

ANNUAL REPORT 2023-2025



MONASH
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**Transport
Accident
Commission**



The Victorian Orthopaedic Trauma Outcomes Registry (VOTOR) is a clinical quality registry managed through a collaboration of hospitals and academic institutions.



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Overview

Background

The Victorian Orthopaedic Trauma Outcomes Registry (VOTOR) is a clinical quality registry managed through a collaboration of hospitals and academic institutions. The Registry documents the nature and extent of orthopaedic injuries, and resulting treatment, rehabilitation and complication rates and outcomes of admitted patients. It provides a robust monitoring system for orthopaedic trauma admitted to the participating hospitals in Victoria and is funded by the Transport Accident Commission (TAC). It allows a mechanism to apply evidence based methods to priority research areas and to examine variations in clinical practice and their impact on the short and longer term outcomes of

injured patients. The Registry started as a collaboration between The Alfred, the Royal Melbourne Hospital and the Department of Epidemiology and Preventive Medicine (DEPM) at Monash University in 2003 and expanded in 2007 to include University Hospital Geelong (UHG) and the Northern Hospital. From the start of 2021 Box Hill Hospital commenced data contribution whilst data collection from the Northern Hospital ceased.



Overview

Eligibility

VOTOR captures data about all patients with an emergency admission greater than 24 hours to the participating hospitals for an orthopaedic injury. Eligible patients are identified by the discharge diagnosis through ICD 10 AM reports, or from Abbreviated Injury Scale codes if ICD 10 AM reports are not available.

Reporting Period

This report covers two cohort years (2023/24 and 2024/25). The headline figures below reflect the most recent complete year (2024/25) with comparisons to both 2023/24 and the last reported year (2022/23).

INCLUSION CRITERIA

- All patients admitted with a new orthopaedic (bone or soft tissue) injury with a length of stay > 24 hours
- Death after orthopaedic injury

EXCLUSION CRITERIA

- Pathological fracture related to metastatic disease, and/or:
- Age <16 years
- Isolated soft tissue injury managed non operatively
- Isolated soft tissue injury managed operatively from 1 st Jan 2018



Year in Review: Summary



Across the three years (2022/23 to 2024/25), the VOTOR data is stable. All key metrics, including case volume, patient demographics, causes and types of injury, length of stay, and in-hospital mortality, show only minor 1 to 2 point fluctuations with no meaningful trends or emerging concerns.

“All key metrics ... show only minor 1 to 2 point fluctuations with no meaningful trends or emerging concerns.”

Demographics

2024/2025

7931

NUMBER OF VOTOR CASES

64 YEARS

OVERALL MEDIAN AGE

♂ 55% MALE

31%

OCCURED ON WEEKENDS



2023/2024

7833

NUMBER OF VOTOR CASES

65 YEARS

OVERALL MEDIAN AGE

♂ 54% MALE

31%

OCCURED ON WEEKENDS



2022/2023

7683

NUMBER OF VOTOR CASES

65 YEARS

OVERALL MEDIAN AGE

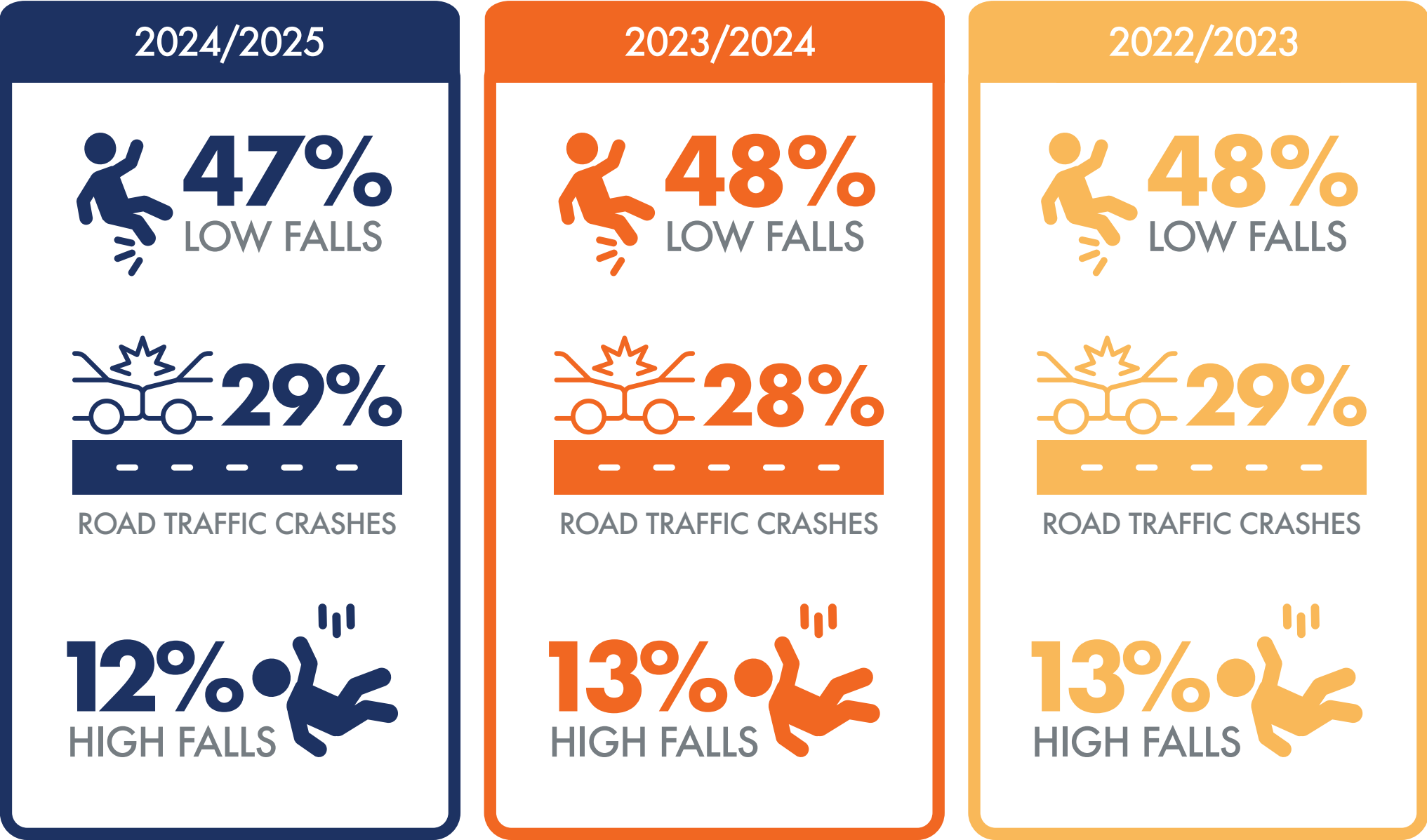
♂ 53% MALE

32%

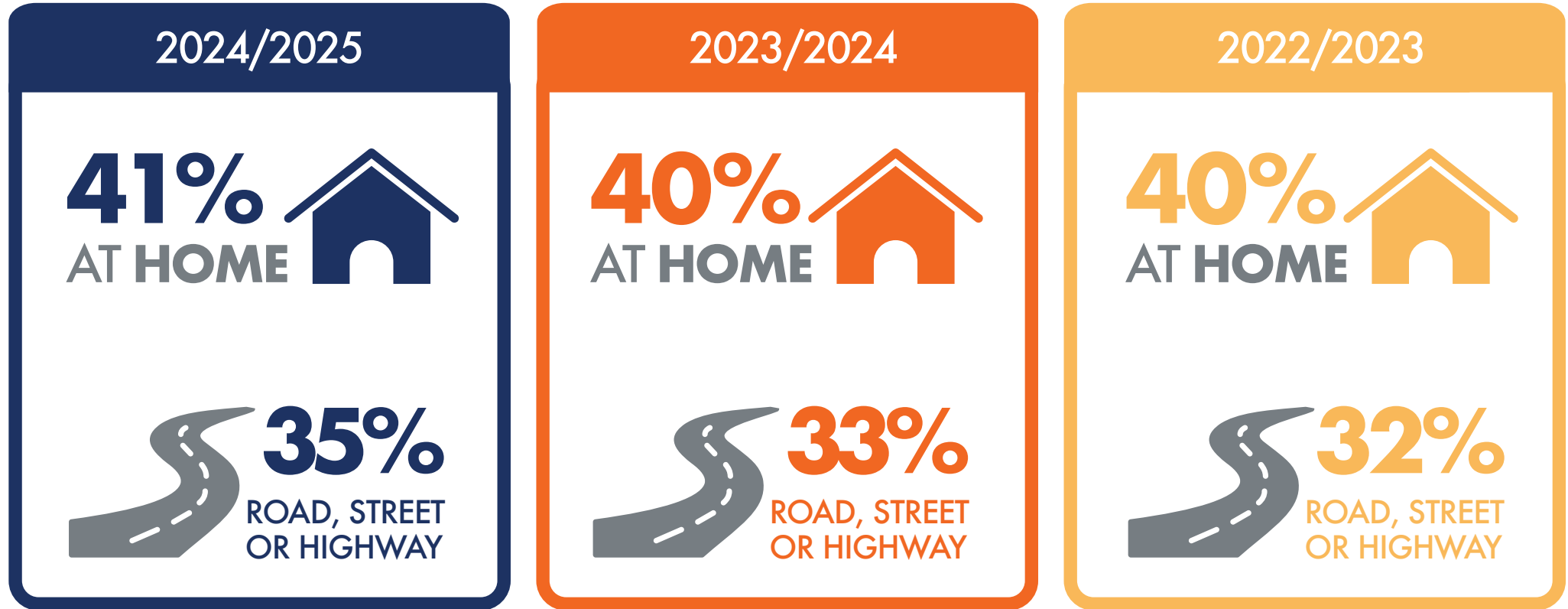
OCCURED ON WEEKENDS



Cause of injury



Location of Injury



Types of Injury

2024/2025

32%

ISOLATED
LOWER
EXTREMITY INJURIES

23%

SPINAL INJURIES

17%

ISOLATED **UPPER**
EXTREMITY INJURIES

2023/2024

34%

ISOLATED
LOWER
EXTREMITY INJURIES

23%

SPINAL INJURIES

16%

ISOLATED **UPPER**
EXTREMITY INJURIES

2022/2023

33%

ISOLATED
LOWER
EXTREMITY INJURIES

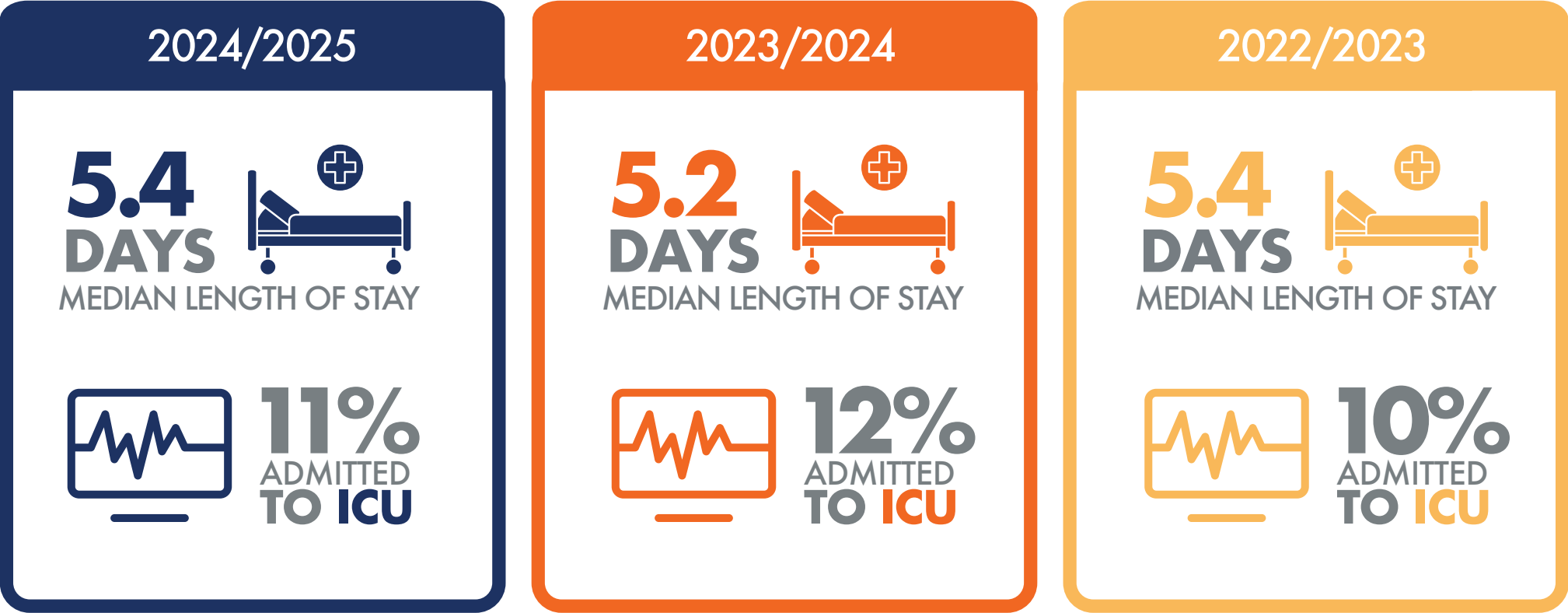
23%

SPINAL INJURIES

17%

ISOLATED **UPPER**
EXTREMITY INJURIES

Hospital Outcomes



Discharge Destination

2024/2025

63%
DISCHARGED
TO **HOME**



22%
DISCHARGED
TO **REHAB**

2023/2024

62%
DISCHARGED
TO **HOME**



24%
DISCHARGED
TO **REHAB**

2022/2023

61%
DISCHARGED
TO **HOME**



26%
DISCHARGED
TO **REHAB**

In-Hospital Deaths

2024/2025

255 APPROX
3%
DIED IN HOSPITAL

 **64%**
MALE

 **MALE** MEAN AGE
71 YEARS

FEMALE MEAN AGE
79 YEARS 

2023/2024

231 APPROX
3%
DIED IN HOSPITAL

 **61%**
MALE

 **MALE** MEAN AGE
73 YEARS

FEMALE MEAN AGE
79 YEARS 

2022/2023

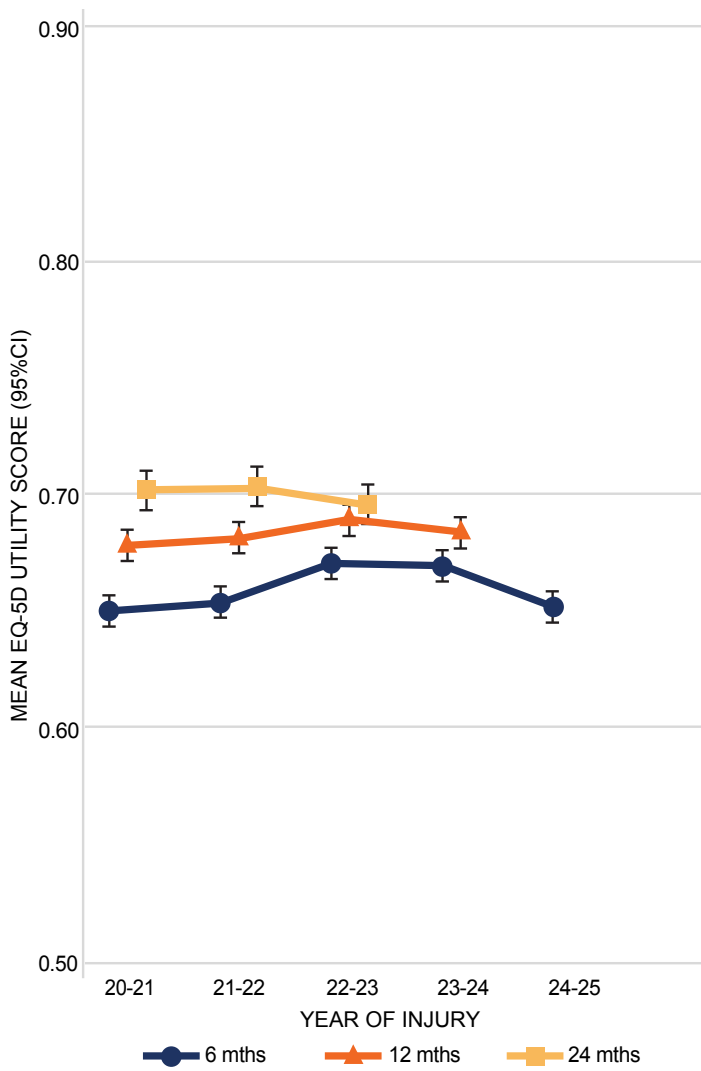
247 APPROX
3%
DIED IN HOSPITAL

 **66%**
MALE

 **MALE** MEAN AGE
73 YEARS

FEMALE MEAN AGE
80 YEARS 

Outcomes and analysis

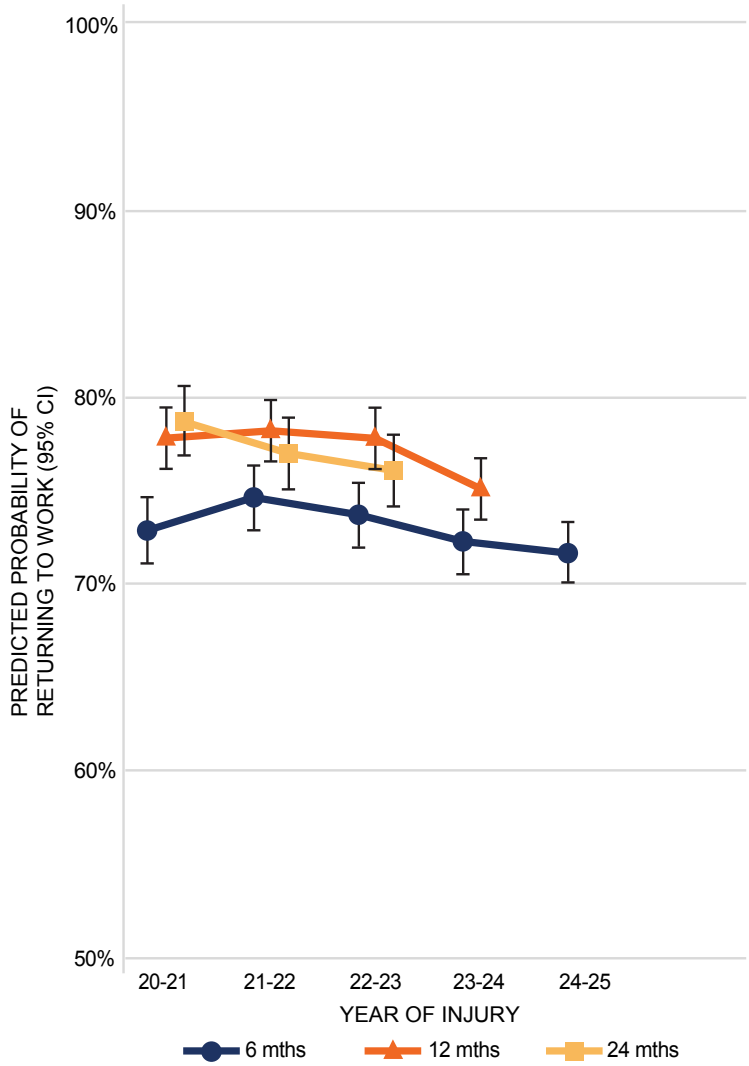


Average EQ5D Health Utility Score

The health status of patients at follow-up is measured using the EQ-5D, which covers five dimensions of health: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Scores of zero or less are equivalent to a health state of death or worse, whilst a score of 1.0 reflects perfect health.

Within each injury year, scores generally improve as follow-up lengthens. The gap between 12 and 24-month scores narrows notably for the 2022-23 injury year, where the two lines nearly converge. Looking across injury years this outcome has been largely stable. The 2024-25 cohort showed a slight dip in health utility scores at 6 months, returning to levels comparable to the 2020-21 and 2021-22 cohorts.

Outcomes and analysis

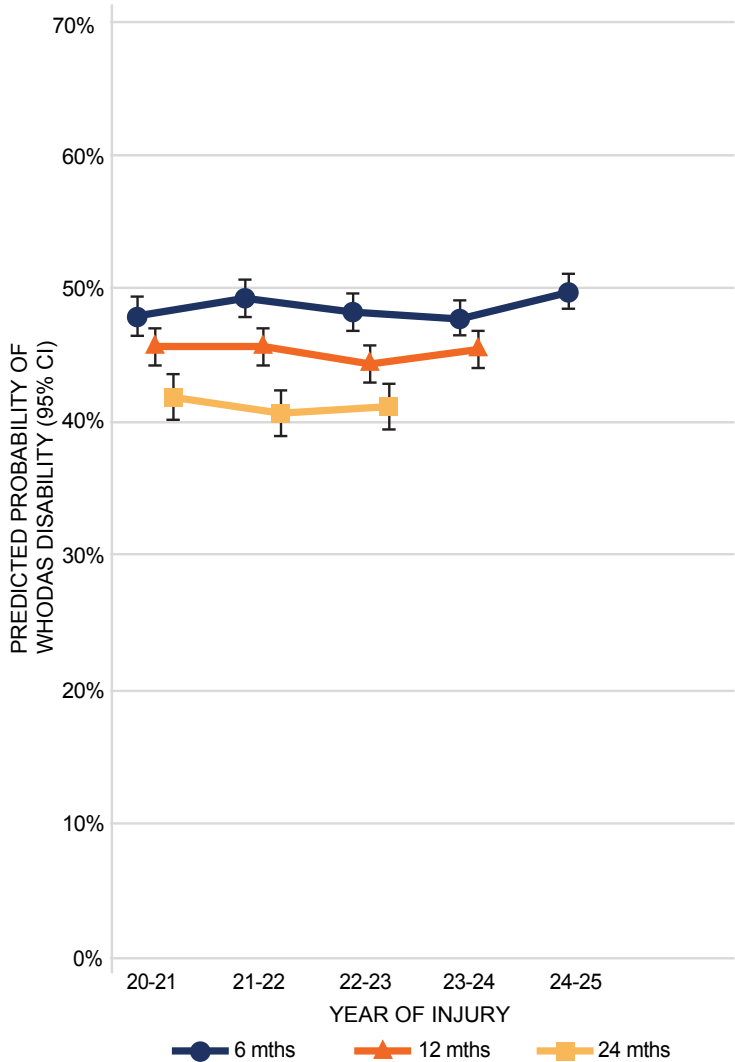


Return to work

For patients working prior to their injury, the probability of returning to work (RTW), adjusted for demographic and injury factors is shown on the left.

The return to work probability has been largely stable across injury years, though the 12-month line shows a slight decline from its peak around 2021-22, and the 6-month line dips in 2024-25. In 2022-23, there is little separation between the 6, 12 and 24-month probabilities, suggesting limited additional recovery in return to work beyond 6 months for that cohort. Overall these changes are small and not significant.

Outcomes and analysis



Predicted probability WHODAS 2.0 Disability ≥ 10 (95% CI)

The WHODAS 2.0 measures disability due to six different health conditions covering physical, mental and drug/alcohol problems. A cut off score of 10 or more has been used to assign disability status in normative data from an Australian population.

Disability rates have been stable across injury years, with the 6-month probability consistently highest, followed by 12 months and 24 months. There is a small increase at 6 months in 2024-25 but changes are minor and not significant.



Year in Review: Research

Traumatic Cauda Equina Syndrome (CES): Presentation, Outcomes and Patient Experiences

The cauda equina is a bundle of nerves in the lumbar spine that provides motor and sensory function to the lower limbs and innervates the bladder, bowel and sexual organs. While CES is most commonly caused by lumbar disc herniation, traumatic injury to the cauda equina is a rare but clinically important cause that remains poorly understood.

A series of studies were undertaken to address key gaps in the literature. A scoping review found substantial heterogeneity in how traumatic CES is defined, with significant underreporting of functional and quality-of-life outcomes and few studies examining it as a distinct clinical entity. A retrospective chart review then revealed considerable variation in clinical presentation and highlighted the critical role of imaging in establishing a diagnosis.

Two registry-based studies examined patient outcomes. The first compared individuals with traumatic CES to those with spinal cord injury and found that, despite the expectation that cauda equina injuries would result in less disability, both groups

experienced similar long-term health and disability burdens. The second focused on bladder and bowel dysfunction, providing important insight into the long-term impact of these underreported consequences.

A qualitative study explored the lived experiences of people with traumatic CES. Participants described ongoing symptoms that were often not fully optimised medically, and raised concerns about patient education, communication and prognosis, with many experiencing considerable anxiety due to uncertainty about their recovery.

Overall, this body of work highlights the substantial long-term burden of traumatic CES despite its rarity. The heterogeneity in presentation and diagnosis underscores the need for a clearer definition of this injury. Improved identification, particularly in time-critical emergency settings, could enable better prioritisation of resources and ultimately improve patient outcomes.

Publications

Zubenko X, Liew S, Reeder S, Dipnall J, Gabbe B. Comparison of health outcomes between traumatic spinal cord and cauda equina injuries. *Spinal Cord*. 2026 Apr;64. PMID 41826641.
Zubenko X, Liew S, Ying Y, Humadi H, Gabbe B. The incidence and outcomes of traumatic cauda equina syndrome in Victoria, Australia. *North American Spine Society Journal*. 2024 (Accepted for publication).

Beaumont X, Liew S, Reeder S, Gabbe B. A scoping review of traumatic cauda equina injury. *Topics in Spinal Cord Injury Rehabilitation*. 2026 (Accepted; awaiting print).

Beaumont X, Reeder S, Liew S, Gabbe B. A qualitative study of traumatic cauda equina syndrome. *Disability and Rehabilitation*. 2026 (Accepted; awaiting print).

Year in Review: Research

Proximal Humerus Fractures: Operative Versus Non-Operative Management and Outcomes

Proximal humerus fractures are among the most common orthopaedic injuries. Increasing rates of surgical treatment for these injuries contrast with a growing body of evidence supporting non-operative management. However, numerous challenges exist in managing these injuries and there remain several demographic groups and fracture patterns where limited evidence is available. This body of work, comprising five observational studies using VOTOR data, investigated outcomes of operative and non-operative management in these areas.

A comparison of internal fixation and non-operative management in younger adults (18 to 55 years) found no difference in health status or patient-reported outcome measures between groups. In contrast, examination of translated proximal humerus fractures, a pattern where no cortical contact exists between humeral head and shaft fragments, demonstrated improved radiological and health status outcomes with operative management. A case series of proximal humerus fracture dislocations demonstrated poor overall outcomes following these injuries regardless of treatment undertaken. Notably, this is the first study

to report outcomes where closed reduction alone was successful, with findings suggesting it may be a viable treatment option particularly in patients with significant comorbidities.

In addition risk factors for failure of locking plate fixation were also identified resulting in the development of a predictive tool, designed to aid surgeons in decision-making both pre-operatively and intra-operatively to minimise the risk of surgical failure. A cost analysis comparing operative and non-operative management in a cohort of patients who sustained proximal humerus fractures in road transport-related incidents found no difference in inpatient and rehabilitation costs between management groups.

These findings provide clinicians with practical evidence to aid decision-making when managing patients with proximal humerus fractures across a range of presentations. Identification of risk factors for fixation failure has the potential to reduce post-operative complication rates and improve outcomes of surgical management. Further research building on these findings will continue to refine the evidence base for optimal management of these common injuries.

Publications

Cosic F, Kirzner N, Edwards E, Page R, Kimmel L, Gabbe B. Comparison of outcomes of internal fixation and non-operative management of 2-part and 3-part proximal humerus fractures in younger adults. *Trauma*. 2023;0(0): DOI 10.1177/14604086231183586

Cosic F, Kirzner N, Edwards E, Page R, Kimmel L, Gabbe B. The translated proximal humerus fracture: a comparison of operative and nonoperative management. *J Orthop Trauma*. 2023 Sep 1;37(9):e341-8. PMID 37053113

Cosic F, Kirzner N, Edwards E, Page R, Kimmel L, Gabbe B. Proximal humerus fracture dislocations: outcomes of management. *ANZ J Surg*. 2025 Jan 28. PMID 39876620

Cosic F, Kirzner N, Edwards E, Page R, Kimmel L, Gabbe B. Factors associated with failure of locking plate fixation in proximal humerus fractures. *Injury*. 2025 Feb;56(2):112024. PMID 39608129

Cosic, F, Edwards E, Page R, Kimmel L, Gabbe B. A comparison of the costs of managing proximal humerus fractures in a cohort of patients injured in road traffic incidents. *ANZ J Surg*. 2026. *ANZ J Surg*. 2026 Apr 9. DOI 10.1111/ans.70669

VOTOR, Monash University

Access to VOTOR data must comply with ethics requirements and receive approval from the VOTOR Steering Committee

Requests for information from the VOTOR are welcome.

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