ANNUAL REPORT

1 JULY 2015 TO 30 JUNE 2016

AUSTRALIAN TRAUMA REGISTRY

Management of the Severely Injured in Australia

national trauma research institute

MONASH University

ANNUAL **REPORT**
1 JULY 2015 TO 30 JUNE 2016

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Australian Trauma Registry

national trauma research institute

MONASH University

FOREWORD

Trauma is a significant burden to the Australian economy. In 2017 the Australian Automobile Association estimated the cost of road trauma alone at $30 billion a year, up from 27 billion in 2006[1]. In May 2016, the Senate enquiry into Aspects of road safety in Australia[2] made seventeen key recommendations, the first of which was to recommend that the Commonwealth Government commit to funding the operation of the Australian Trauma Registry. This prioritisation of registries with capacity to influence care was supported by the Royal Australasian College of Surgeons. In addition, in November 2016, the Australian Commission on Safety and Quality in Health Care prioritised trauma in its second highest clinical domain for clinical quality registry development[3].

In December 2016, the Prime Minister Malcolm Turnball, concerned about the number of Australians killed on the road and responding to the above recommendations, announced new funding for the Australian Trauma Registry to allow it to accurately track the progress of major injuries through the major trauma centres in Australia. Commonwealth funding was provided by the Department of Infrastructure, Regional Development & Cities and the Department of Health.

Operating since 2012, the Australian Trauma Registry (ATR) is a key component of the Australian Trauma Quality Improvement Program. It provides an annual report as the basis for understanding the burden and patterns of severe injury in Australia. This, the third annual report since the registry's inception in 2012, is the result of the collaboration of now 26 major trauma centres across the country, that together with the National Trauma Research Institute (NTRI) and Monash University have worked jointly to improve the care of the severely injured. The efforts of the Australian Trauma Society, the Royal College of Surgeons and all involved have been invaluable to the success of the program.

As the ATR continues to grow, we encourage sites other than level 1 trauma centres to contribute to the collaboration with the aim of capturing all major trauma cases in Australia. Last year we saw the merging of the Mater Children's Hospital and Royal Children's Hospital Brisbane, to form the Lady Cilento Children's Hospital. This year we welcomed the Gold Coast University Hospital in Queensland, improving the overall picture of Queensland's severely injured. Three further sites are planned to join in the near future as is the planned inclusion of the New Zealand Major Trauma Network, allowing for bi-national analysis of Australasian trauma systems. The future will also see data sharing and linkages with other agencies, to increase our knowledge of at risk population groups. The annual reports will continue to become more comprehensive and sophisticated as the registry matures, and in time, when the data are more complete, implementation of benchmarking strategies will be introduced.

Professor Mark Fitzgerald
Co-chair ATR Steering Committee

Professor Kate Curtis
Co-chair ATR Steering Committee

CONTENTS

2015-16 YEAR IN REVIEW

PATIENT

8,283 severely injured

median **AGE 47**

72% MALE

most injuries occured between **FRIDAY & Sunday**

MECHANISM

95% BLUNT trauma

4% penetrating **trauma** <1% BURNS

33% caused **by falls**

44% caused by transport related trauma

PLACE

46% occurred on **streets & highways** injuries

26% injuries occurred at home

ARRIVAL

67% direct from scene to definitive **HOSPITAL**

Median time from scene to definitive care 1hr 24mins

HOSPITAL

Median time **spent in ED 4hrs 13mins**

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

37% admitted **to ICU**

median ICU length of stay **4 DAYS**

OUTCOMES

827 in-hospital **deaths 1 in 10**

40% of deaths **aged 75+**

15.8% died in ED

62% discharge home

23% to rehabilitation

EXECUTIVE SUMMARY

In Australia today, injury is the leading cause of death in people aged less than 45 years[4]. Research has shown that improving trauma systems alone can reduce preventable death following injury by more than 50 percent. The Australian Trauma Registry (ATR) focusses 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. Twenty-six designated trauma centers have collaborated to provide meaningful national data to the ATR with 24 trauma centers providing data for this report.

This annual report is the third released by the ATR since the inception of the program in 2012, providing data on severe injuries (ISS>12 or in-hospital death following injury) from 1 July 2015 to 30 June 2016. The ATR collects in-hospital data so does not include severe injuries which died at scene or minor injuries.

In 2015-16 the ATR had 8,283 patients that met criteria. Men continued to over-represent severe injuries by more than two to one, except for patients aged 85 years or more, where there were more females than males, with low falls as the most predominant injury cause.

Ninety-five percent of severe injury was caused by blunt mechanisms with almost 80 percent resulting from transport-related injury and falls. Transport-related injuries accounted for 44 percent of cases, similar to the previous two financial years, while falls accounted for 33 percent of all injuries. 85 percent of transport-related trauma was on-road with motor vehicle as the dominant mechanism. Motor-cycles were more prominent in off-road crashes.

There were almost twice as many low falls than high falls and falls from ladders resulting in severe injury were most common in males aged 65 to 74 years. High falls were more prevalent for those aged 40 and above, and low falls for the 75+ age range. 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.

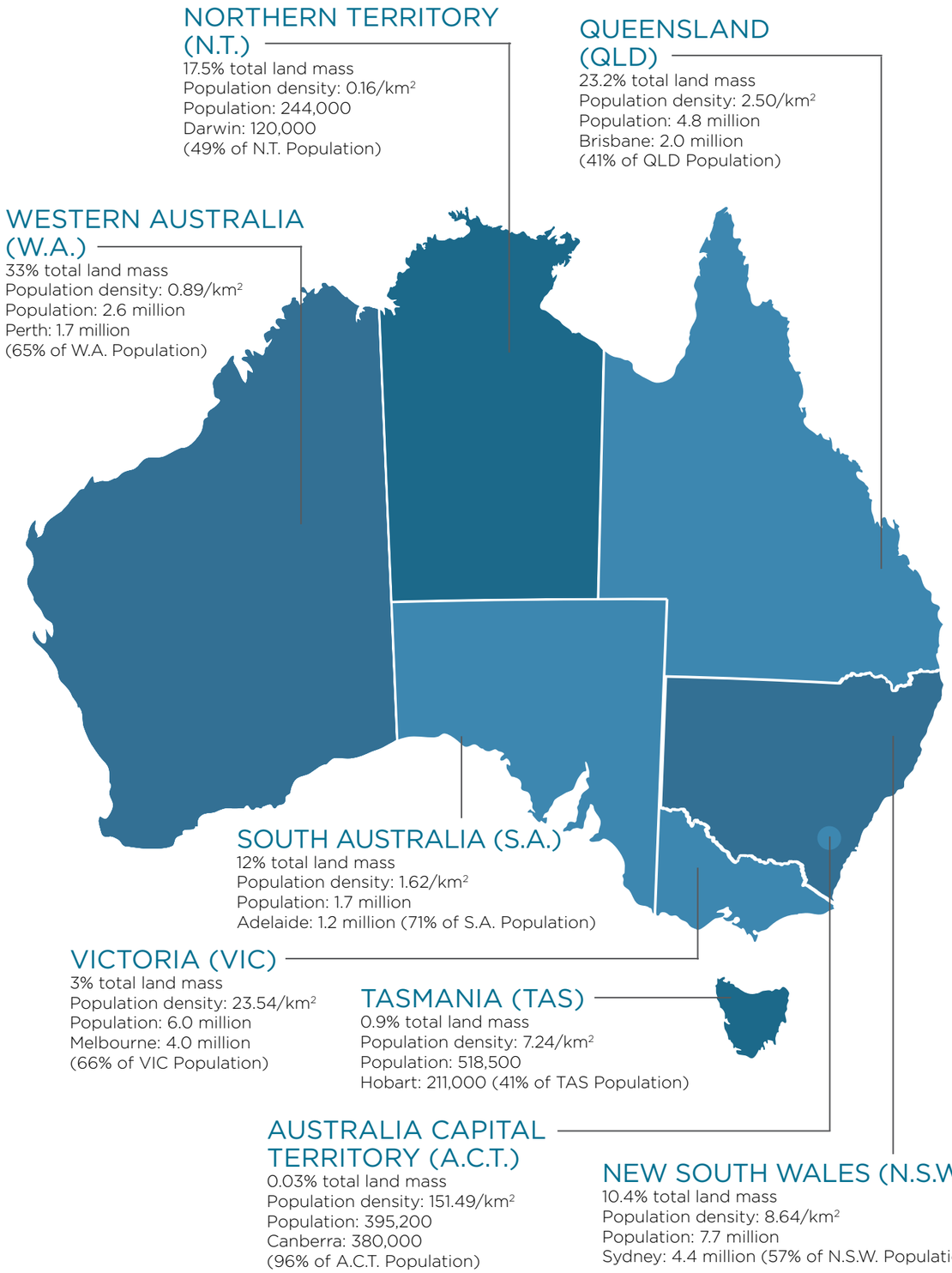
Two-thirds of severely injured were transferred from the scene directly to definitive care. Seventy-eight percent were transported directly from the scene to definitive care by road ambulance, 16 percent by helicopter and four percent arrived via private vehicle.

The median time from scene to arrival at definitive care was 1.4 hours, with a peak in hospital arrival time between 5pm to 8pm. The median time spent in the emergency department was four hours and 13 minutes. The median length of stay in hospital was 7 days and the median intensive care unit length of stay was 4 days. Overall mortality was 10 percent, with 15.8 percent of deaths occurring in ED.

At the conclusion of their acute episode of care most people were discharged to home (62 percent), or to rehabilitation (23 percent).

This report provides a *national view* of severe injury.

NATIONAL SNAPSHOT



NORTHERN TERRITORY (N.T.)
17.5% total land mass
Population density: 0.16/km²
Population: 244,000
Darwin: 120,000
(49% of N.T. Population)

QUEENSLAND (QLD)
23.2% total land mass
Population density: 2.50/km²
Population: 4.8 million
Brisbane: 2.0 million
(41% of QLD Population)

WESTERN AUSTRALIA (W.A.)
33% total land mass
Population density: 0.89/km²
Population: 2.6 million
Perth: 1.7 million
(65% of W.A. Population)

SOUTH AUSTRALIA (S.A.)
12% total land mass
Population density: 1.62/km²
Population: 1.7 million
Adelaide: 1.2 million (71% of S.A. Population)

VICTORIA (VIC)
3% total land mass
Population density: 23.54/km²
Population: 6.0 million
Melbourne: 4.0 million
(66% of VIC Population)

TASMANIA (TAS)
0.9% total land mass
Population density: 7.24/km²
Population: 518,500
Hobart: 211,000 (41% of TAS Population)

AUSTRALIA CAPITAL TERRITORY (A.C.T.)
0.03% total land mass
Population density: 151.49/km²
Population: 395,200
Canberra: 380,000
(96% of A.C.T. Population)

NEW SOUTH WALES (N.S.W.)
10.4% total land mass
Population density: 8.64/km²
Population: 7.7 million
Sydney: 4.4 million (57% of N.S.W. Population)

CONTRIBUTING SITES

ACT
Canberra Hospital (from 1 July 2014 to present)

QLD
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

NSW
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

NT
Royal Darwin Hospital

SA
Flinders' Medical Centre

Royal Adelaide Hospital

Women's and Children's Hospital, SA

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

VIC
Alfred Hospital

Royal Melbourne Hospital

Royal Children's Hospital

WA
Princess Margaret Hospital

Royal Perth Hospital

ABOUT THE ATR

Governance

The National Trauma Research Institute (NTRI) is a partnership between Alfred Health and Monash University that 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).

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.

Funding

The ATR is jointly funded 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.

Key Objectives & Outcomes

The ATR provides a system for monitoring the quality of trauma care provided in the pre-hospital and hospital system. A national registry provides an opportunity to streamline efforts and work towards reducing inconsistencies in care across services and States/Territories. By establishing a risk-adjustment model in the future, the ATR will be better positioned to calculate the true cost of trauma care and provide a platform for the development of service improvements to assist in the minimisation of preventable deaths and disability from major trauma.

Data Quality & Limitations

Collaboration members submit data based on the Bi-national Trauma Minimum Dataset for Australia and New Zealand (BNTMDS), in conjunction with individual hospital capabilities. In 2015-2016 the ATR welcomed the Gold Coast University Hospital to the collaboration, whilst Townsville and Hobart have not submitted data since 2012. One site was only able to contribute data for 11 of the 12 months. Many hospitals have undergone overhauls to their data systems, affecting both their ability to meet the ATR deadlines and submit the minimum dataset. Data completeness remains varied but continues to progress with each year due to improved quality improvement processes, putting the ATR in a position to report on further measures in coming reports. (Appendix B).

It is difficult to make comparisons between years at this stage due to an anticipated rise in numbers as new sites join the collaboration and provide an improved picture of overall national major trauma.

The ATR is currently limited to the sites that contribute data to the registry and as the ATR continues to increase the number of collaborators, it will reveal the true burden of injury across Australia. Currently, the ATR is in the process of incorporating New Zealand trauma data into the registry, becoming a bi-national 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 7 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
- Elderly (≥65 years of age) patients 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).

DEMOGRAPHICS

The 2015-16 financial year (FY) saw 8,283 severely injured episodes collected by the ATR. This was a 5 percent increase from the previous 2014-15 FY (n=7,888) and a 19 percent increase from the 2013-14 FY (n=6,968).

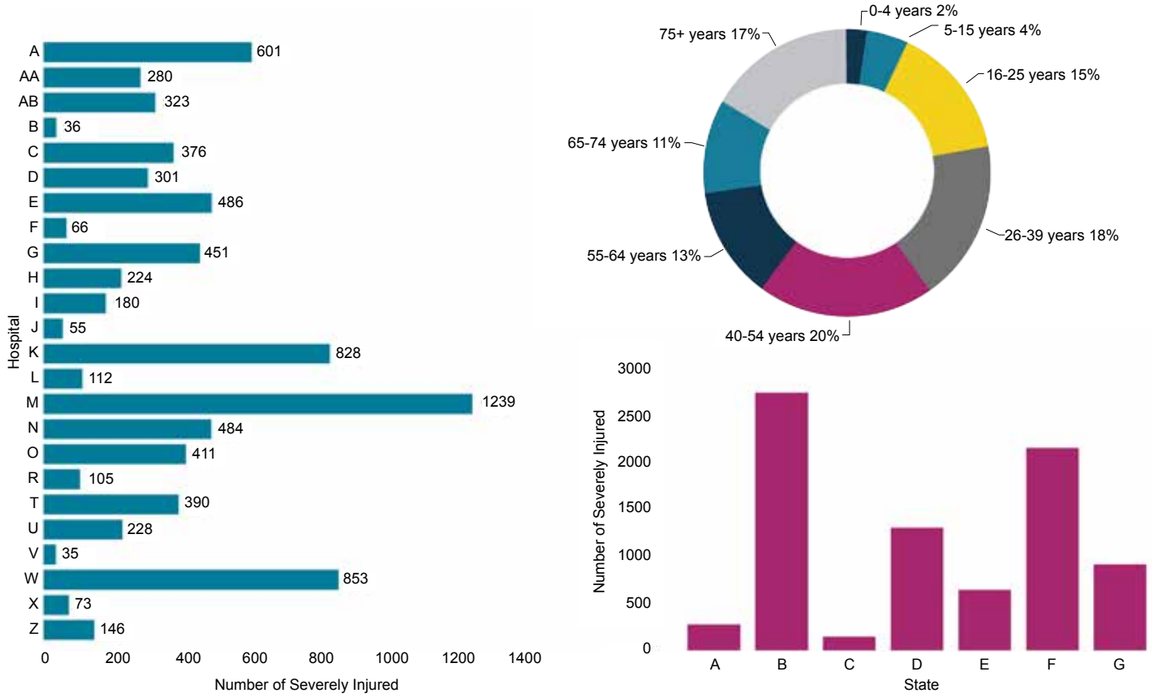


Figure 1. Severe Injury by hospital, State and age group, n=8,283

AGE AND GENDER

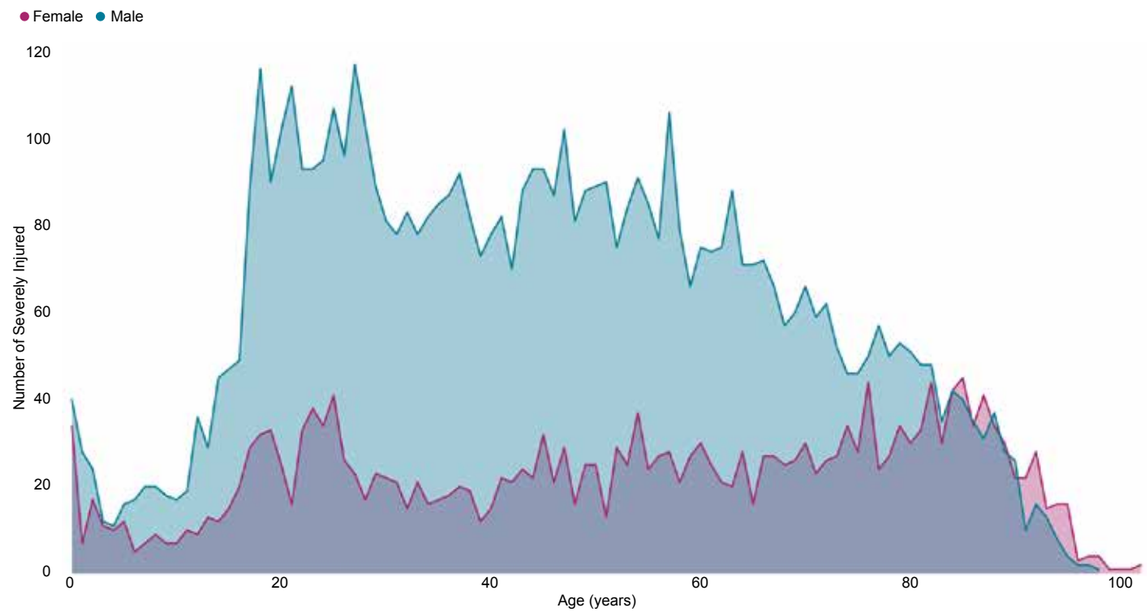


Figure 2. Severe Injury by Age and Gender

INJURY PLACE

Seventy-two percent of all injuries occurred at home or out on the street and highway. Fifteen percent had a place of unknown origin and were excluded from the analysis.

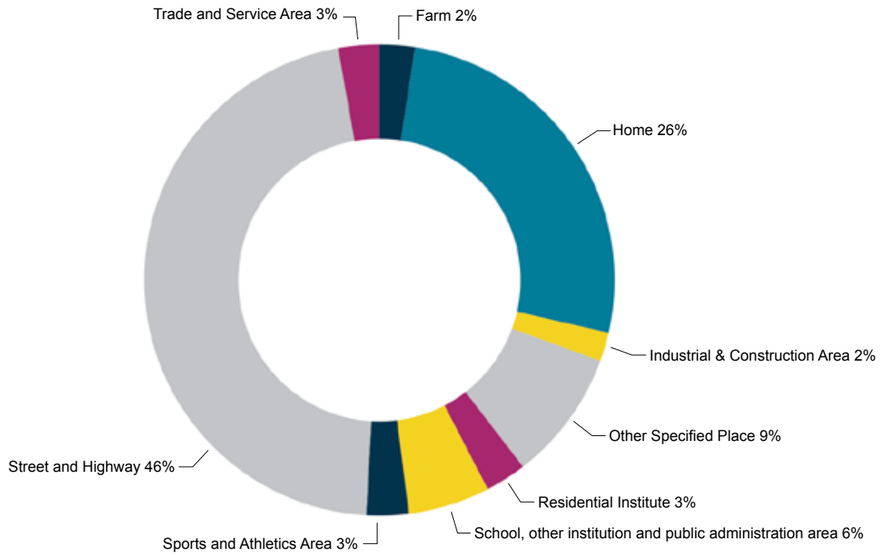


Figure 3. Severe Injury by Place

INJURY WEEKDAY

The numbers of severely injured presenting to hospital remained consistent over Monday to Thursday and increased on Fridays before declining on Sundays. Saturday saw 42 percent more presentations to hospital than the Monday to Thursday average.

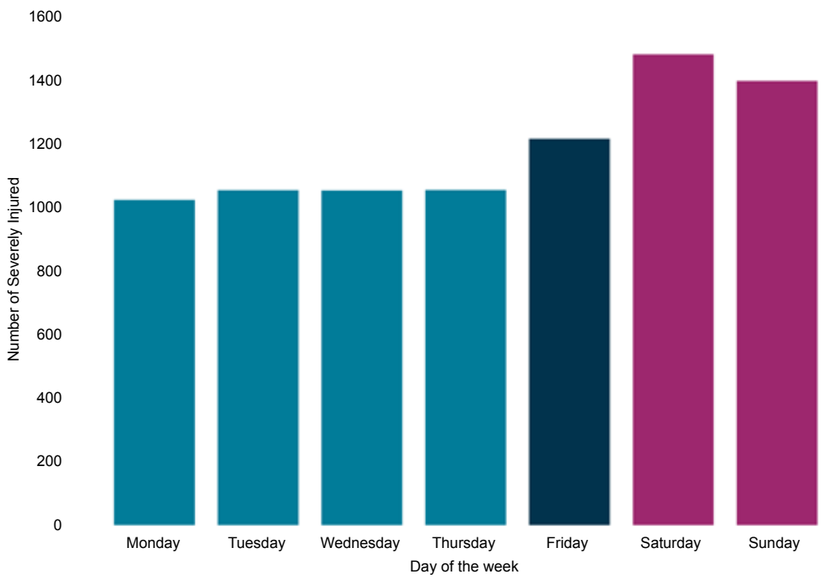


Figure 4. Severe Injury by Weekday

INJURY WEEKDAY (CONT')

Saturday and Sunday were consistently the days that saw more presentations of severely injured at each hospital, however trends for the week days differed between hospitals.

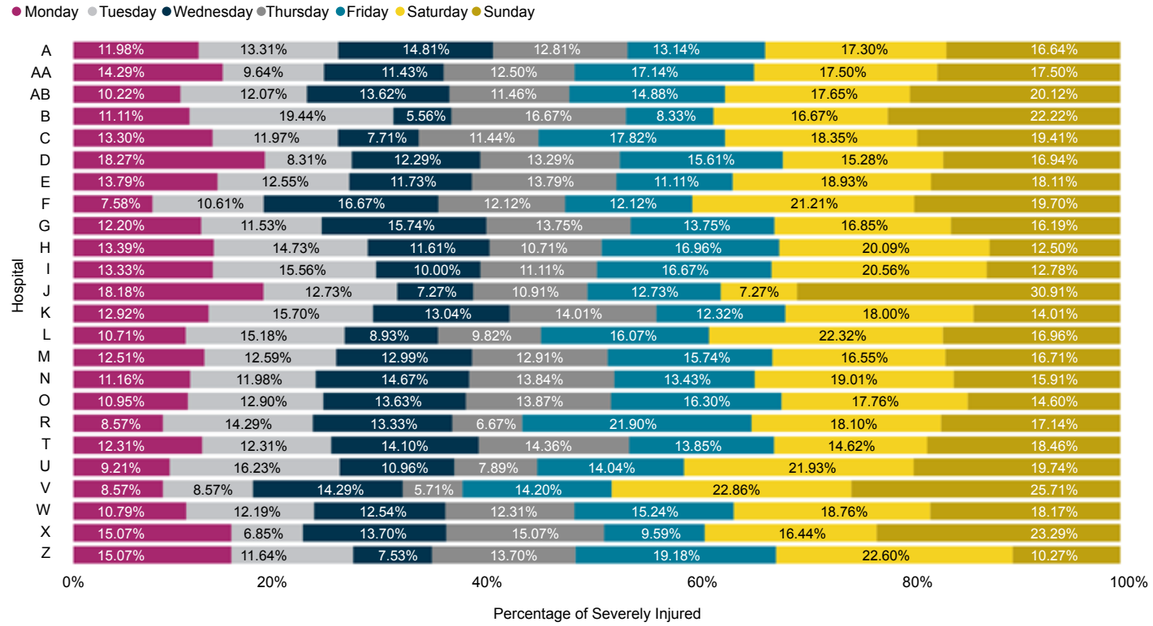


Figure 5. Severe Injury by Weekday and Hospital

INJURY INTENT

Intent data was provided by 14 hospitals accounting for 4,708 episodes of care. The three largest intent categories were: unintentional (88 percent), unspecified assault (6 percent) and intentional self-harm (3 percent).

INJURY CAUSE

Transport-related injury and falls accounted for 77 percent of all severe injury across Australia. Comparing with the previous three financial years, the numbers trend in an upward direction, however it is difficult to interpret if these are true increases or reflective of a change in the contributing hospitals and improved data quality.

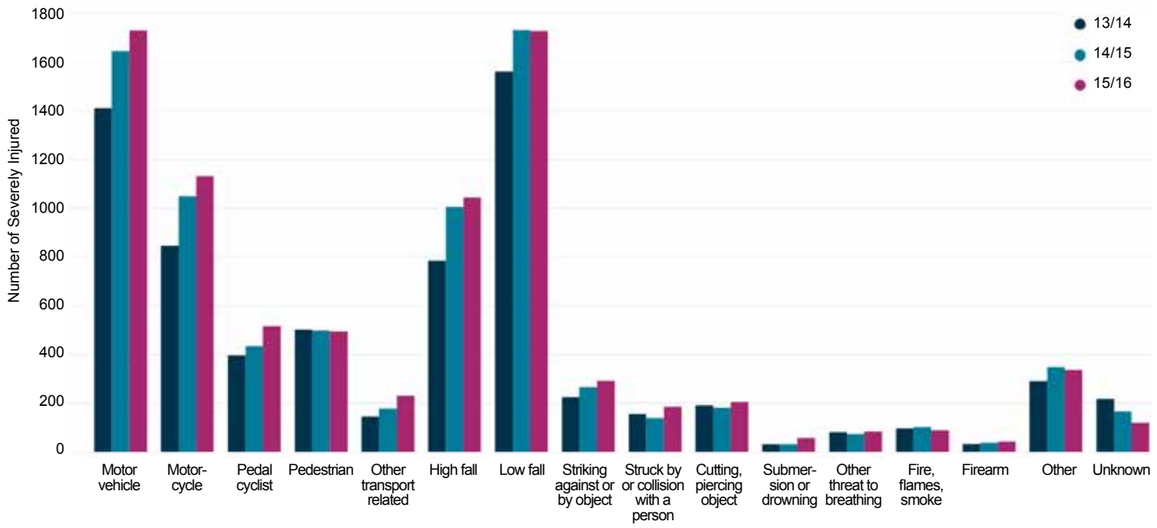


Figure 6. Severe Injury by Cause and Financial Year

Forty-four percent of severe injury were caused by transport-related trauma. Of those 44 percent, motor vehicle occupants accounted for 47 percent of severe injuries and in contrast motor cyclists contributed 30 percent. Eighty-five percent of transport-related trauma was categorised as on-road.

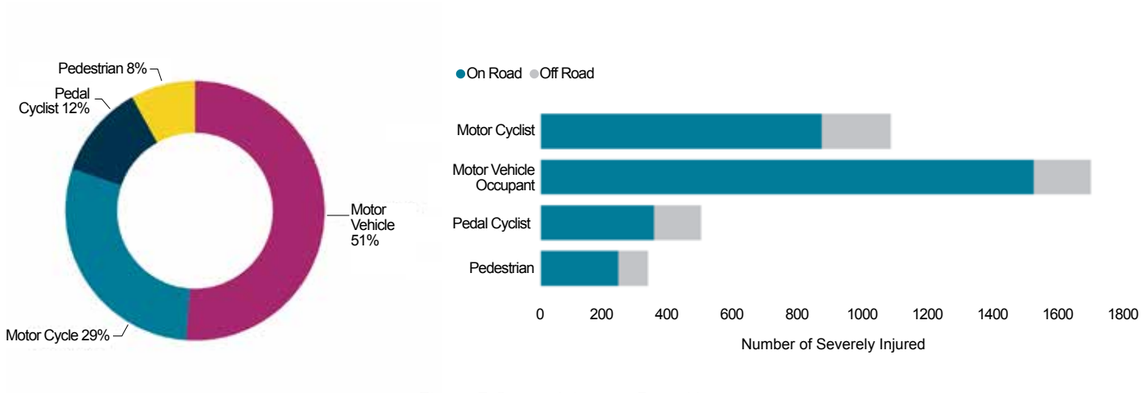


Figure 7. Severe Injury by Road User

Thirty-three percent of all severe injuries were caused by falls. There were almost twice as many low falls as high falls with high falls accounting for 12.6 percent of total severe injuries (n=1,044) and low falls contributing to 21 percent of total severe injures (n=1,728).

INJURY SEVERITY

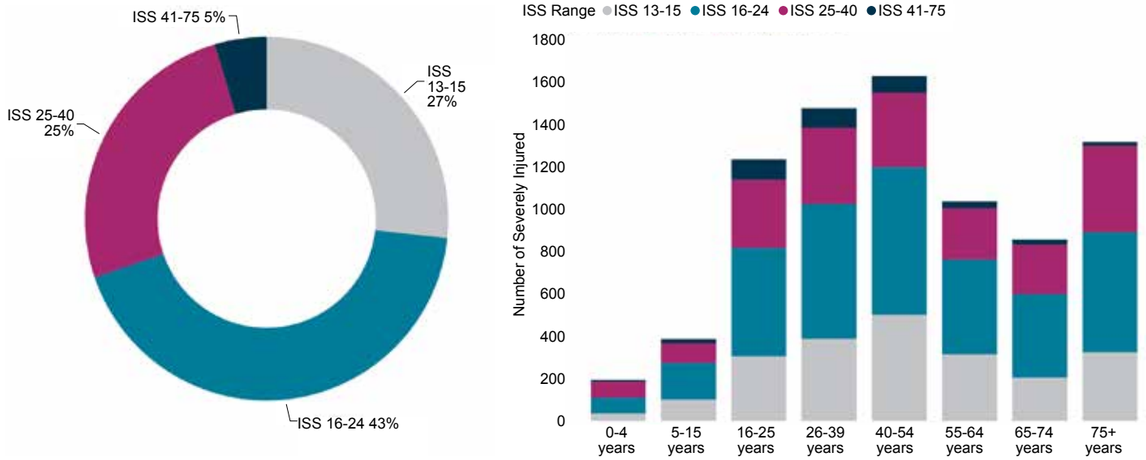


Figure 8. Severe Injury by ISS Range and Age Group

MODE OF TRANSPORT

Two-thirds of all severely injured (n=5,579) were transported direct from scene to definitive care. Of those transported direct, 78 percent arrived via road ambulance, 16 percent via helicopter and four percent via private vehicle, the three most common forms of transport totaling 98 percent of all transports direct from scene to hospital. The remaining 122 arrived via fixed wing, interstate ambulance, private ambulance or other.

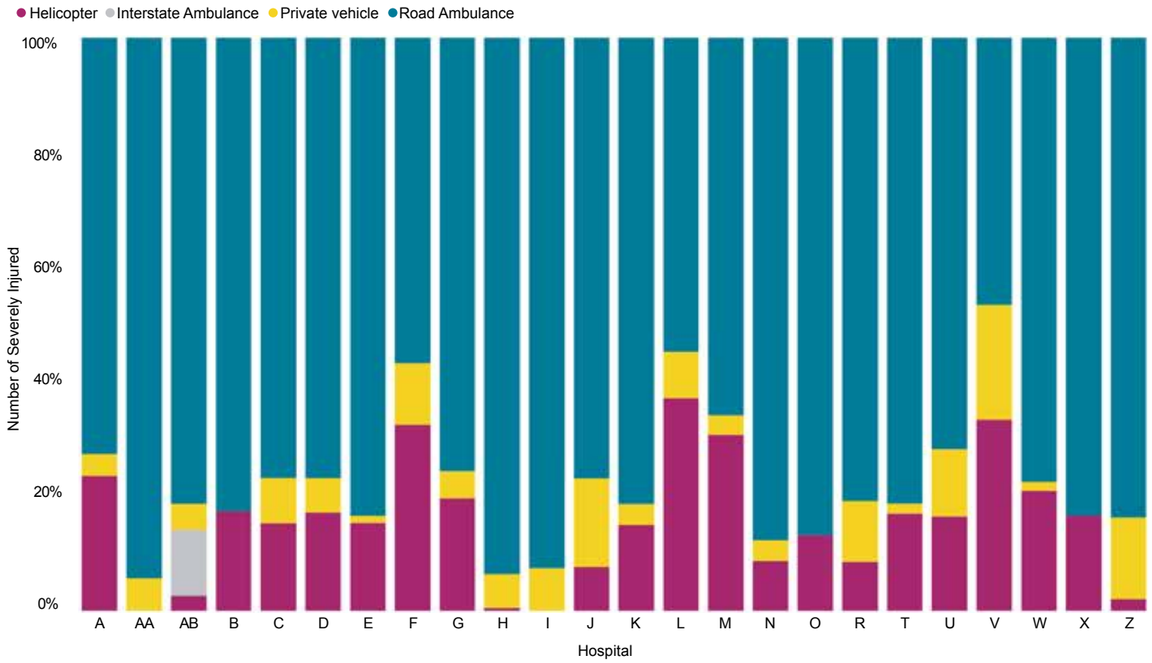


Figure 9. Transport Mode from Scene to Definitive Care, by Hospital

TIME FROM SCENE TO DEFINITIVE HOSPITAL

The national median time from injury to arrival at defintive care was 1.4 hours. Patients transferred to another hospital prior to definitive were excluded due to poor data quality.

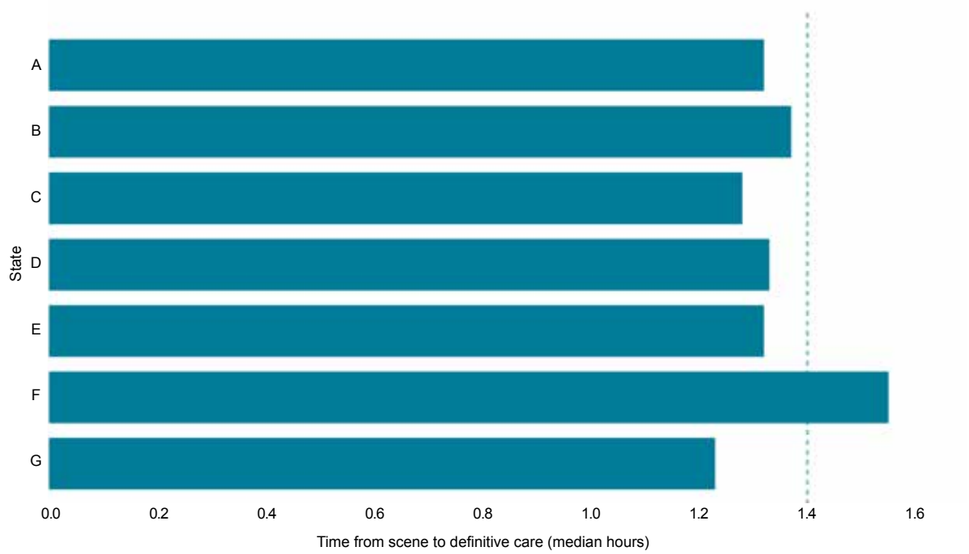


Figure 10. Median time (hours) to Definitive Hospital, by State, with national median line

IN-HOSPITAL INDICATORS

TIME OF ARRIVAL AT DEFINITIVE CARE

Time of arrival at definitive care increased throughout the day with highest numbers arriving between 5pm and 8pm. The lowest arrivals were between 3am and 8am before they continued to rise again.

Figure 11. Arrival Time at Hospital, by Age Group

TIME IN EMERGENCY DEPARTMENT

Time spent in the emergency department (ED) varied between State and Territories. The national median time in ED was 4 hours and 13 minutes.

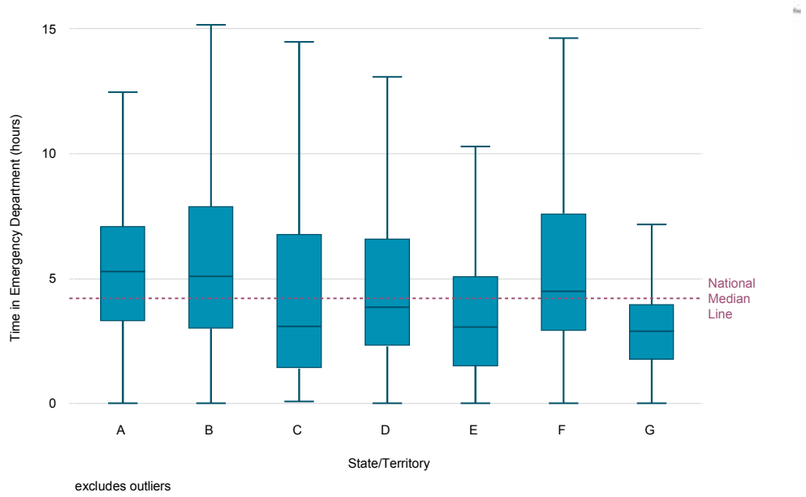


Figure 12. Boxplot of Time Spent in ED (hours) with national median line

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

The median LOS was seven days and the median ICULOS was four days. State E was missing a large proportion of ICULOS data, only 16 of 237 ICU admissions had a known ICULOS.

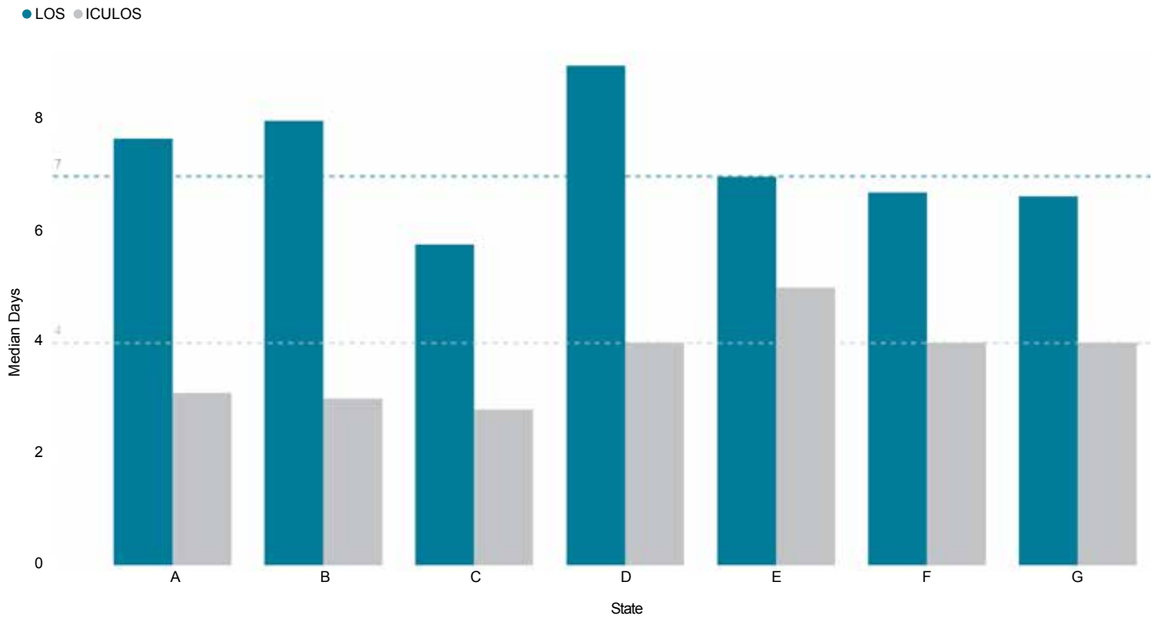


Figure 13. Median LOS and ICULOS (in Days) by State, with national median lines

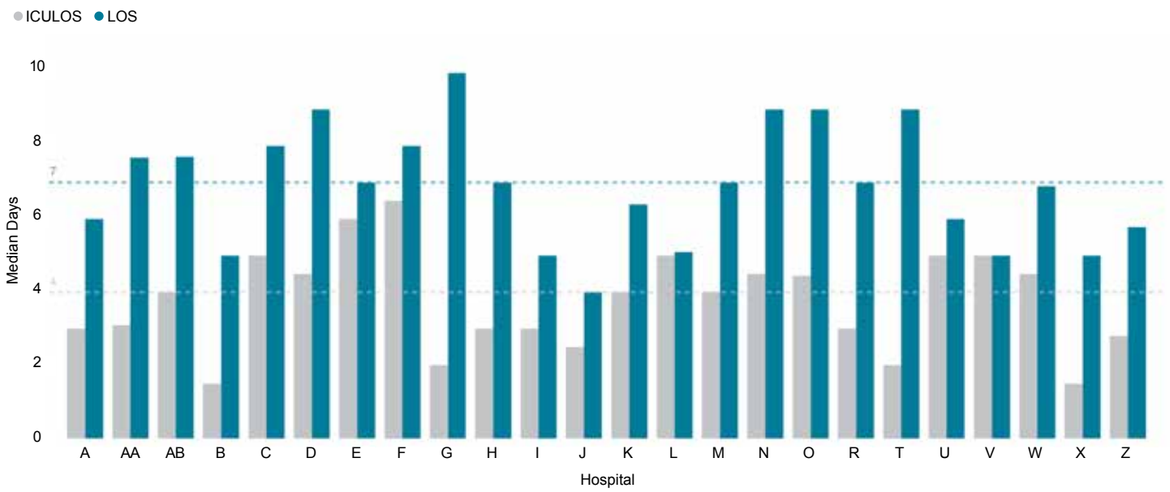


Figure 14. Median LOS and ICULOS by Hospital, with national median lines

Sites T, U, and V were missing a large proportion of ICU LOS data.

OUTCOMES

MORTALITY

Eight hundred and twenty-seven severely injured people died in hospital with a national mortality rate of 10 percent.

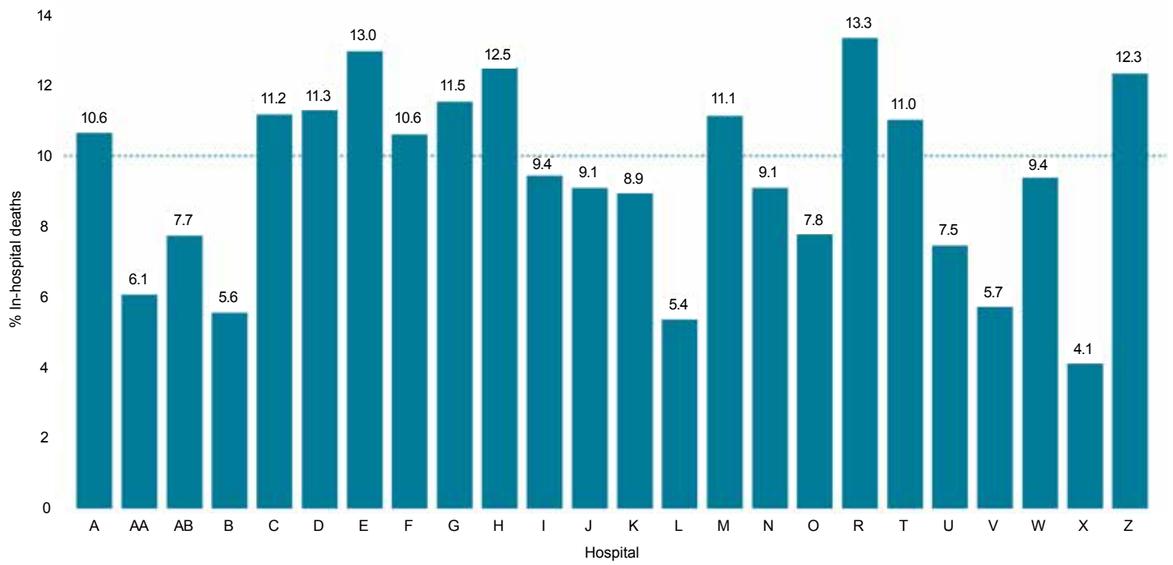
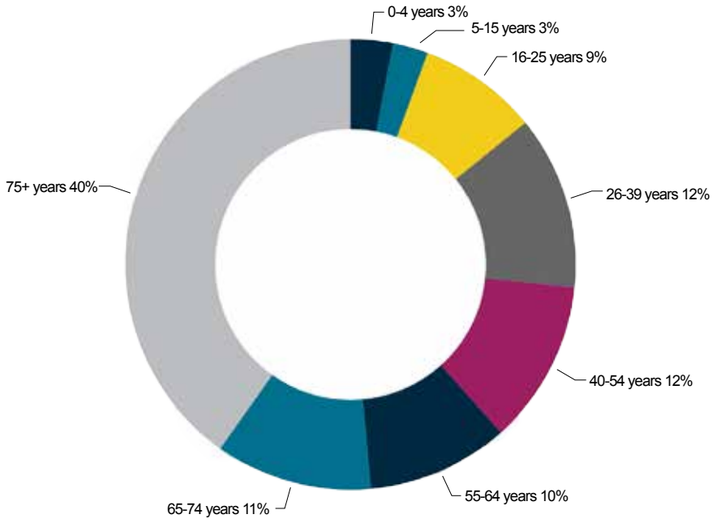


Figure 15. In-hospital Mortality Rate by Hospital



24% of severely injured **75+ YEAR OLDS** died in-hospital

Figure 16. In-hospital mortality by Age Range

1 in 4 deaths caused by **TRANSPORT** RELATED TRAUMA

Median ISS for in-hospital **DEATHS: 26**

15.8% in-hospital deaths occurred in ED

49% 0-15 yo deaths were aged 0-2

DISCHARGE DESTINATION

Discharge destination excluded the 827 in-hospital deaths from analysis. Of the remaining 7,456 severely injured, 91 percent were discharged to home, rehabilitation or to a hospital for convalescence. The remaining nine percent (n=663) were categorised as: 'other' (n=254), 'unknown' (n=217), 'residential aged care' (n=63), 'left against medical advice' (n=48), 'acute hospital for further definitive care' (n=42), and 'special accommodation' (n=39).

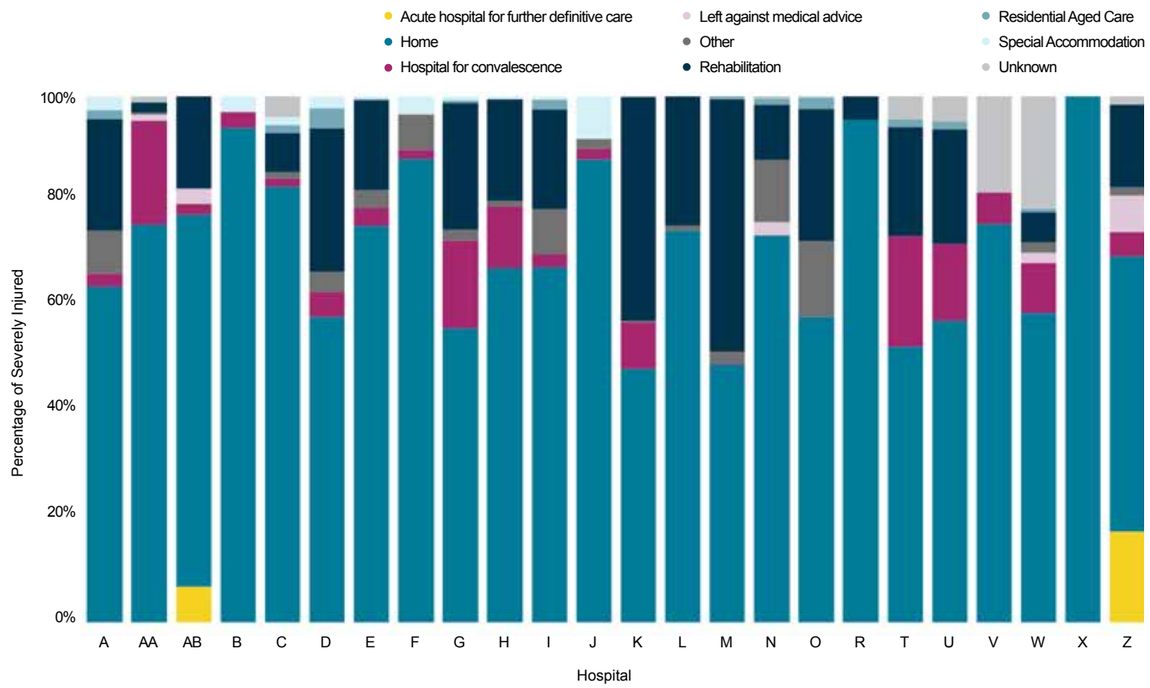


Figure 17. Discharge Destination, by Hospital

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-four 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

1,729
MOTOR VEHICLE OCCUPANTS
61% MALE
MEDIAN AGE 39
Increase in **collisions** on Fri-Sun by **OVER 20%**
90% ON-ROAD
6.5% DIED **in-hospital**

1,098
MOTOR CYCLISTS
92% male
ON-ROAD MEDIAN AGE 39
OFF-ROAD MEDIAN AGE 33
80% ON-ROAD
Double the injuries **ON SAT-SUN**
4.3% DIED **in-hospital**

503
PEDAL CYCLISTS
88% male
ON-ROAD MEDIAN AGE 48
OFF-ROAD MEDIAN AGE 43
71% ON-ROAD
NO OFF-ROAD cycling deaths
3.0% DIED **in-hospital**

336
PEDESTRIANS
57% MALE
192 males
MEDIAN AGE 49
73% ON-ROAD
14% DIED **in-hospital**
41% deaths AGED 75+

IN-HOSPITAL FACTS BY LOCATION

On-Road

Three thousand and forty on-road injuries (37 percent of all in-hospital injuries). In 2015-16 we saw 45 percent more on-road traffic accidents on Saturdays and Sundays, compared with the Monday to Thursday average (n=376).

Off-Road

Six hundred and thirty-five off-road injuries (8 percent of all in-hospital injuries). In 2015-16 off-road transport-related hospital admissions doubled on the weekend, consistent over both Saturday and Sunday.

TRANSPORT-RELATED INJURY BY QUARTER

It appears there are seasonal cycles for both on-road and off-road injuries, and that severe injuries for both on-road and off-road injuries is increasing (Figure 18), however, it is difficult to interpret if these are true increases or reflective of a change in the contributing hospitals and improved data quality.

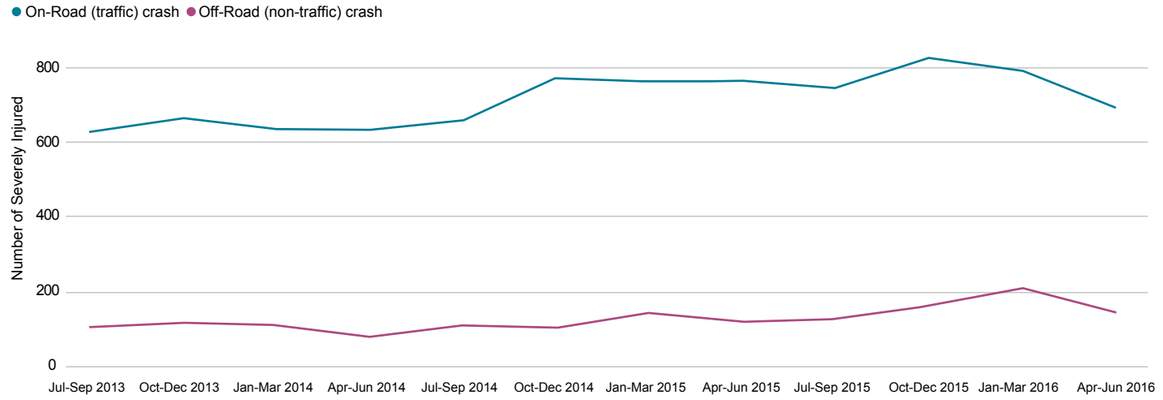


Figure 18. On-Road and Off-Road Quarterly Numbers

TRANSPORT-RELATED INJURY BY LOCATION AND CAUSE

Eighty-five percent of transport-related crashes were on-road, where motor vehicle crashes dominated on-road crashes (51 percent) and motor cycle crashes dominated off- road crashes (34 percent).

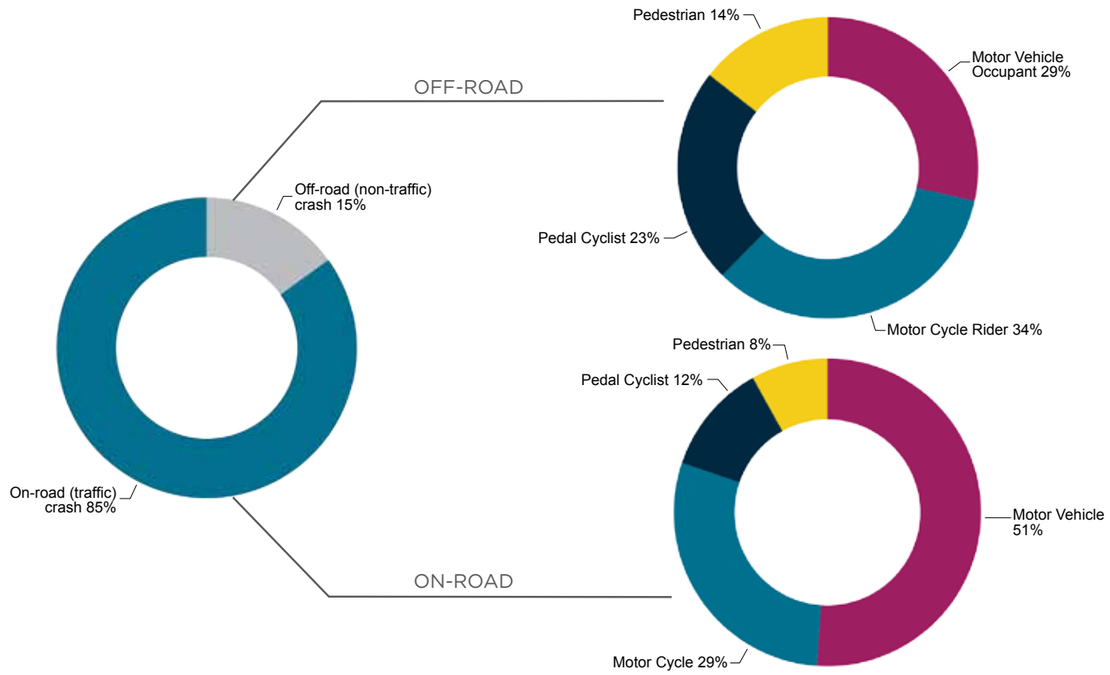


Figure 19. Breakdown of Transport-related Injury by Cause

FOCUS GROUP – FALLS

Falls accounted for 33 percent of total severe injuries, with approximately twice as many low falls (21 percent) compared with high falls (12.6 percent).

HIGH FALLS

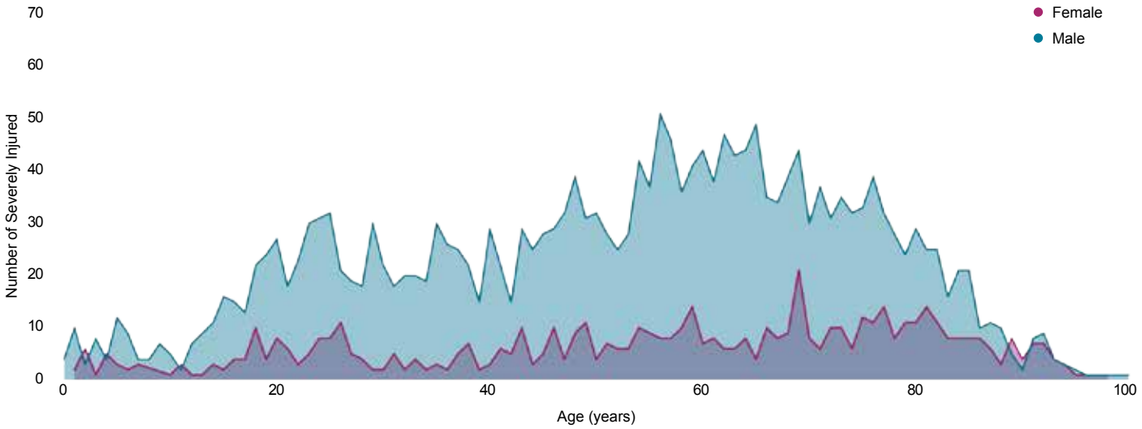


Figure 20. Incidence of High Falls by Gender

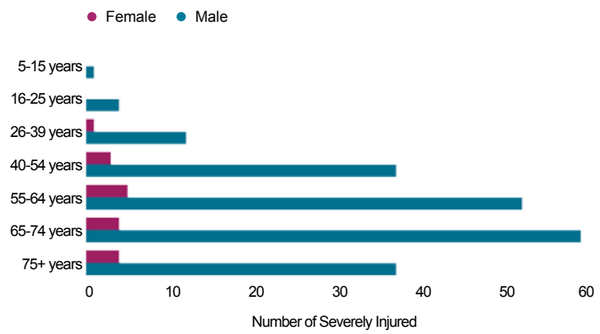


Figure 21. Falls from Ladders by Gender

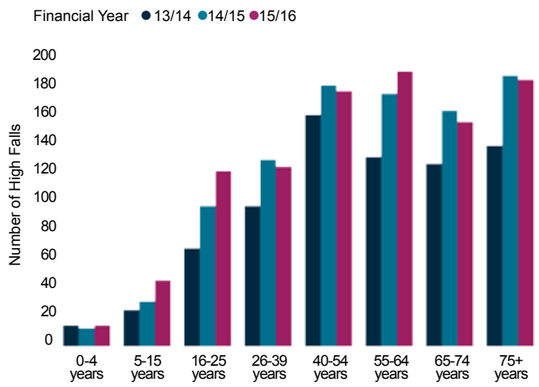


Figure 22. High Falls by Age Range and Financial Year

LOW FALLS

Sixty percent of low falls with known place of injury occurred in the home, with this number increasing for the 75+ age range (83 percent) and 0-4 year age range (82 percent).

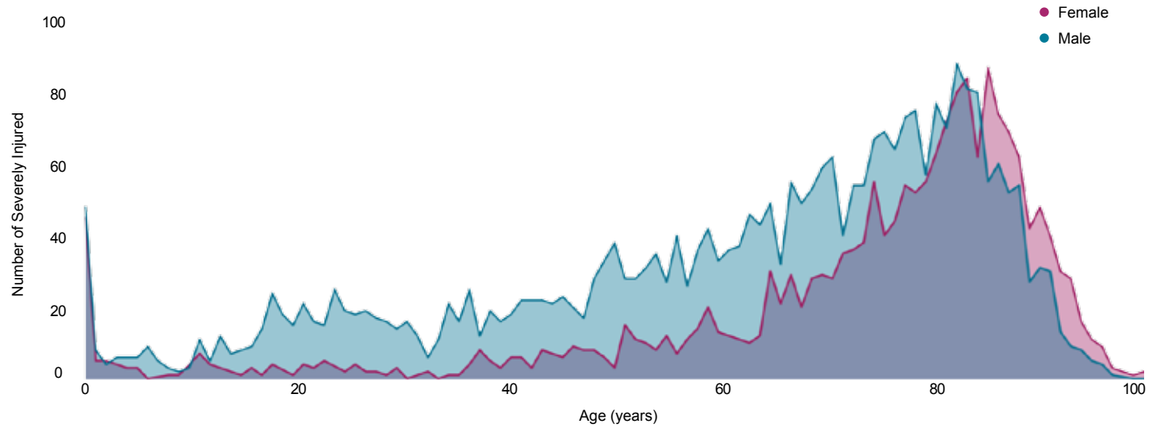


Figure 23. Incidence of Low Falls by Gender

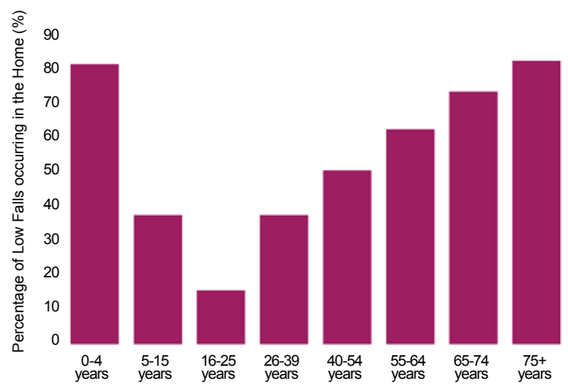


Figure 24. Percentage of Low Falls occurring in the Home by Age Range

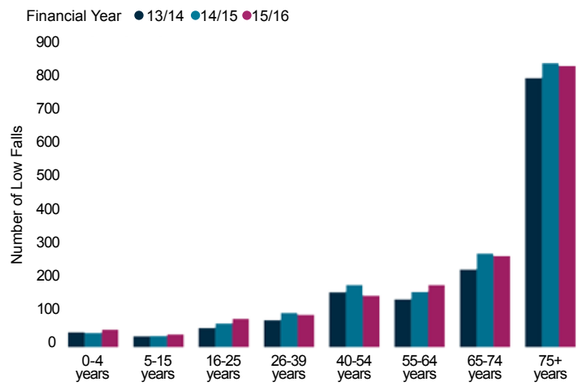


Figure 25. Low Falls by Age Range and Financial Year

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
Ms Kathleen McDermott	Adjunct to NCCTRC Executive Sponsor
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

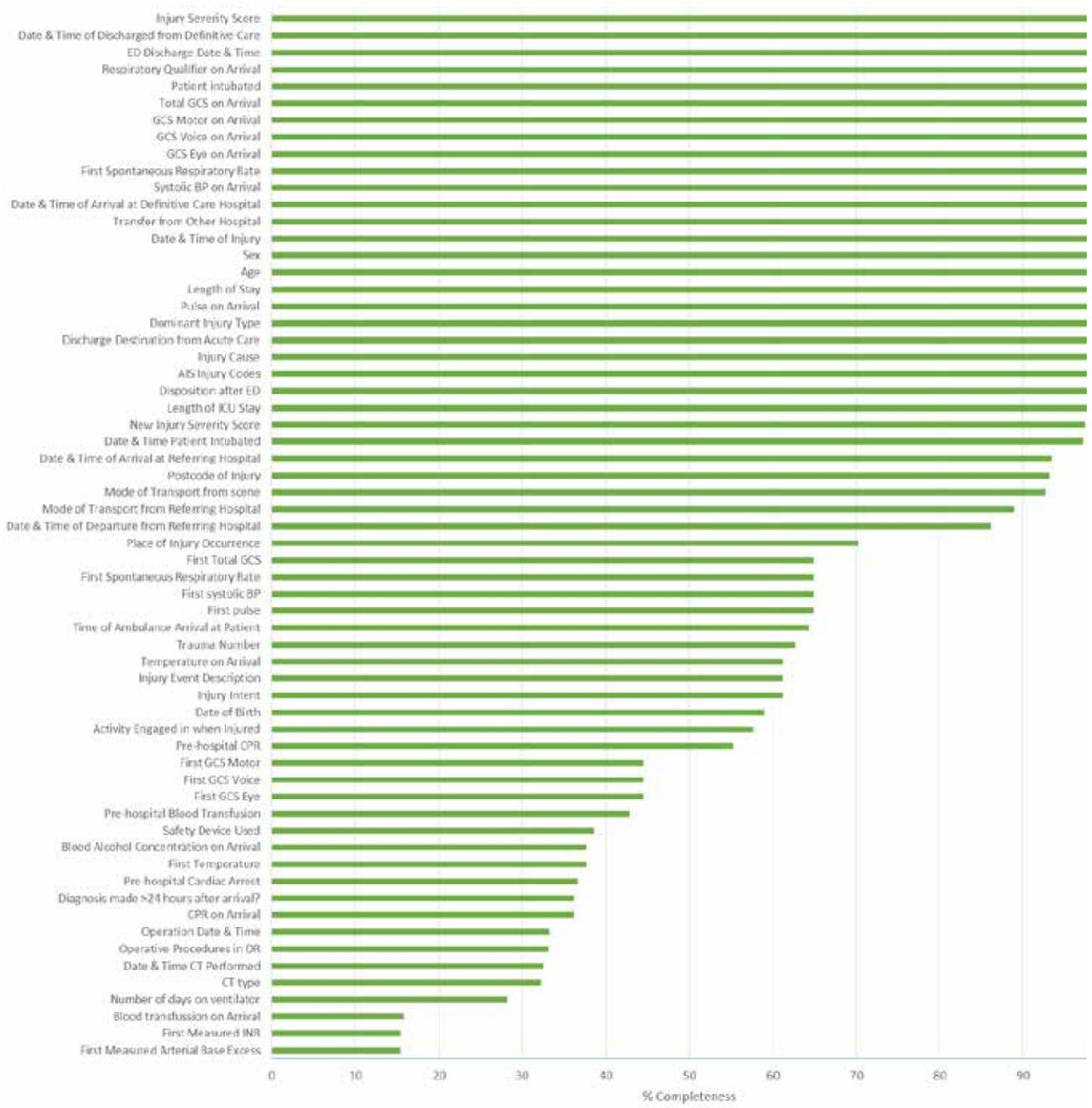
MANAGEMENT COMMITTEE MEMBERSHIP

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

COMPLETENESS

For the purposes of the Completeness Report, the incidence of Unknown values for each field was used as a quality measure. The incidence of blank fields, or where the system had inserted a default, was used as a completeness measure. The chart below is a representation of completeness only, that is, where the field has been left blank and/or a system default has been inserted. The completeness of each field is relevant to this Annual Report as it impacts on the quality of the data.



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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.

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AusTQIP

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