ANNUAL REPORT
1 JULY 2016 TO 30 JUNE 2017

AUSTRALIAN TRAUMA REGISTRY

Management of the Severely Injured in Australia

national trauma research institute

MONASH University

ISBN Print: 978-0-6482870-4-9 ISBN Online: 978-0-6482870-5-6

Suggested citation: Australian Trauma Quality Improvement (AusTQIP) Collaboration (2018). Australian Trauma Registry, Management of the Severely Injured in Australia, 1 July 2016 to 30 June 2017. Alfred Health, Melbourne, Victoria.

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ANNUAL **REPORT**

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Australian Trauma Registry

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FOREWORD

On behalf of the Australian Trauma Quality Improvement (AusTQIP) Steering Committee, and the AusTQIP Collaboration of Australian major trauma centres, we present the Australian Trauma Registry (ATR) Annual Report, *Management of the severely injured in Australia* 2016-17.

The AusTQIP collaboration and the ATR continues to be indebted to the May 2016 Senate enquiry into Aspects of road safety in Australia[1], the Australian Commission on Safety and Quality in Health Care[2], and the Royal Australasian College of Surgeons all of whom publicly prioritised funding of a trauma registry and the ATR. We thank Prime Minister Malcolm Turnbull for responding to this need.

The AusTQIP Collaboration is currently a collaboration of 26 major trauma centres across Australia whose mission is to improve survival, enhance the quality of trauma care, and optimise recovery by consolidating data and shared data and shared knowledge. These 26 major trauma centres submit data to the ATR directly or through state-based registries. The AusTQIP Steering Committee oversees the AusTQIP Collaboration. The current report is possible because of the commitment and dedication of the people working in these centres and states, and to the support of Prime Minister Malcolm Turnbull and the Commonwealth Government, The Royal Australasian College of Surgeons, The Australasian Trauma Society and a host of others since 2003 to the current day.

The ATR was formally established in 2012, and produced its first report in 2014. The ATR now has finalised data from 2010 to June 30, 2017. The ATR is a valuable source of data about major trauma patients across Australia. Its purpose is to help improve the quality of care of trauma patients in Australia, and to assist in monitoring the state-based trauma systems.

The National Trauma Research Institute (NTRI), founded in 2003, is a collaboration between Alfred Health, Monash University and Gold Coast University Hospital and Health Service. The NTRI collaborates with organisations nationally and internationally to integrate research, education, medical technologies and trauma systems development to improve clinical care and outcomes. The NTRI leads and coordinates the AusTQIP Collaboration and maintains the ATR in collaboration with Monash University's Department of Epidemiology and Preventive Medicine.

The trauma data collected by the ATR is accessible to all ATR contributors, government, clinical researchers and the public. As the dataset grows and improves we encourage wider use of the data by all interested parties. Details about ATR data access can be found at https://www.ntri.org.au/australian-trauma-quality-improvement-program-and-the-australian-trauma-registry.

For the coming year we look forward to the inclusion of the New Zealand Major Trauma Network into the ATR, and the addition of Sunshine Coast University Hospital, followed by the Tasmanian State Trauma Registry (representing Royal Hobart Hospital, Launceston General Hospital and North-West Regional Hospital Burnie) in 2019.

Professor Mark Fitzgerald
Co-chair ATR Steering Committee

Professor Kate Curtis
Co-chair ATR Steering Committee

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2016-17 YEAR IN REVIEW

PATIENT

8,423 severely injured

median **AGE 48**

72% **MALE**

most injuries occured between **FRIDAY & Sunday**

MECHANISM

95% **BLUNT** trauma

3.5% penetrating **trauma**

<1% BURNS

35% caused **by falls**

45% **caused by transport** related trauma

PLACE

42% occurred on **streets & injuries highways**

28% injuries occurred at home

ARRIVAL

68% direct from scene to definitive **HOSPITAL**

Median time from scene **to definitive care** **1hr 30mins**

HOSPITAL

Median time **spent in ED** **4hrs 16mins**

median **length** of stay **7days**

37% **admitted to ICU**

median ICU length of stay **4 DAYS**

OUTCOMES

897 in-hospital **deaths** **1 in 10**

36% of deaths **aged 75+**

14.2% **died** in ED

62% discharge home

24% to rehabilitation

EXECUTIVE SUMMARY

Injury remains the leading cause of death in Australia for people aged less than 45 years, despite decades of injury prevention efforts in each jurisdiction[3]. Research has shown that improving trauma care systems alone can reduce preventable death following injury by more than 50 percent. The Australian Trauma Registry (ATR) focuses on monitoring trauma care, from the time of incident to discharge from definitive care, in order to reflect and act upon emerging trends and demands on the trauma system across Australia. Of the 26 designated trauma centres that have collaborated to provide comprehensive national data to the ATR, 24 trauma centres have provided data for the ATR annual report.

This annual report covers dates of injury between 1 July 2016 to 30 June 2017 and provides summary data for the most severe injuries (injury severity score greater than 12 or in-hospital death following injury).

In 2016-17 the ATR received data for 8,423 patients. Overall, men continued to be over-represented, accounting for 72 percent of severe injuries. This was consistent across age groups with the exception of patients aged 85 years or older where there were more females represented.

Across Australia, ninety-five percent of severe injury was caused by blunt mechanisms, with 3.5 percent penetrating trauma, and less than one percent burns.

45 percent of severe injuries were transport-related and 35 percent were falls-related, accounting for 80 percent of all severe injuries. The Australian Institute of Health and Welfare (AIHW) reported that transport-related injuries accounted for 12 percent of all injures (not only severe), highlighting that transport-related injuries are more likely than other injuries to be severe[4].

Most transport-related trauma (85%) was on-road, similar to the previous financial year, with motor vehicles the most common mechanism. Motor-cycles were again more prominent in off-road crashes.

Whilst there continues to be greater numbers of low falls (20 percent of all severe injures) compared with high falls (15 percent of all severe injuries), incidence of high falls has increased by 22 percent since the 2015-16 financial year and low falls has dropped 3.6 percent. Falls from ladders accounted for 22% of high falls. It is important to emphasise again, that this report focuses only on major trauma centres and not community hospitals, where admissions from low falls are more frequent.

The most common place of injury was in the home for children aged less than five years and older adults (65 years and older). For all other age groups, a road, street or highway was the most common place of injury. Serious workplace injuries resulting in hospitalisation are less common.

Two-thirds of the severely injured were transferred from the scene directly to definitive care. Of these, 65 percent were transported directly from the scene to definitive care by road ambulance, 11 percent by helicopter and 14 percent arrived via private vehicle.

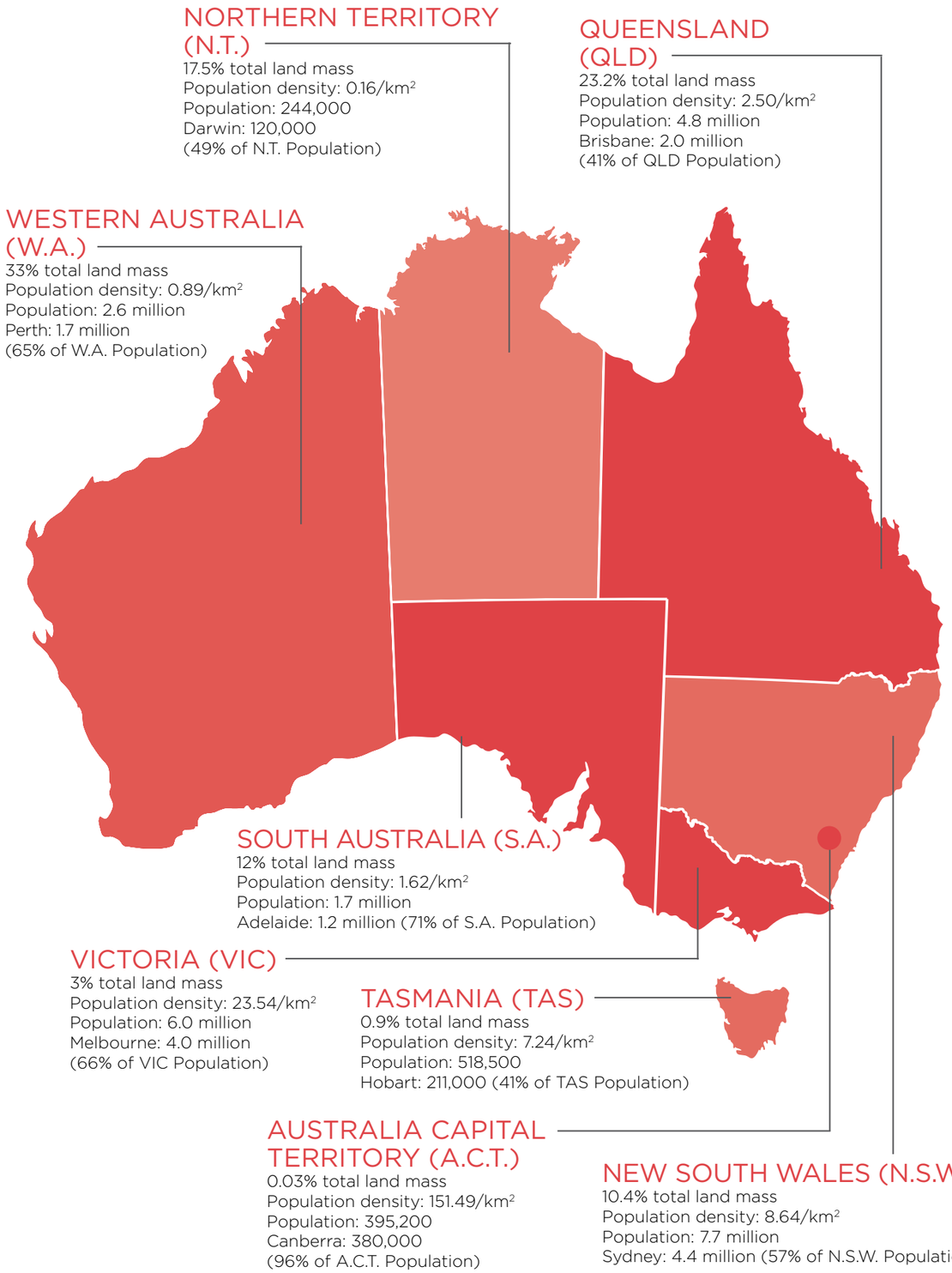
The median time from scene to arrival at definitive care was one hour 30 minutes and the median time spent in the emergency department was four hours and 16 minutes, both similar to the previous financial year. The median length of stay in hospital was seven days and the median intensive care unit length of stay was four days. Overall in-hospital mortality was 10.6 percent with 14.2% of deaths occurring in the emergency department.

At the conclusion of their acute episode of care most patients were discharged to home (62 percent), or to rehabilitation (24 percent).

This report provides a national view of severe injury resulting in hospitalisation. It is hoped that as we improve the system of care for injured patients across Australia, there will be further improvements in preventable death and morbidity post injury.

Professor Peter Cameron
University Representative
Monash University

NATIONAL SNAPSHOT



CONTRIBUTING SITES

AUSTRALIA CAPITAL TERRITORY

Canberra Hospital (from 1 July 2014 to present)

QUEENSLAND

Gold Coast University Hospital (from 1 January 2015 to present)

Lady Cilento Children's Hospital
Mater Children's Hospital (merged)
Royal Children's Hospital, Brisbane (merged)
(from 1 December 2014 to present)

Princess Alexandra Hospital (from 1 July 2014 to present)

Royal Brisbane and Women's Hospital

Townsville Hospital
Signed the variation but has not submitted data to the ATR

NEW SOUTH WALES

Children's Hospital, Westmead

John Hunter Children's Hospital

John Hunter Hospital

Liverpool Hospital

Royal North Shore Hospital

Royal Prince Alfred Hospital

St George Hospital

St Vincent's Hospital

Sydney Children's Hospital

Westmead Hospital

NORTHERN TERRITORY

Royal Darwin Hospital

SOUTH AUSTRALIA

Flinders' Medical Centre

Royal Adelaide Hospital

Women's and Children's Hospital, SA

TASMANIA

Royal Hobart Hospital
No data submitted since the inaugural report (2010-2012)

VICTORIA

Alfred Hospital

Royal Melbourne Hospital

Royal Children's Hospital

WESTERN AUSTRALIA

Princess Margaret Hospital

Royal Perth Hospital

ATR METHODOLOGY

Governance

The National Trauma Research Institute (NTRI), founded in 2003, is a collaboration between Alfred Health, Monash University and Gold Coast University Hospital and Health Service. The NTRI collaborates with organisations nationally and internationally to integrate Research, Education, Medical Technologies and Trauma Systems Development to improve clinical care and outcomes.

In 2012, the NTRI established the Australian Trauma Quality Improvement Program (AusTQIP) including the Australian Trauma Registry (ATR) bringing together Australia's 26 designated trauma centres to form a collaboration to provide important data on the most severely injured.

AusTQIP was formed with an overarching Steering Committee comprised of representation from all states and territories, and other participating stakeholders (Appendix A). Reporting to the Steering Committee is the AusTQIP Management Committee (Appendix A).

The ATR is supported by the Department of Infrastructure, Regional Development and Cities (DIRDC) and the Department of Health (DOH), who have provided funding for the period 16 May 2017 to 30 June 2019, and also by the large group of contributing sites and states and territories.

Key Objectives & Outcomes

The ATR is a valuable source of data about major trauma patients across Australia. Its purpose is to help improve the quality of care of trauma patients in Australia, and to assist in monitoring the state-based trauma systems. The ATR provides the data for monitoring the quality of trauma care provided in the pre-hospital and in-hospital setting. A national registry provides an opportunity to streamline efforts and work towards reducing inconsistencies in care across services and states and territories.

In future, outcome data will be risk-adjusted, a process that allows data beyond the control of clinicians or health services to be compared without influencing factors, such as geographic distance impacting on pre-hospital transfer time, patient demographics and severity of injury. In this report, the outcome data was not risk-adjusted however we hope to present the risk-adjusted outcome data in the 2017-2018 ATR Annual Report.

Data Elements

ATR data is defined by the Bi-National Trauma Minimum Dataset (BNTMDS), listed in Appendix B. Data elements from existing hospital and state-based registries were mapped to the BNTMDS according to standard definitions as accurately as possible. If data elements were not already collected by existing data sources, they were not otherwise obtained by the ATR.

The current version of this dataset (Version 1.5) can be downloaded from www.ntri.org.au/australian-trauma-quality-improvement-program-and-the-australian-trauma-registry.

Inclusion and Exclusion Criteria

The ATR collects data on severely injured patients presenting to one of 26 major trauma centres across Australia. Patients admitted to these centres who subsequently die after injury, or who sustain major trauma (defined as an Injury Severity Score greater than 12)[5] are included in ATR data.

Exclusion Criteria

- Patients with delayed admissions greater than seven days after injury
- Poisoning or drug ingestion that do not cause injury
- Foreign bodies that do not cause injury
- Injuries secondary to medical procedures
- Isolated neck of femur fracture
- Pathology directly resulting in isolated injury
- Older adults (≥65 years of age) who die with superficial injury only (contusions, abrasions, or lacerations) and/or have co-existing disease that precipitates injury or is precipitant to death (e.g. stroke, renal failure, heart failure, malignancy).

Data Definitions

Emergency Department length of stay (ED LOS) is calculated by the ATR based on the date and time of arrival at the definitive care hospital to the emergency department discharge date and time. ED LOS is presented as hours.

Intensive Care Unit length of stay (ICU LOS) is based on values provided by the designated trauma centres or as reported by the state-based trauma registries. ICU LOS is presented as days.

Hospital length of stay (LOS) is from date and time of arrival at definitive care hospital to the date and time of discharge from definitive care hospital as reported. Hospital LOS is based on values provided by the designated trauma centres or as reported by the state-based registries. Hospital length of stay is presented as days.

External cause of injury International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification[6] (ICD-10-AM) codes were used to define causes/mechanisms of injury, injury type and injury intent. Causes of injury were based on the Center for Disease Control's External Cause of Injury and Mortality Matrix (www.cdc.gov/nchs/data/ice/icd10_transcode.pdf).

Type of injury was based on ICD-10-AM codes as previously reported[7]. Codes were mapped to injury types in the BNTMDS.

Data Confidentiality

In 2016, Monash University, Department of Epidemiology and Preventive Medicine, became the custodian of the ATR data and responsible for all reporting.

All state and territory data is de-identified in order to maintain hospital confidentiality as per the collaboration agreement.

Each hospital and state/territory has been allocated a unique identifier which is consistent throughout the report.

Data quality

Data submitted to the ATR underwent various validity checks such as date and time formats and chronology, and correct classification as per the ICD-10-AM and Abbreviated Injury Scale 2005 (Updated 2008)[8] (AIS) codes prior to data processing. If data did not pass these validations, an error file was generated and a notification sent to sites submitting the data to address and correct the error, if possible.

Data contribution varies between hospitals as not all hospitals have all the BNTMDS data points available. However this continues to improve, along with data completeness (see Appendix C) as the hospitals update data systems and improved data quality processes are put in place.

DEMOGRAPHICS

Across the 2016-17 financial year (FY) 8,423 severely injured episodes were collected by the ATR, similar to the previous FY (Figure 1).

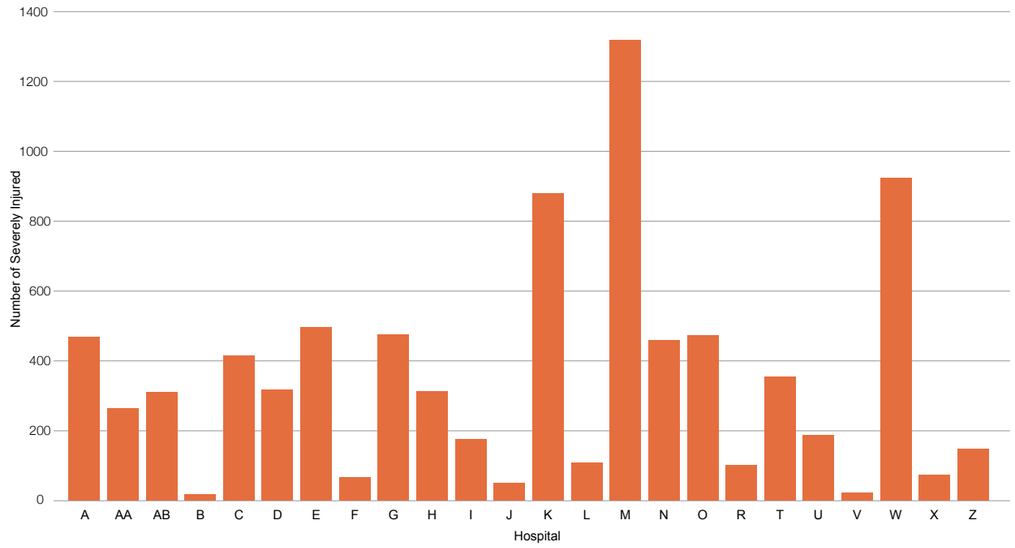


Figure 1. Severe Injury by hospital

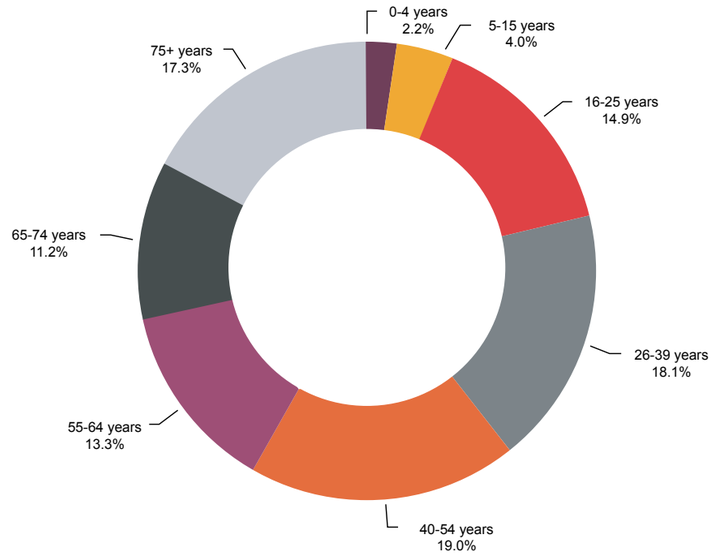


Figure 2. Severe Injury by age group

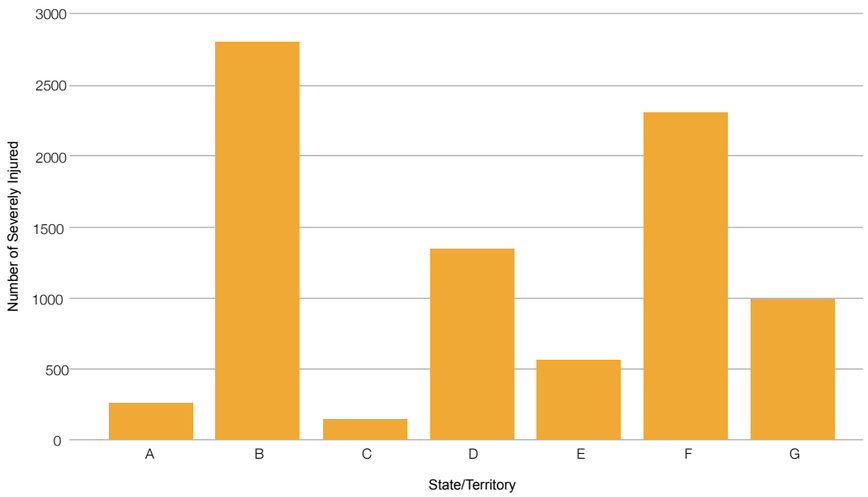


Figure 3. Severe Injury by State/Territory

AGE AND GENDER

Males continued to dominate severe injuries with 72 percent males overall (Figure 4). Only the very young and the older adults defied this gender imbalance.

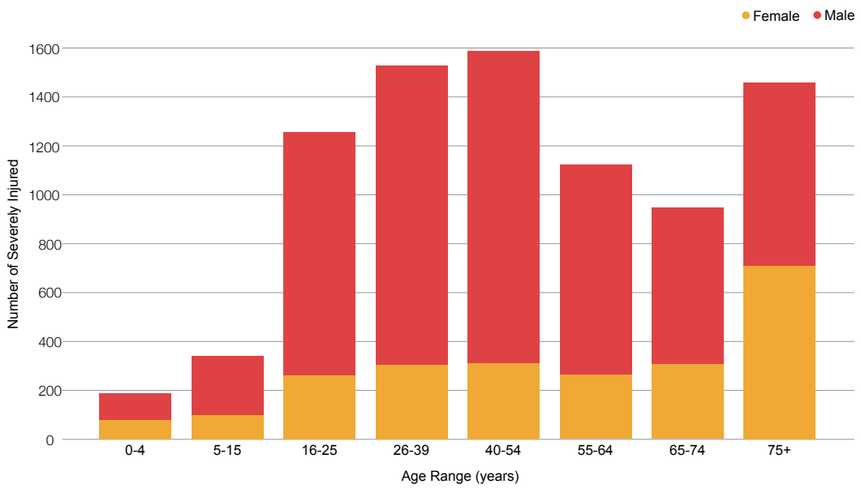


Figure 4. Severe Injury by Age and Gender

When severe injuries are shown as a proportion by gender, the results show interesting variations between age groups (Table 1).

	0-4 years	5-15 years	16-25 years	26-39 years	40-54 years	55-64 years	65-74 years	75+ years	TOTAL
Male	1.7	4.0	16.3	20.1	21.0	14.1	10.5	12.3	100
Female	3.3	4.2	11.3	13.0	13.3	11.3	13.2	30.4	100

Table 1. Percentage of Severely Injured by Gender and Age Range

INJURY EVENT

DAY OF INJURY

The number of severely injured presenting to hospital remained consistent over Monday to Thursday and increased on Fridays before declining on Sundays. Saturdays saw 47 percent more presentations to hospital than the Monday to Thursday average.

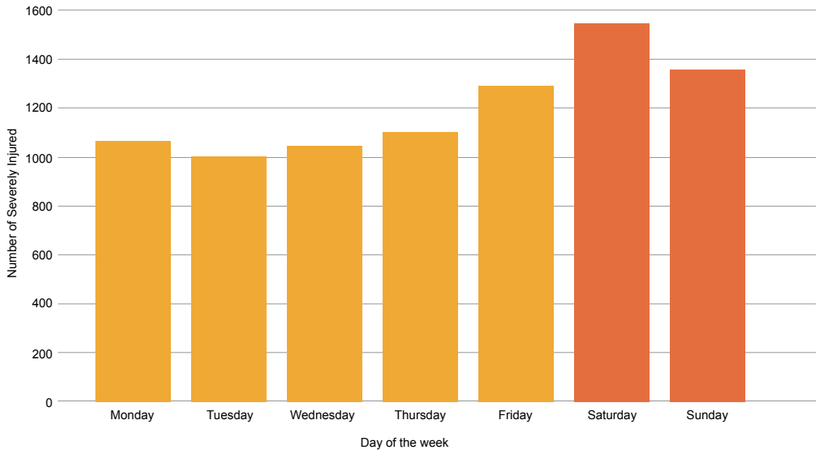


Figure 5. Severely Injured by Weekday

Table 2 shows the percentages of severely injured by hospital compared with the national average.

Hospital	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
National	12.7	11.9	12.4	13.1	15.4	18.4	16.1
A	12.1	9.4	10.2	15.4	12.2	22.6	18.1
AA	18.3	12.2	9.9	13.3	11.0	17.5	17.8
AB	15.8	10.9	10.3	11.9	15.4	19.3	16.4
B	5.9	11.8	5.9	5.9	11.8	23.5	35.2
C	13.5	12.0	12.8	13.7	13.2	17.8	17.0
D	10.7	9.4	15.1	10.1	17.0	20.7	17.0
E	11.8	11.7	12.7	14.7	13.7	17.5	17.9
F	17.6	17.7	4.4	14.7	14.7	17.7	13.2
G	12.8	13.7	11.6	16.3	14.1	16.4	15.1
H	15.7	12.8	13.5	13.5	18.9	13.1	12.5
I	14.8	7.9	11.9	14.2	15.3	17.7	18.2
J	12.0	10.0	16.0	14.0	10.0	20.0	18.0
K	13.5	13.1	13.1	12.3	13.4	18.2	16.4
L	5.6	14.8	12.0	13.9	19.4	20.4	13.9
M	11.9	13.1	12.6	11.8	16.8	19.0	14.8
N	12.4	12.9	11.3	13.5	17.9	19.0	13.0
O	14.8	11.6	12.5	11.6	16.3	18.8	14.4
R	14.7	12.8	15.7	16.7	8.8	10.8	20.5
T	12.7	10.7	13.0	11.6	17.2	17.8	17.0
U	8.6	10.7	11.2	16.6	15.5	19.3	18.1
V	4.4	8.7	21.7	21.7	8.7	21.8	13.0
W	10.7	10.7	14.3	12.3	16.8	18.1	17.1
X	12.3	11.0	12.3	13.7	16.4	19.2	15.1
Z	8.7	12.8	8.7	14.1	17.5	19.5	18.7

Table 2. Percentage of Severely Injured by Day and Hospital

PLACE OF INJURY

Eighty-one percent of severely injured patients had a known place of injury. Of those, 69.6 percent occurred at home or on the streets and highways similar to the previous financial year (Figure 6).

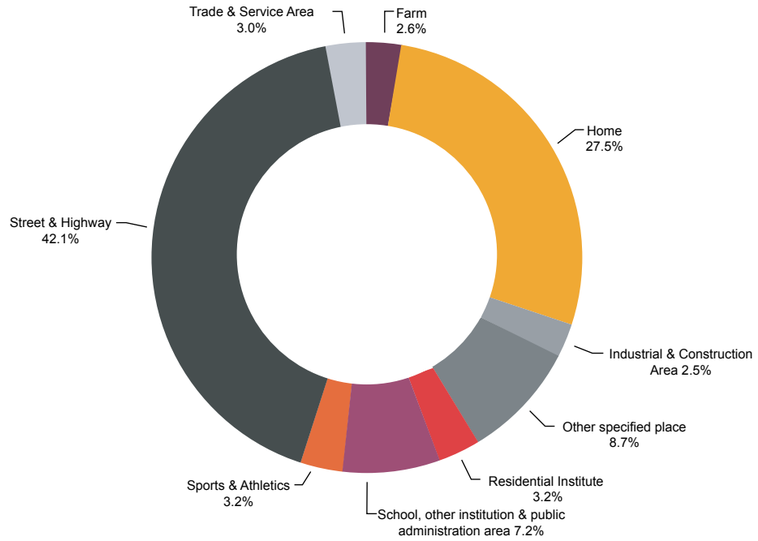


Figure 6. Places of Injury Occurrence

Injury Place by age range shows some interesting variations in the data. Whilst home, and streets & highways, are the most common place of injury for all age categories, their prevalence varies greatly by age (Figure 7). All other categories remained constant throughout the age ranges with little variation.

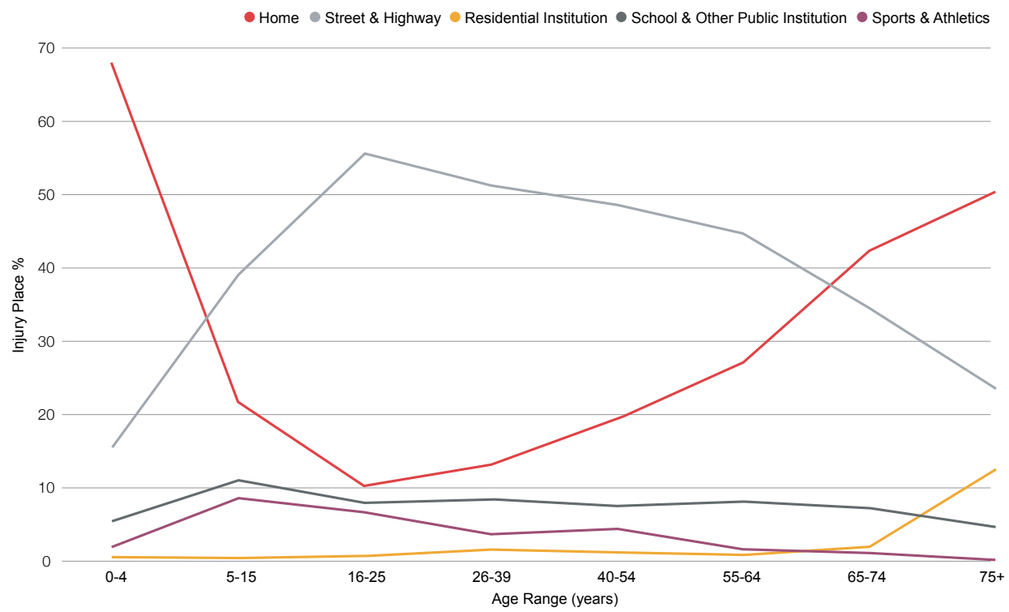


Figure 7. Injury Place by Age Range

INTENT OF INJURY

Data for intent was provided by ten hospitals accounting for 4,756 episodes of care (Figure 8). The three largest categories mirror those of the 2015-16 report: unintentional (87 percent), assault (6 percent) and intentional self-harm (3.8 percent).

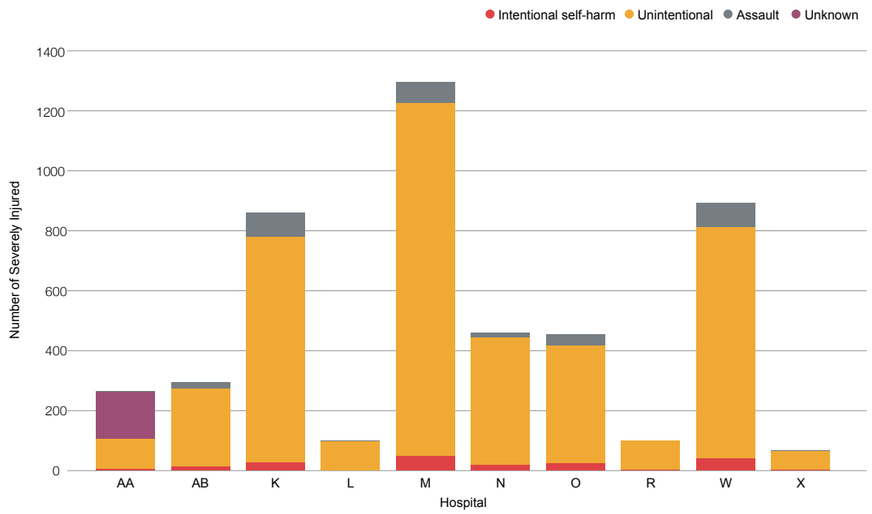


Figure 8. Intent of Injury by Hospital

CAUSE OF INJURY

Transport-related and falls-related injuries accounted for 80 percent of all severe injuries across Australia. Thirty-five percent of all severe injuries were caused by falls. High falls increased this financial year by 21.7 percent whereas low falls fell by 3.6 percent. High falls accounted for 15.1 percent of total severe injuries and low falls accounted for 19.8 percent of total severe injuries.

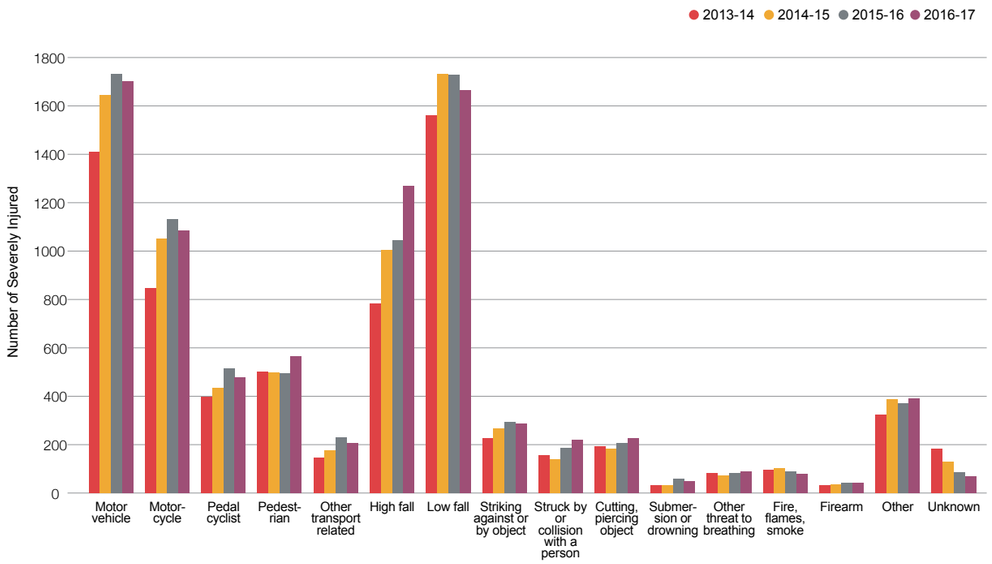


Figure 9. Severe Injury by Cause and Financial Year

Forty-five percent of severe injuries were transport-related (Figure 10). Of this 45 percent, motor vehicle occupants accounted for 44.4 percent, lower than the previous financial year (51 percent), whilst pedestrians increased from eight percent of transport-related injuries to 14.8 percent. Motorcyclists and pedal cyclists had reduced numbers overall, however as a percentage of transport-related injury, had similar numbers to the previous financial year, 28.3 percent and 12.5 percent respectively.

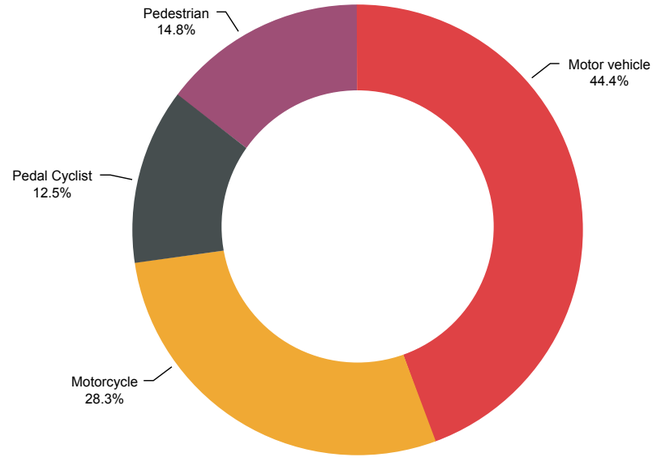


Figure 10. Transport-related Severe Injuries by Road User, 2016-17

Figure 11 shows severe injuries of road users by age range and identifies that peak motor-vehicle injuries occurred in the 16-25 age range, peak injury for motor-cycle and pedal cycle injuries occurred in the 40-54 age range, and peak injury for pedestrians occurred in the 26-39 age group.

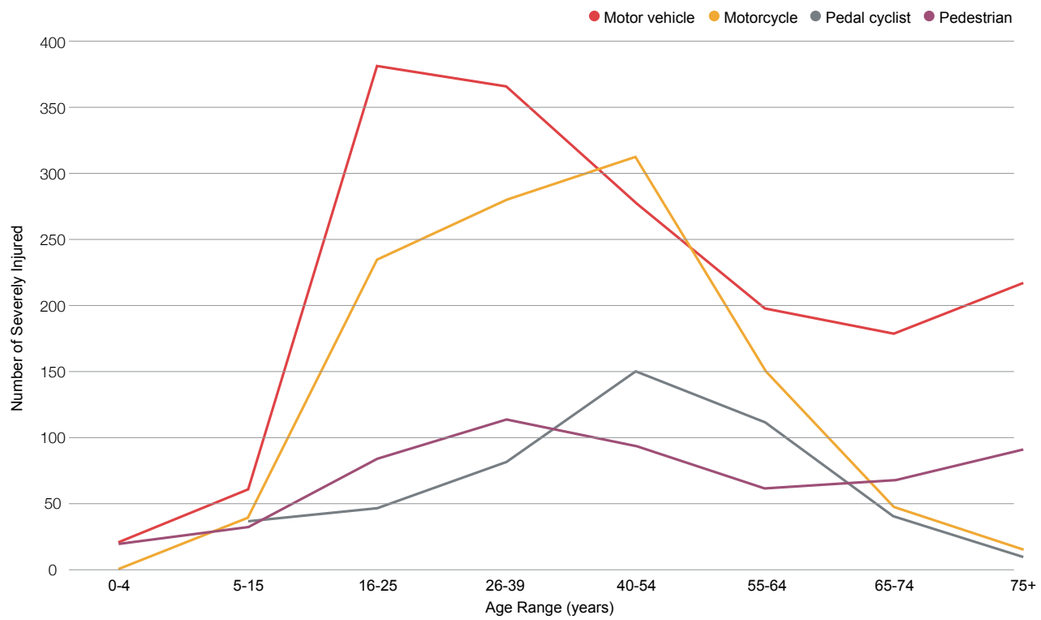


Figure 11. Transport-related Severe Injury by Age Range

INJURY

SEVERITY OF INJURY

Injury Severity Score (ISS) is an internationally-standardised approach to describing the overall severity of injury for each patient. The calculated value enables comparison between cohorts of injured patients, and can be used for inclusion into trauma registries. The higher the number the more severe the injury, ranging from one to 75.

Trauma patients are allocated an ISS after injury in order to determine their status as 'major trauma'. For this report major trauma is defined as an ISS > 12, which is derived from the Abbreviated Injury Scale (AIS) 2008. ISS is useful for predicting hospital length of stay, and associated morbidity and mortality.

In the 2016-17 financial year, the proportion of severely injured in each ISS range was comparable to the previous year (Figure 12). Proportions were also similar by age ranges and gender for the entire cohort, but varied when broken down by hospital (Table 3).

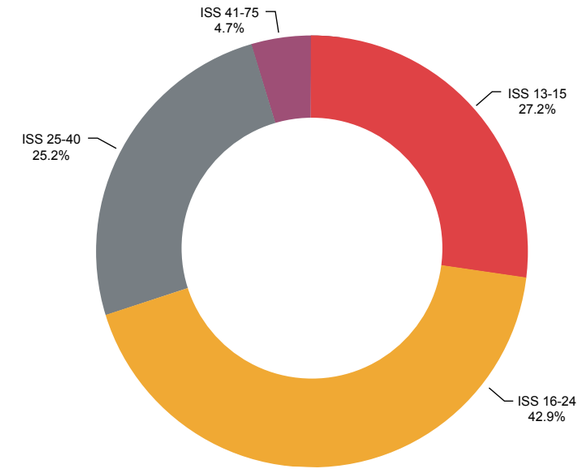


Figure 12. Injury Severity by ISS Range (national)

ISS Range	A	AA	AB	B	C	D	E	F	G	H	I	J	K	L	M	N	O	R	T	U	V	W	X	Z
ISS 41-75	3.0	3.4	3.9	5.9	4.4	4.2	2.1	10.3	4.5	3.3	2.3	0.0	5.4	1.9	5.9	4.6	3.2	6.9	10.7	5.4	8.7	5.3	0.0	2.0
ISS 25-40	25.0	23.2	23.0	5.9	21.8	25.7	20.0	33.8	35.4	22.2	24.1	38.0	26.9	31.5	24.0	21.7	26.0	24.5	29.4	21.7	26.1	26.5	27.4	21.6
ISS 16-24	46.2	40.3	41.1	70.6	46.5	43.4	41.3	45.6	39.7	53.9	43.7	38.0	42.6	50.0	41.4	44.7	41.6	45.1	38.6	46.7	47.8	40.8	45.2	41.2
ISS 13-15	25.8	33.1	32.0	17.6	27.3	26.7	36.6	10.3	20.4	20.6	29.9	24.0	25.1	16.6	28.7	29.0	29.2	23.5	21.3	26.2	17.4	27.4	27.4	35.2

Table 3. Proportion of In-hospital Severe Injuries by ISS Range and Hospital

Injury severity by age group and ISS range was similar to the previous financial year and variations when broken down further by gender can be seen in Table 4.

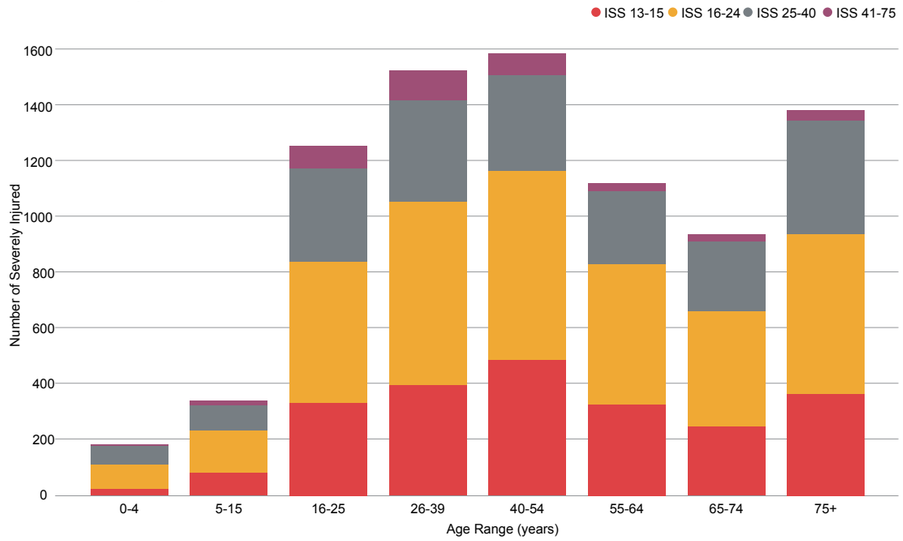


Figure 13. Injury Severity by Age, 2016-17

	0-4 years		5-15 years		16-25 years		26-39 years		40-54 years		55-64 years		65-74 years		75+ years	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
ISS 13-15	12.2	15.5	23.0	26.0	26.4	27.1	26.8	23.9	31.0	29.0	28.9	29.7	26.0	27.7	24.8	28.1
ISS 16-24	49.5	45.5	49.0	34.4	40.7	39.3	42.6	44.2	43.0	42.6	45.9	41.8	43.4	45.7	42.9	40.2
ISS 25-40	34.6	36.4	23.1	34.4	26.0	27.9	23.9	22.9	21.6	21.9	22.6	25.1	27.4	24.3	28.8	29.6
ISS 41-75	3.7	2.6	4.9	5.2	6.9	5.7	6.7	9.0	4.4	6.5	2.6	3.4	3.2	2.3	3.5	2.1

Table 4. Proportion of In-hospital Injuries by ISS Range, Age and Gender, 2016-17

INJURIES SUSTAINED

The proportion of injuries sustained by state and territory is shown in Table 5. The *multiple injuries, burns or other* was the most prevalent category followed by *head injuries* (*isolated head injures* and *head and other associated injuries* combined).

State/Territory	Multiple injuries, burns or other (excluding serious neurotrauma)	Head and other associated injuries	Isolated head injury	Extremity and/or spine injuries only	Chest and/or abdominal injuries only	Serious spinal cord injury
A	56.3	24.7	8.6	5.0	3.6	1.8
B	39.1	24.1	20.2	7.5	5.6	3.5
C	40.3	20.8	18.8	10.7	6.7	2.7
D	46.5	26.7	10.6	7.9	4.8	3.6
E	44.5	20.0	14.2	10.1	7.3	3.9
F	42.7	28.5	12.4	9.2	5.2	2.0
G	37.0	30.7	14.5	7.3	5.4	5.0

Table 5. Proportion of Injuries Sustained, by State/Territory, 2016-17

Multiple injuries, burns or other = includes multiple body region injuries (excluding serious neurotrauma), burns and other injuries that do not fit into any of the other groups.

Head and other associated injuries = head injury with AIS > 2 in addition to another injury.

Isolated head injury = head injury with AIS > 2 and no other injury with AIS > 1

Extremity and/or spine injuries only = extremity injury with AIS > 1 and/or spine injury with AIS 2 or 3 and no other injury with AIS > 1

Chest and/or abdominal injuries only = chest and/or abdominal injury with AIS > 2 and no other injury with AIS > 1

Serious spinal cord injury = spinal cord injury with AIS > 3 with or without other injuries

MODE OF TRANSPORT

Two-thirds of all severely injured were transported directly from the scene to definitive care, similar to the 2015-16 financial year. Of those transported direct, 65 percent arrived via road ambulance, 11.1 percent via helicopter and 14 percent via private vehicle. These were the three most common forms of transport, accounting for over 90 percent of transport.

Hospital	Road Ambulance	Helicopter Ambulance	Private Vehicle	Other	Unknown
National	76.2	16.7	4.6	0.9	1.6
A	72.9	23.0	4.1	0.0	0.0
AA	72.8	19.6	4.9	0.5	2.2
AB	80.2	5.1	7.1	7.5	0.0
B	76.9	15.4	7.7	0.0	0.0
C	79.5	13.4	6.6	0.3	0.3
D	77.9	15.3	5.9	0.0	0.9
E	80.0	14.4	4.4	0.5	0.8
F	67.5	22.5	10.0	0.0	0.0
G	77.0	17.7	5.0	0.3	0.0
H	92.2	0.4	7.5	0.0	0.0
I	92.6	0.0	7.4	0.0	0.0
J	44.4	33.3	16.7	5.6	0.0
K	68.5	22.8	0.9	0.9	6.9
L	29.1	49.1	16.4	5.5	0.0
M	69.4	26.9	2.7	0.6	0.4
N	88.2	9.5	2.0	0.3	0.0
O	76.9	12.1	4.8	0.8	5.4
R	72.7	9.1	9.1	3.0	6.1
T	77.2	17.5	0.9	2.2	2.2
U	69.9	19.0	10.5	0.7	0.0
V	37.5	12.5	25.0	0.0	25.0
W	78.7	20.1	0.9	0.3	0.0
X	73.3	0.0	26.7	0.0	0.0
Z	79.7	1.7	16.1	0.8	1.7

Table 6. Mode of Transport from Scene to Definitive Care by Hospital

TIME FROM SCENE TO EMERGENCY DEPARTMENT

Time to the ED was only analysed for patients conveyed directly from scene to definitive care. The median time from scene to definitive care was one hour 30 minutes, similar to the previous financial year.

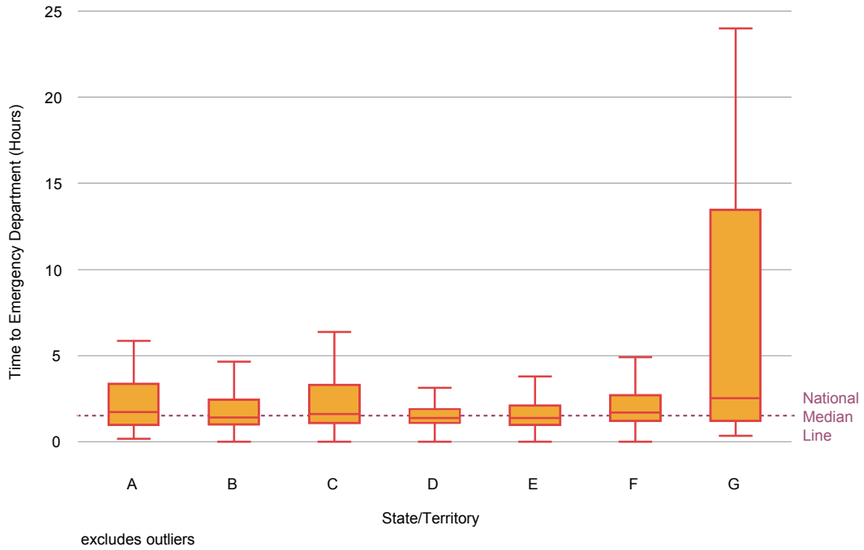
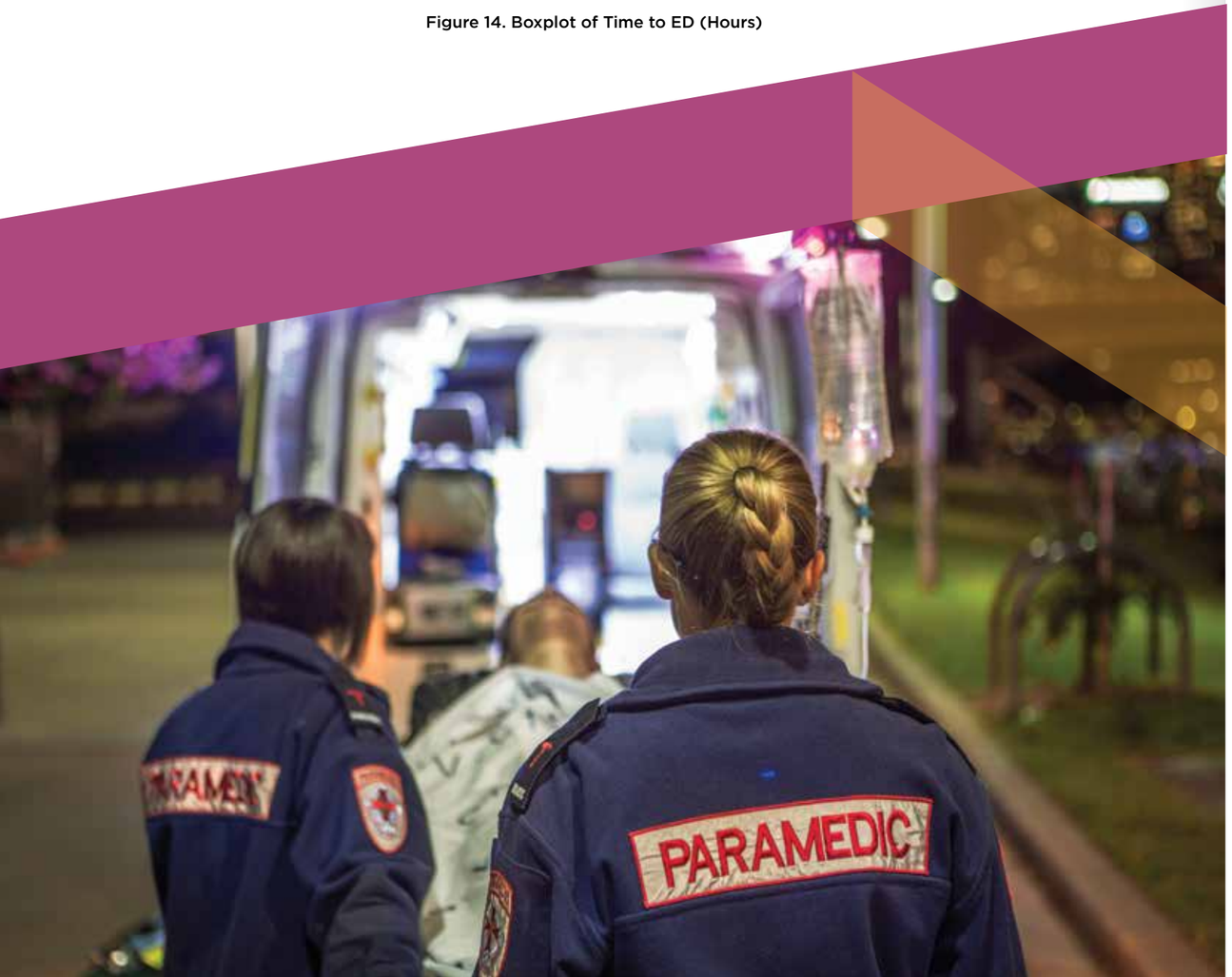


Figure 14. Boxplot of Time to ED (Hours)



IN-HOSPITAL INDICATORS

TIME IN EMERGENCY DEPARTMENT

Time spent in the ED varied between states and territories. The national median time in ED was four hours and 16 minutes.

The National Healthcare Agreement, 2018, states the importance of emergency department care remaining within 4-hours is a key performance indicator for improved outcomes.

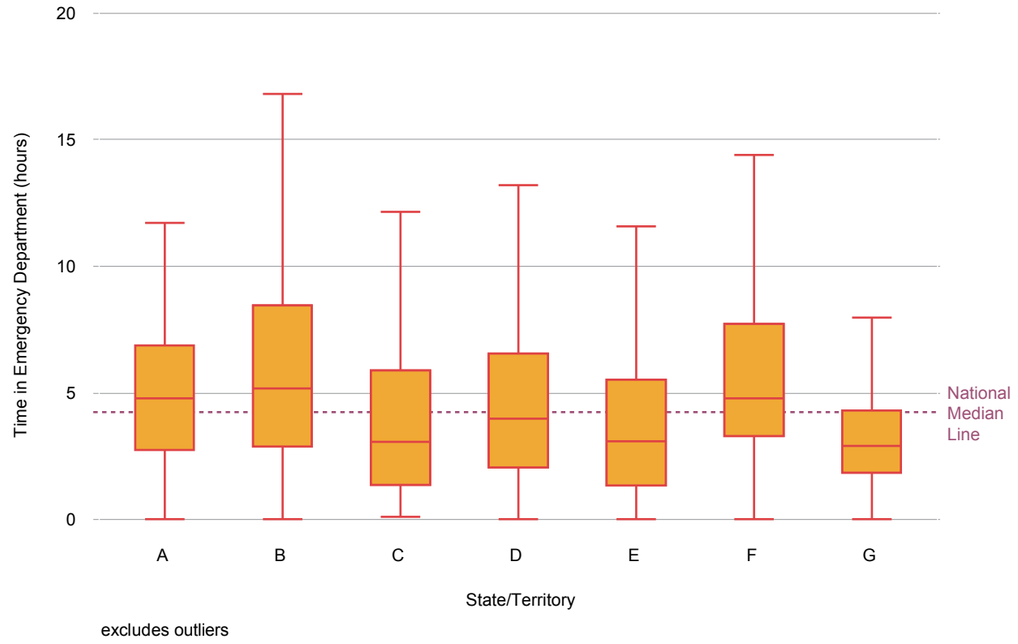


Figure 15. Boxplot of Time Spent in ED

HOSPITAL LENGTH OF STAY (LOS) AND INTENSIVE CARE UNIT LENGTH OF STAY (ICULOS)

The national median hospital LOS was seven days and the national median ICULOS was four days.

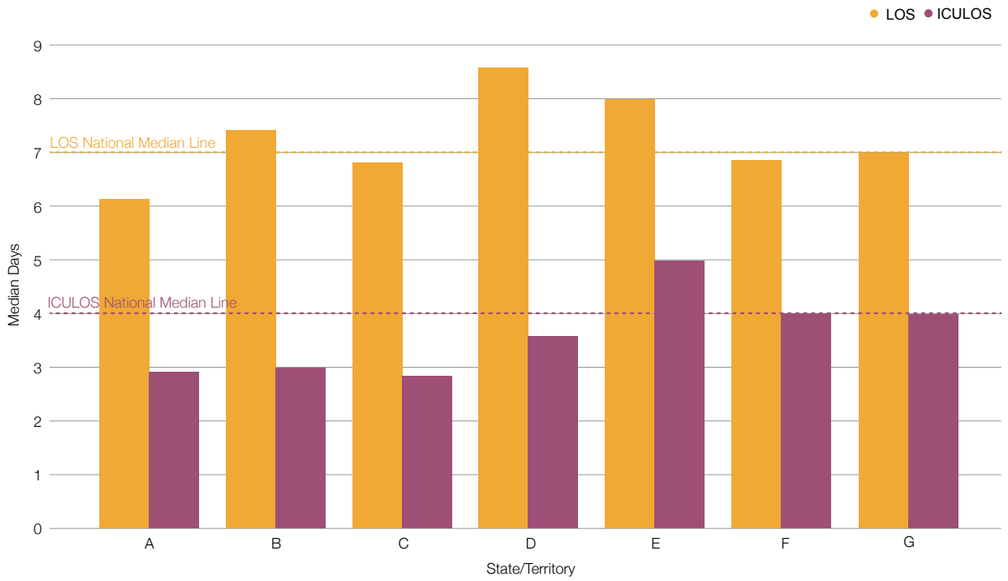


Figure 16. Median LOS and ICULOS (in Days) by State

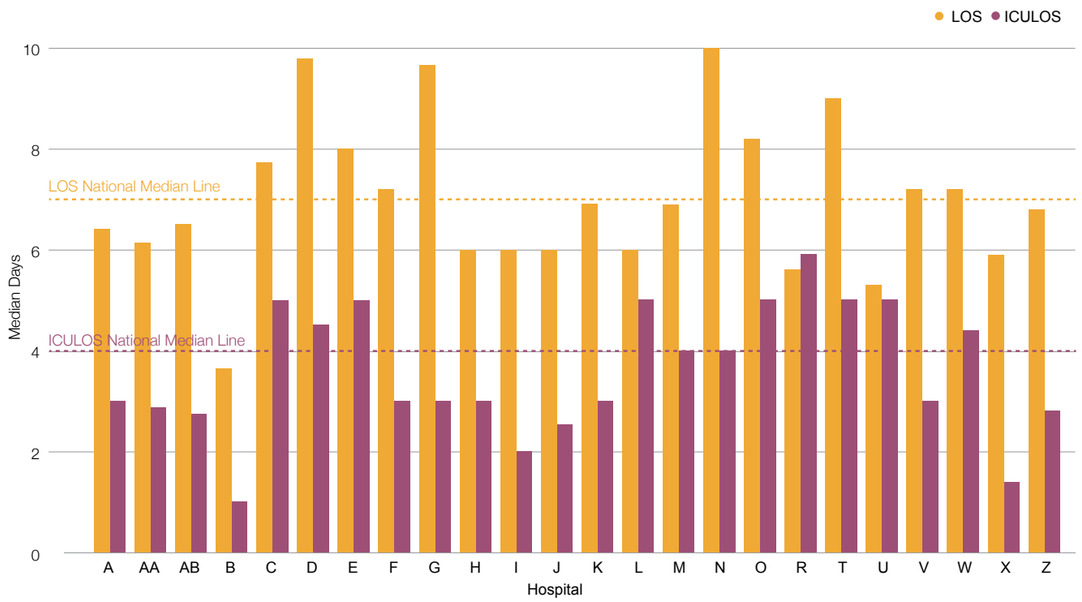


Figure 17. Median LOS and ICULOS by Hospital

OUTCOMES

The outcome collected by the ATR is the discharge destination, including deaths. Discharge destination was provided for 8,284 patients (out of 8,423).

MORTALITY

Eight hundred and ninety seven severely injured people died in-hospital with a national mortality rate of 10.6 percent, similar to the previous financial year.

By Age Range

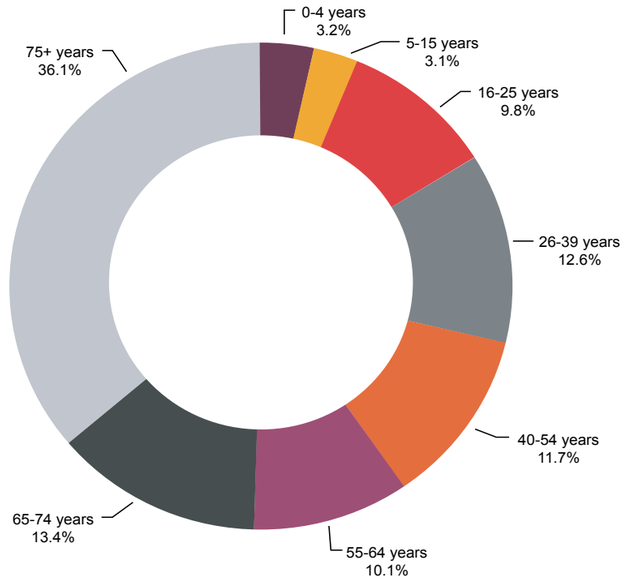


Figure 18. Mortality by Age Range

When mortality rates were looked at in terms of proportion of deaths within each age group, a different trend emerged. Despite the national mortality rate sitting at 10.6 percent, the rate is disproportionately higher for the 0-4 age group and the 75+ age group (Figure 19), affecting the overall mortality rate.

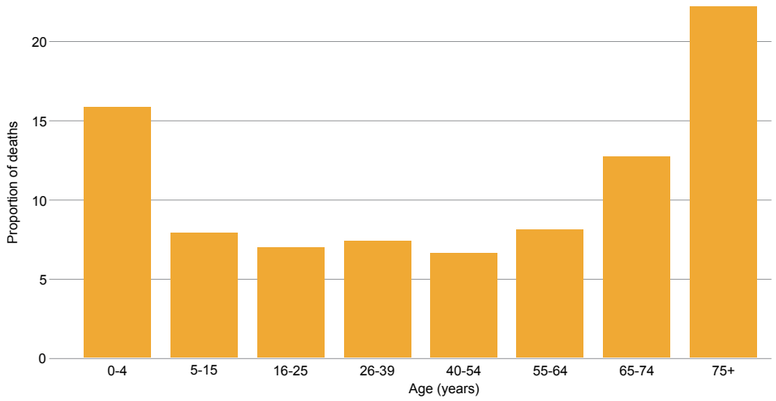


Figure 19. Proportion of deaths by age range

22% of
seriously injured
75+ YEAR OLDS
died in-hospital

By Gender

The greatest number of deaths by gender is seen in the 75+ age group for both males and females (Figure 20).

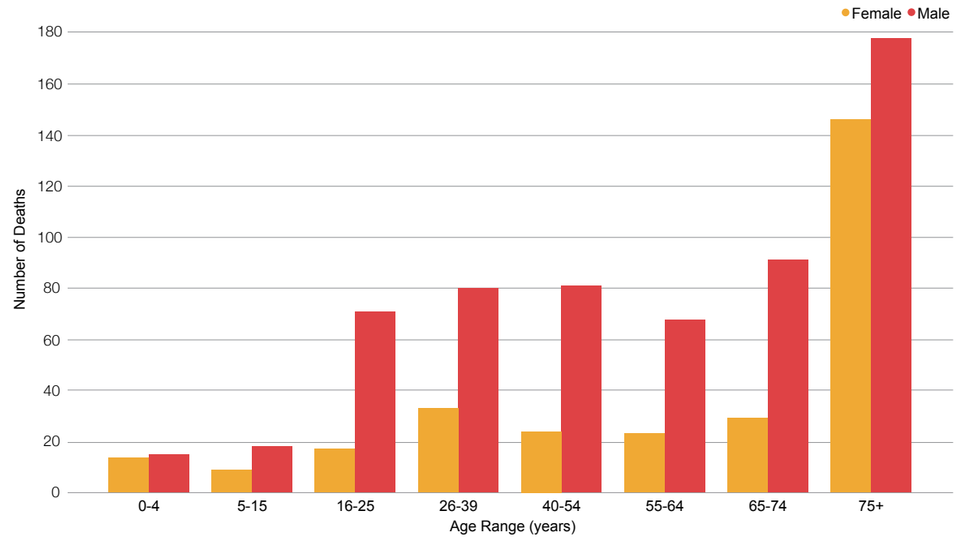


Figure 20. Number of Deaths by Age Range and Gender

By Hospital

The proportion of deaths by hospital in the 2016-17 financial year varied compared to the previous financial year. Figure 21 shows both the 2016-17 mortality rates by hospital and also the variation between years (Table 7).

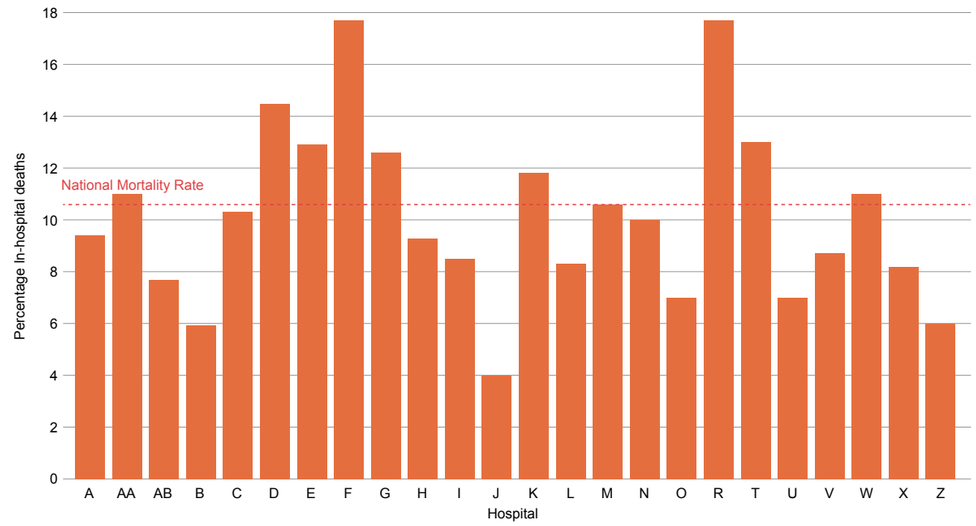


Figure 21. Percentage of In-hospital Deaths by Hospital

Finacial Year	A	AA	AB	B	C	D	E	F	G	H	I	J	K	L	M	N	O	R	T	U	V	W	X	Z
2016-17	9.4	11.0	7.7	5.9	10.3	14.5	12.9	17.7	12.6	9.3	8.5	4.0	11.8	8.3	10.6	10.0	7.0	17.7	13.0	7.0	8.7	11.0	8.2	6.0
2015-16	10.6	6.1	7.7	5.6	11.2	11.3	13.0	10.6	11.5	12.5	9.4	9.1	8.9	5.4	11.1	9.1	7.8	13.3	11.0	7.5	5.7	9.4	4.1	12.3

Table 7. Comparison of the proportion of deaths by hospital

1 in 4
deaths caused by
TRANSPORT
RELATED TRAUMA

Median ISS
for in-hospital
DEATHS: 26

43% 0-15 yo
deaths were
AGED 0-2

14.2%
in-hospital
DEATHS
died in ED

DISCHARGE DESTINATION

The discharge destination data presented in this report excluded the 897 in-hospital deaths from analysis. Of the remaining 7,526 severely injured, 94 percent were discharged to home, rehabilitation or to a hospital for convalescence. This was an increase on the previous financial year by three percent. Below shows the discharge destinations by proportion for each hospital.

	Home	Rehabilitation	Hospital for Convalescence	Residential Aged Care	Left Against Medical Advice	Acute Hospital for Further definitve care	Special Accommodation	Other	Unknown
National	62.4	23.9	5.9	1.4	0.6	1.1	0.5	2.4	1.8
A	64.7	13.2	15.5	1.2	0.0	1.4	1.7	0.0	2.3
AA	67.1	2.1	19.7	3.9	3.0	0.0	1.7	0.9	1.6
AB	77.0	8.7	0.0	0.7	1.7	10.8	0.4	0.0	0.7
B	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C	85.5	6.4	1.9	0.3	0.0	1.1	1.1	1.6	2.1
D	55.5	24.6	8.8	3.3	0.0	2.6	1.5	0.0	3.7
E	71.9	18.5	2.5	3.2	0.0	0.9	1.9	0.7	0.4
F	83.9	8.9	0.0	0.0	0.0	1.8	3.6	1.8	0.0
G	53.6	28.9	14.9	0.7	0.0	0.7	0.7	0.0	0.5
H	72.1	11.7	11.3	1.4	0.0	1.1	0.7	0.0	1.7
I	64.0	19.3	3.7	4.4	0.0	0.0	1.2	7.4	0.0
J	93.8	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.0
K	47.6	46.0	5.9	0.5	0.0	0.0	0.0	0.0	0.0
L	75.8	19.2	3.0	0.0	0.0	0.0	0.0	2.0	0.0
M	51.5	43.9	0.5	1.0	0.0	0.0	0.0	3.1	0.0
N	73.1	9.7	0.0	0.5	2.7	0.0	0.2	7.5	6.3
O	58.2	25.7	0.0	2.5	0.0	0.0	0.0	13.6	0.0
R	85.7	4.8	3.6	0.0	0.0	0.0	0.0	5.9	0.0
T	59.4	22.7	10.4	0.3	0.0	0.0	0.0	2.3	4.9
U	63.8	16.7	16.7	0.0	0.0	0.0	0.0	2.8	0.0
V	85.7	0.0	4.8	0.0	0.0	0.0	0.0	0.0	9.5
W	58.9	21.7	8.0	2.3	2.1	0.0	0.0	0.9	6.1
X	95.5	0.0	3.0	1.5	0.0	0.0	0.0	0.0	0.0
Z	57.9	17.1	2.9	0.0	5.0	15.7	0.0	0.7	0.7

Table 8. Discharge Destination by Hospital (%)

FOCUS GROUP – TRANSPORT-RELATED TRAUMA

There has been an increased focus on the incidence of road trauma, reflecting the National Road Safety Strategy 2011-2020 (NRSS) target of reducing the annual number of deaths and serious injury (hospitalisations) on the roads by 30 per cent by 2020. The NRSS target is a joint strategy signed by the Australian, State and Territory governments.

Forty-five percent of all in-hospital severe injuries were caused by transport-related trauma, both on-road and off-road, which is consistent over the past three financial years.

IN-HOSPITAL FACTS BY CAUSE

1,641 MOTOR VEHICLE OCCUPANTS

64% MALE

MEDIAN AGE 41

Increase in **collisions** on Fri-Sat by **OVER 20%***

89% ON-ROAD

7.5% DIED **in-hospital**

1,071 MOTOR CYCLISTS

94% male

ON-ROAD MEDIAN AGE 40

OFF-ROAD MEDIAN AGE 31

78% ON-ROAD

2.5 x more injuries **ON SATURDAY***

4.3% DIED **in-hospital**

479 PEDAL CYCLISTS

90% male

ON-ROAD MEDIAN AGE 49

OFF-ROAD MEDIAN AGE 41

76% ON-ROAD

ONE OFF-ROAD cycling death

2.1% DIED **in-hospital**

421 PEDESTRIANS

59% MALE

26-39 year olds MOST AT RISK

MEDIAN AGE 44

69% ON-ROAD

13% DIED **in-hospital**

27% deaths AGED 75+

*Compared with the Monday to Thursday average

TRANSPORT-RELATED INJURY BY FINANCIAL YEAR

Incidence of transport-related injuries for 2016-17 was similar to 2015-16 (Figure 22.) In contrast to previous years, the data for these two financial years was comparable, as the data was complete and the number of participating hospitals was unchanged.

Each year there are injuries which cannot be identified as either on-road or off-road. This accounted for 5.3 percent of transport-related injuries in 2016-17. Whilst the number of unknowns continues to decrease each year, a large proportion (70 percent) are pedestrians, which makes it more challenging to interpret the pedestrian data.

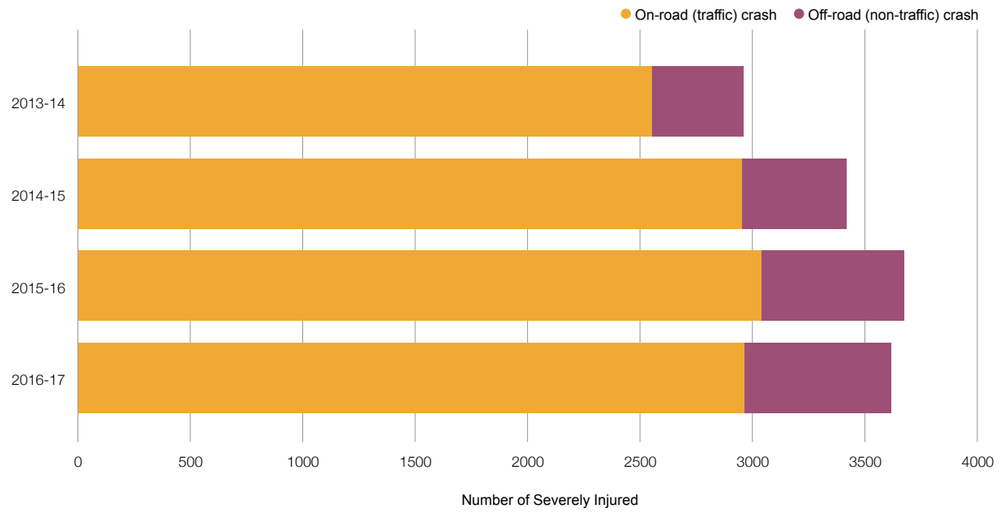


Figure 22. On-road and Off-road Injuries by Financial Year

FOCUS GROUP – TRANSPORT-RELATED TRAUMA

TRANSPORT-RELATED INJURY BY LOCATION AND CAUSE

On-road injuries for pedal cyclists and pedestrians increased in 2016-17 whilst motor vehicle and motor cycle decreased. Off road motor cyclist and pedestrian injuries increased whilst off-road motor vehicle remained constant and pedal cyclist decreased.

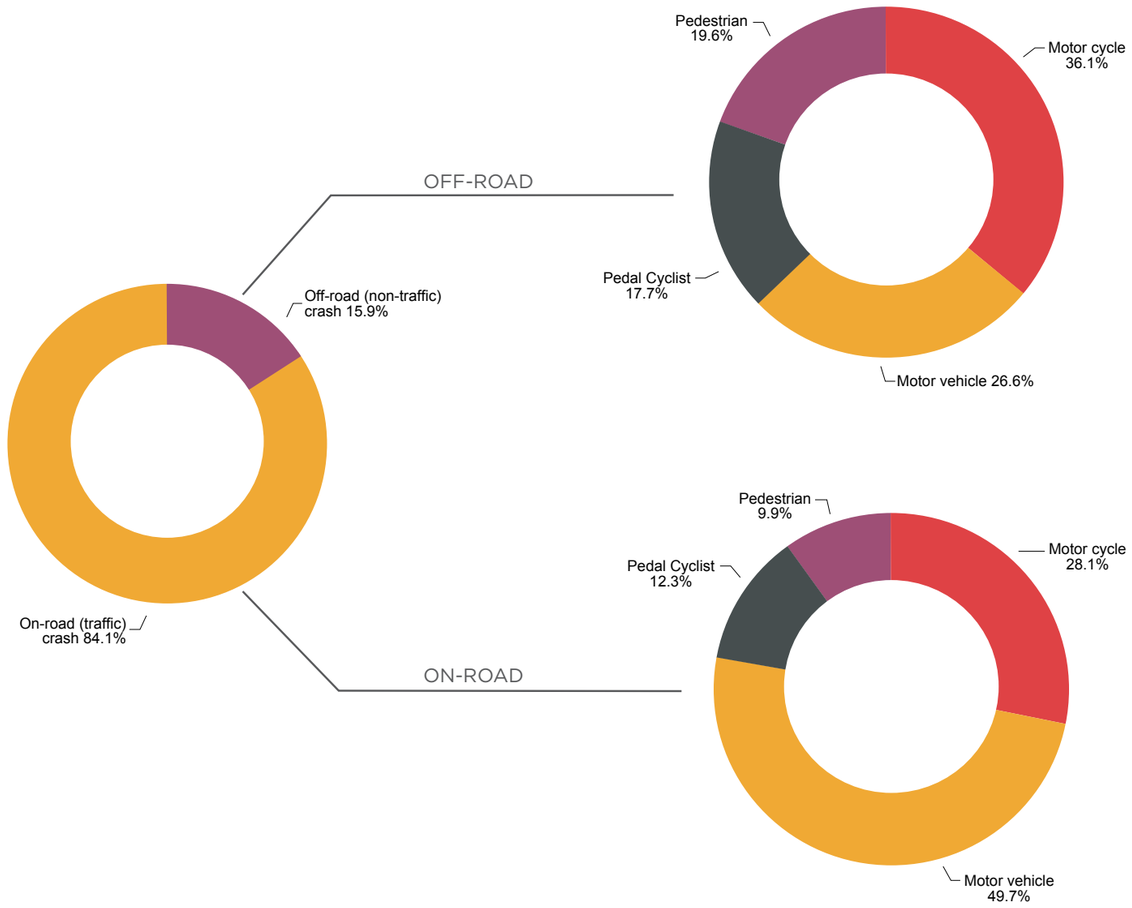


Figure 23. Breakdown of Transport-related Injury by Road User

FOCUS GROUP – FALLS

Falls accounted for 35 percent of all severe injuries. High falls increased this financial year by 21.7 percent whereas low falls fell by 3.6 percent. High falls accounted for 15.1 percent of total severe injuries and low falls accounted for 19.8 percent of total severe injuries. Twenty-two percent of high falls were a result of falls from ladders.

HIGH FALLS

in-hospital MORTALITY 9.4%

57% high fall IN-HOSPITAL DEATHS WERE AGED 65+

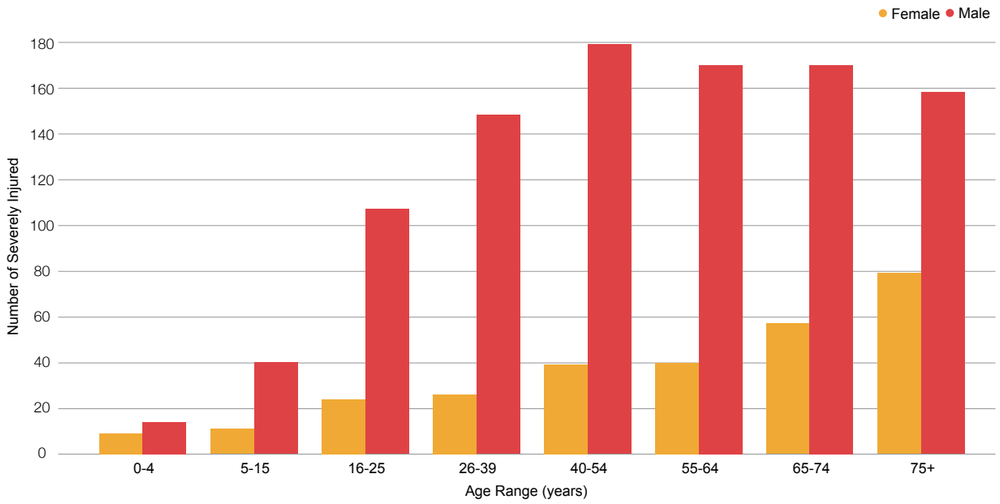


Figure 24. Incidence of High Falls by Gender

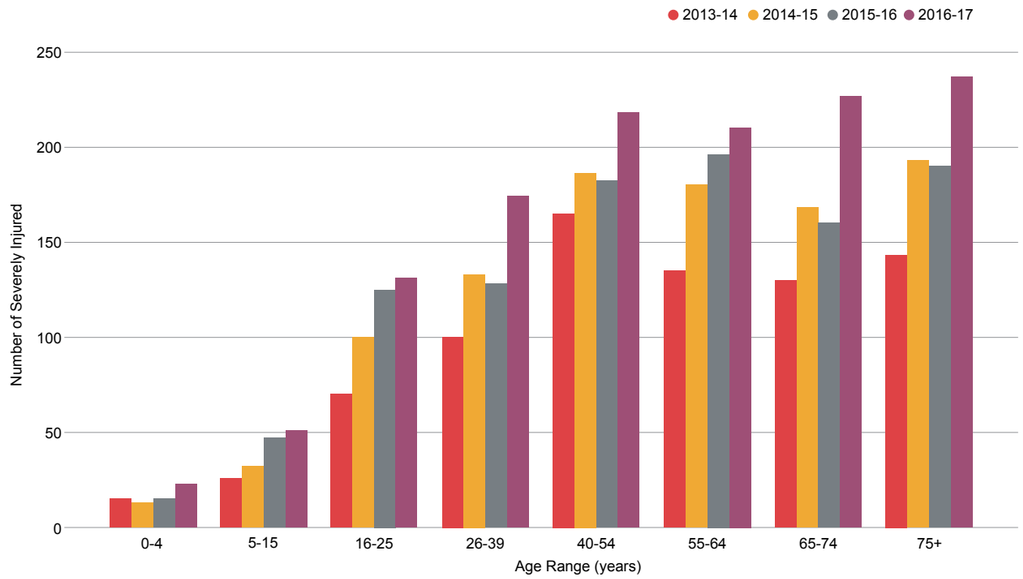


Figure 25. High Falls by Age Range and Financial Year

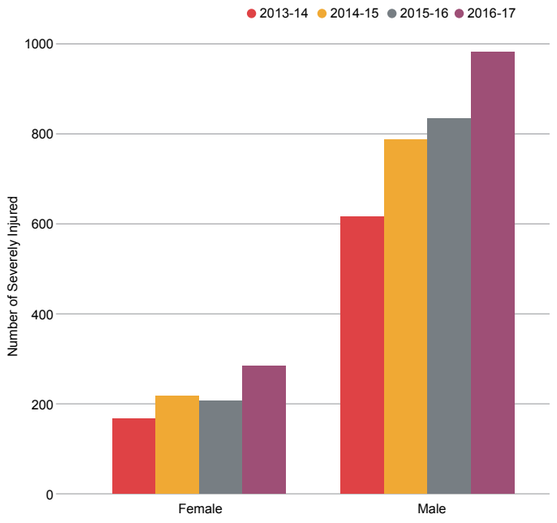


Figure 26. High Falls by Gender and Financial Year

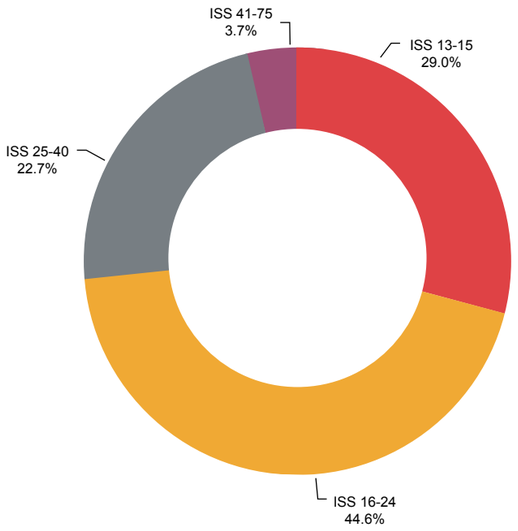


Figure 27. High Falls by ISS Range

FOCUS GROUP – FALLS

LOW FALLS

Seventy percent of low falls with known place of injury occurred in the home (includes residential institution), with this number increasing for the 75+ age range (82 percent) and 0-4 age range (90 percent).

in-hospital MORTALITY 16.4%

84% low fall IN-HOSPITAL DEATHS WERE AGED 65+

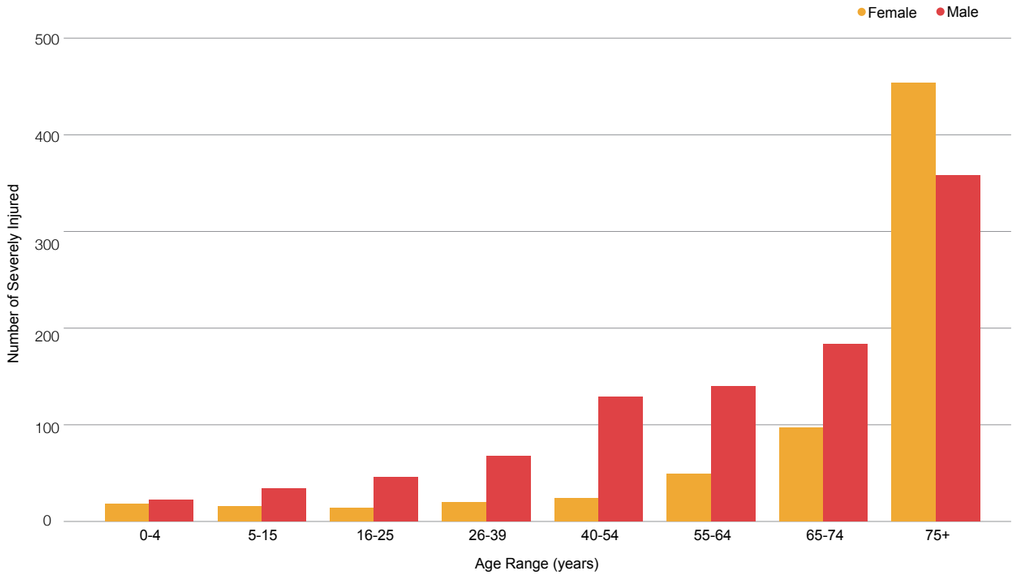


Figure 28. Incidence of Low Falls by Gender

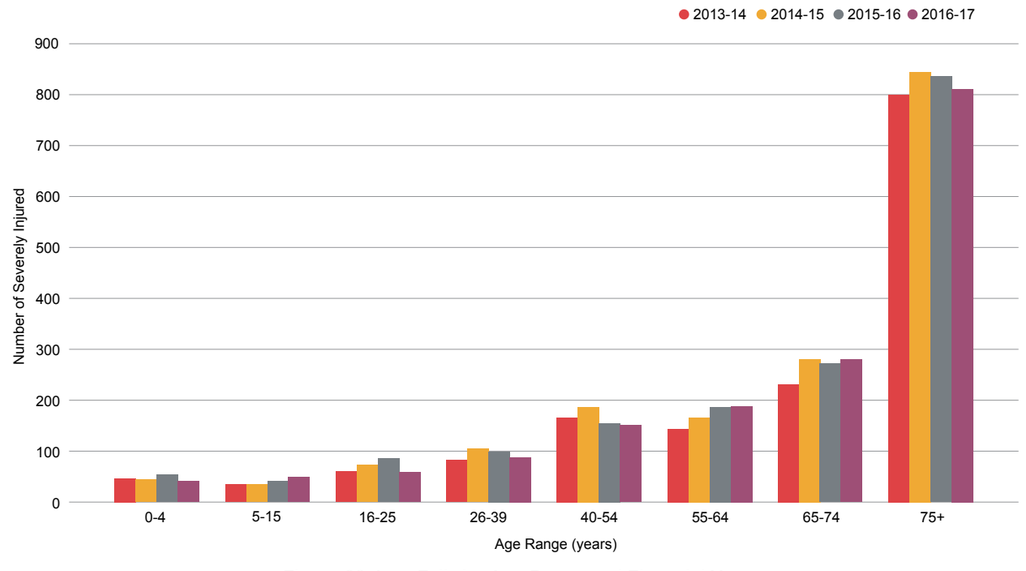


Figure 29. Low Falls by Age Range and Financial Year

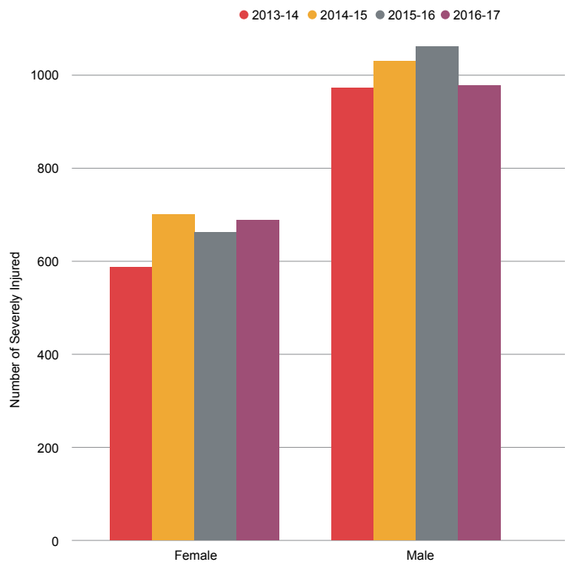


Figure 30. Low Falls by Gender and Financial Year

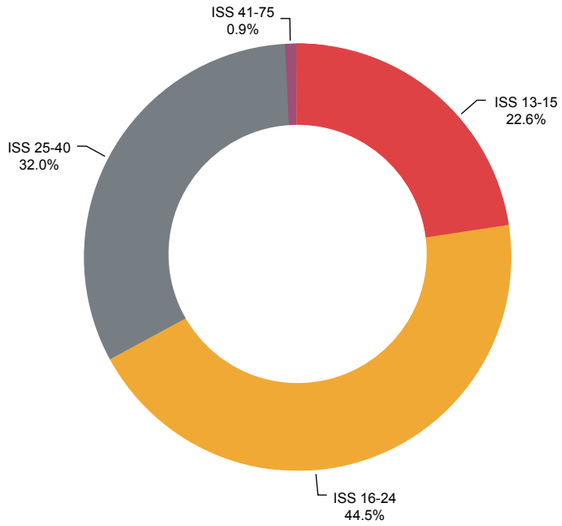


Figure 31. Low Falls by ISS Range

APPENDIX A

ATR STEERING COMMITTEE MEMBERSHIP

Member	Committee Role
Professor Mark Fitzgerald	Co-chair/Alfred Health/NTRI representative
Professor Kate Curtis	Co-chair/University representative
Ms Bronte Martin	National Critical Care & Trauma Response Centre (NCCTRC) Executive Sponsor
Mr Chris Clarke	South Australia representative
Professor Cliff Pollard	Queensland representative
Dr David Read	Northern Territory representative
Dr Oran Rigby	New South Wales representative
Dr Grant Christey	New Zealand representative
Dr John Crozier	Royal Australasian College of Surgeons representative
Professor Michael Reade	Australian Defence Fore representative
Mr Nick Rushworth	Consumer representative
Dr Sandy Zalstein	Tasmania representative
Dr Sudhakar Rao	Western Australia representative
Professor Peter Cameron	University representative
Associate Professor Anthony Joseph	Australasian Trauma Society representative
Professor Rodney Judson	Victoria representative
Dr Ian Civil	New Zealand Major Trauma Registry representative
Dr Joseph Matthew	Australasian College of Emergency Medicine representative
Ms Rebekah Ogilvie	Australian Capital Territory representative
Ms Jane Ford	Manager, Australian Trauma Registry
Proxies, Adjuncts and Observers	
Ms Kathleen McDermott	NCCTRC
Associate Professor Kirsten Vallmuur	Queensland representative
Ms Emily McKie	Australian Trauma Registry
Ms Siobhan Isles	New Zealand Major Trauma Registry representative

MANAGEMENT COMMITTEE MEMBERSHIP

Member	Committee Role
Professor Mark Fitzgerald	Co-chair/Alfred Health/NTRI representative
Professor Kate Curtis	Co-chair/University representative
Professor Cliff Pollard	State Trauma representative
Mr Roy Chow	Finance representative
Professor James Harrison	Consultant expert, Australian Institute of Health & Welfare
Professor Belinda Gabbe	Monash University representative
Ms Sue McLellan	Monash University representative
Ms Mimi Morgan	Monash University representative
Professor Peter Cameron	Monash University representative
Ms Jane Ford	Australian Trauma Registry representative
Ms Emily McKie	Australian Trauma Registry representative

APPENDIX B

BI-NATIONAL TRAUMA MINIMUM DATASET FOR AUSTRALIA AND NEW ZEALAND (BNMTDS) - CORE DATA ITEMS

(VERSION 1.5, JULY 2016)

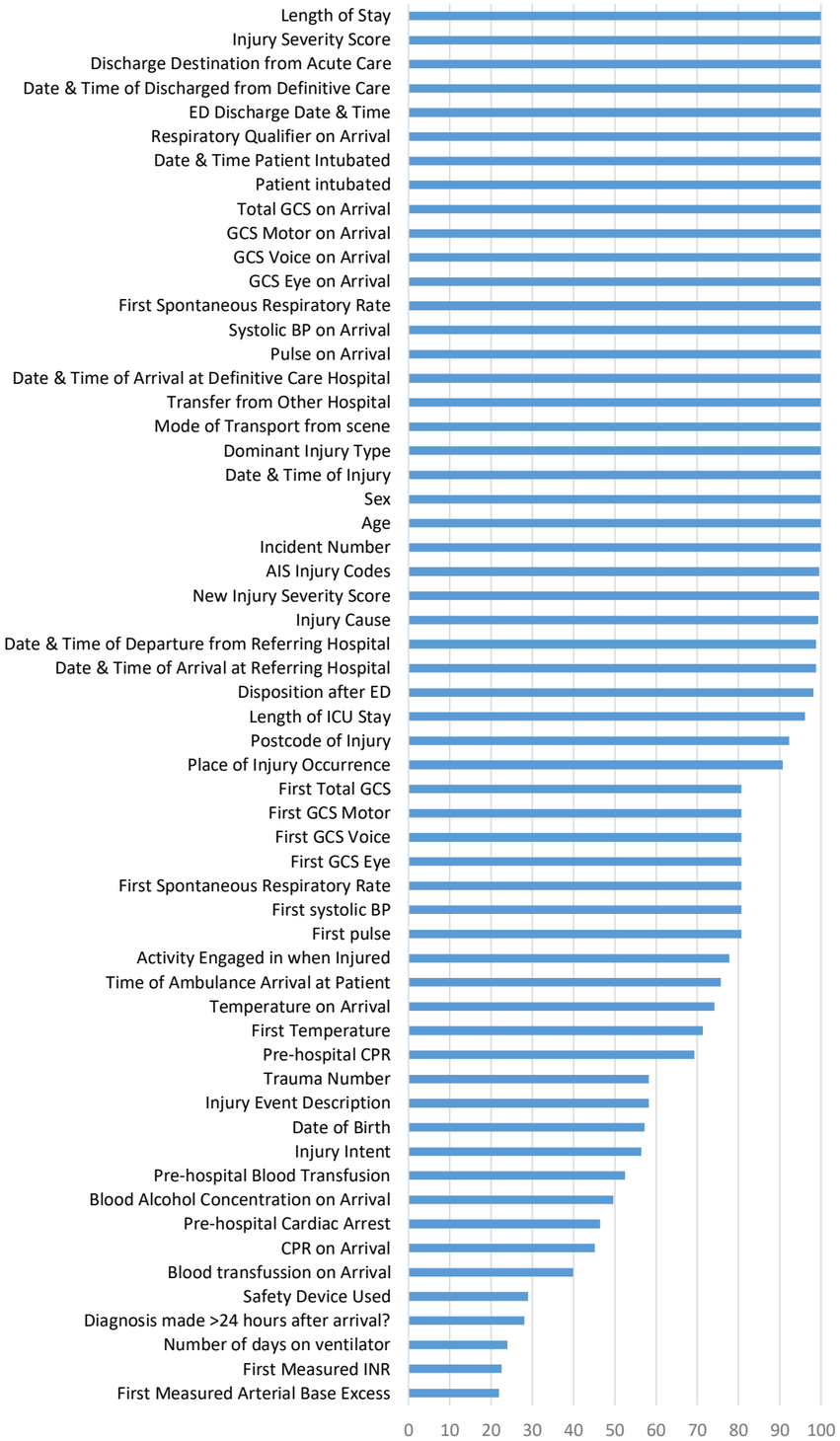
- Institution
- Trauma Number
- Incident Number
- Date of Birth
- Age
- Sex
- Pre-injury Co-morbidities
- Date & Time of Injury
- Injury Cause
- Dominant Injury Type
- Postcode of Injury
- Injury Intent
- Place of Injury Occurrence
- Activity engaged in when Injured
- Injury Event Description
- Safety Devices Used
- Mode of Transport from Scene
- Date & Time of Ambulance Arrival at Patient
- Transfer from Other Hospital
- Referring Hospital
- Date & Time of Arriving at Referring Hospital
- Date & Time of Departure from Referring Hospital
- Mode of Transport from Referring Hospital to Definitive Care
- Pre-hospital Blood Transfusion
- Pre-hospital CPR
- Pre-hospital Cardiac Arrest
- First Pulse
- First Systolic Blood Pressure
- First Spontaneous Respiratory Rate
- First Temperature
- First GCS Eye
- First GCS Voice
- First GCS Motor
- First Total GCS
- Date & Time of Arrival at Definitive Care Hospital
- Pulse on Arrival
- Systolic Blood Pressure on Arrival
- Respiratory Rate on Arrival
- Temperature on Arrival
- GCS Eye on Arrival
- GCS Voice on Arrival
- GCS Motor on Arrival
- Total GCS on Arrival
- CPR on Arrival
- Blood transfusion on Arrival
- Patient Intubated
- Respiratory Qualifier on Arrival
- Blood Alcohol Concentration on Arrival
- First Measured Arterial Base Excess
- First Measured INR
- ED Discharge Date & Time
- Disposition After ED
- Diagnosis made >24 hours after arrival?
- Date & Time CT Performed
- CT Type
- Operative Procedures in OR
- Operation Date & Time
- Number of Days on Ventilator
- AIS Injury Codes
- Date & Time of Discharge from Definitive Care
- Discharge Destination from Acute Care
- Injury Severity Score
- Length of Stay
- Length of ICU Stay
- Severe Complications

Download the full data dictionary at https://www.ntri.org.au/australian-trauma-quality-improvement-program-and-the-australian-trauma-registry

APPENDIX C

COMPLETENESS

The completeness report below indicates the proportion of complete data for each variable, providing an accurate view of data completeness.



ABBREVIATIONS

AIS	Abbreviated Injury Scale 2005 (update 2008)
ATR	Australian Trauma Registry
AusTQIP	Australian Trauma Quality Improvement Program
BNTMDS	Bi-National Trauma Minimum Dataset of Australia and New Zealand
DOH	Department of Health
DIRDH	The Department of Infrastructure, Regional Development and Cities
ED	Emergency Department
EDLOS	Emergency Department Length of Stay
FY	Financial Year
ICD-10	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision
ICU	Intensive Care Unit
ICU LOS	Intensive Care Unit Length of Stay
ISS	Injury Severity Score
LOS	Length of Stay
NTRI	National Trauma Research Institute
RACS	Royal Australasian College of Surgeons

ACKNOWLEDGEMENTS

The members of the Steering Committee and Management Committee.

The Registry and data managers who have collected and submitted data to the ATR and have been the first points of contact for ATR data management:

Mr Ben Gardiner; Ms Elissa Scriven; Ms Maxine Burrell; Ms Olivia Zheng; Mr Huat Hock Lim; Ms Nicole Gregory; Ms Lauren Harvey; Mr Hardeep Singh; Ms Amy Harney; Mr Cameron Palmer; Ms Helen Thomas; Ms Sue McLellan; Ms Tani Thomas; Mr Joseph Sharpe; Mr Andrew Keygan; Ms Christine Allsopp; Ms Amie Harman; Dr Denise Beaudequin; Ms Deb Wood; Ms Jacqui Winters; Ms Kath McDermott; Ms Kellie Gumm; Ms Karon McDonnell; Ms Louise Niggemeyer; Ms Tona Gillen; Ms Rebekah Ogilvie.

The New Zealand Major Trauma National Clinical Network, particularly Dr Ian Civil, National Clinical Lead and Ms Siobhan Isles, Programme Manager.

Grateful thanks also goes to the site investigators for their ongoing cooperation, and to all other contributors who have indicated their interest in the ATR.

Thanks to Jane Ford, the immediate past ATR Registry Manager, and to Ms Emily McKie and Dr Teresa Howard for the preparation of this report.

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IMAGE SOURCES

Ambulance Victoria: pages 31.

Ambulance New South Wales: page 37.

South Australia Health: pages 15 and 51.

St. John Ambulance Western Australia: pages 4 and 15.

The Alfred Hospital Melbourne: page 33.

AusTQIP

The Australian Trauma Registry is supported by funding from:

Australian Government
Department of Health

Australian Government
Department of Infrastructure, Regional Development and Cities
Bureau of Infrastructure, Transport and Regional Economics