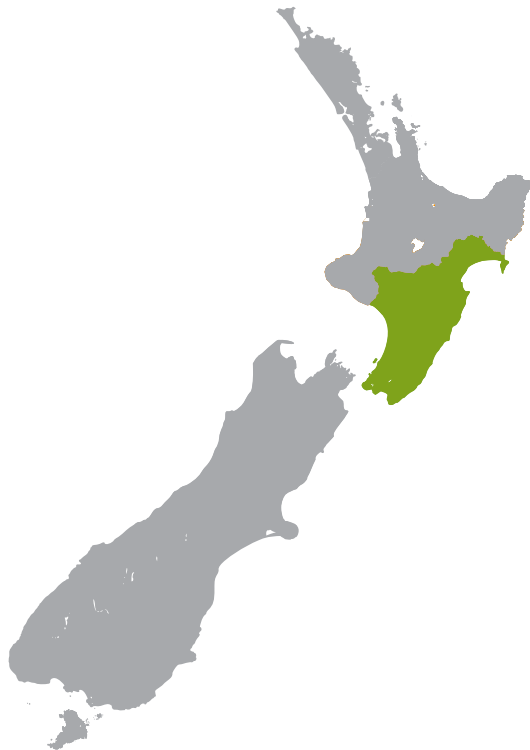
In injury prevention, we are partnering with ACC to focus on the significant group of older patients who suffer from a major injury after falling. In the pre-hospital domain, we are developing a process to review trauma cases that have involved a long scene time before transport in order to understand the barriers to rapid transport of patients with time-critical injuries. In acute care, we have gained support from the health system to undertake trauma verification for all acute hospitals in the region, as well as the regional trauma system. We have also developed partnerships with allied health clinicians, including hospital-based and community rehabilitation providers, and have representation on hospital trauma committees and regional trauma networks.

The region has contributed to national workstreams, including sTBI projects, work on patient-reported outcome measures and the focus on Māori experiences of trauma. We are seeing the benefits starting to emerge from all of these areas of work.

We have continued to develop regional guidelines so that hospitals across the region can follow a standardised approach to trauma. The regional trauma radiology policy was implemented last year, and we have recently approved the introduction of a major pelvic trauma guideline.

An increase in the number and FTE hours of trauma nurses in some hospitals has been beneficial. It has allowed these hospitals to expand their activities in areas such as case management and quality improvement projects. Trauma clinicians from around the region enjoyed participating in face-to-face education and networking at the national trauma symposium held in Wellington.

Thank you to all of our network and strategic group members for their ongoing work and support. We are very grateful for all they have done and are looking forward to further positive progress in the Central Region in the year ahead.



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## South Island

The South Island Trauma Network was dissolved following a restructure of work in the regional support service. While key regional initiatives have stalled as a result, there have been significant developments in hospitals across the South Island.



A trauma admitting service began at Christchurch Hospital and early results show improvements in tertiary survey completion, reduction in time to CT and a reduction in length of stay. Although the service is challenged with limited resources, the positive results of the audit indicate the benefits to patients and the hospital system of having an organised and dedicated approach to managing trauma in New Zealand's largest trauma centre.

Christchurch Hospital has also implemented Code Crimson and since then has activated it several times. It has released a rib fracture pathway to guide protocol-based care of these patients.

Southern Hospital has also released a rib fracture pathway and an audit is assessing the measures following its implementation. In addition, it has developed a spinal care order to guide nurses and allied health staff on taking spinal precautions with inpatients. An allied health team has delivered a quality improvement collaborative to design and implement a whāia te ora framework, which consists of whanaungatanga, the completion of Te Whare Tapa Whā, referral to kaupapa Māori services, and engagement with ACC and Whānau Ora for Māori sTBI patients.

The Right Track programme has been delivered in collaboration with other agencies. This interactive and empowering education programme aims to promote good choices and decision-making for those with recent driving offences.

Nelson Marlborough has developed a tertiary survey template to improve the rate of assessment. It has also implemented a rib fracture pathway. The team has developed a multidisciplinary checklist to include in the discharge summary and has completed a project on concussion assessment and management as part of a quality improvement collaborative.

The focus of work at Timaru and West Coast hospitals is on data collection for the relatively small numbers of trauma patients that present.

Some training activities have involved the entire South Island, such as Trauma Team Training and a study day for trauma nurse coordinators. Most hospitals have a strong focus on clinical audits and grand rounds.

Engagement with senior executive leadership is under way to establish a South Island trauma network under a new governance arrangement.



# Appendix A: RACS key performance indicators, 2021/22

## Case fatality rate (ISS ≥ 13)

Northern	Midland	Central	South Island	National
7.1%	9.6	7.8	5.6	7.4

## Pre-hospital transport time to hospital in hours (ISS ≥ 13)

Northern	Midland	Central	South Island	National
1.6	1.9	1.6	1.8	1.7

## Discharge destination (ISS ≥ 13)

	Northern	Midland	Central	South Island	National
Home	61%	67%	62%	64%	63%
Rehabilitation	18%	17%	16%	23%	19%
Hospital for convalescence	8%	7%	8%	4%	7%
Acute care facility	4%	3%	9%	4%	5%
Left against medical advice	4%	3%	1%	2%	3%
Other	2%	1%	1%	0%	1%
Residential aged care service or nursing home (not usual residence)	2%	0%	1%	2%	1%
Special accommodation	1%	1%	1%	1%	1%
Unknown	1%	0%	2%	0%	0%

## Median time in hours to CT for patients with impaired consciousness (Glasgow Coma Scale 13 or lower; ISS 13)

Northern	Midland	Central	South Island	National
0.8	0.8	1.3	0.8	0.9

## Recording of blood alcohol concentration at first hospital (ISS 13 or over)

Northern	Midland	Central	South Island	National
74%	62%	63%	55%	65%

## Time in hours in first hospital for patients transferred for definitive care (ISS ≥ 13)

Northern	Midland	Central	South Island	National
4.6	6.6	7.9	6	6

## Time in hours in emergency department in first hospital (ISS ≥ 13)

Northern	Midland	Central	South Island	National
6.2	6.2	6.2	5.2	6

# Appendix B:

## Published research on injury in New Zealand

Bentley M, Singhal P, Christey G, et al. 2022. Characteristics of patients hospitalised with traumatic brain injuries. *New Zealand Medical Journal* 135(1550).

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