CONTENTS

1. FOREWORD 1
2. EXECUTIVE SUMMARY 2
3. ABOUT THIS REPORT 4
4. BACKGROUND 7
   4.1 Overview of the Victorian Orthopaedic Trauma Outcomes Registry 7
   4.2 Eligible patients 7
   4.3 Data Collection 7
   4.4 Patient Confidentiality 7
5. PATIENT DEMOGRAPHICS 8
   5.1 Overview of patients registered in 2016–17 8
6. AGE AND SEX PROFILE OF PATIENTS REGISTERED BY VOTOR 9
7. CAUSE AND LOCATION OF INJURIES SUSTAINED BY VOTOR PATIENTS 10
   7.1 Cause of injury 10
   7.2 Place of injury 10
8. TYPES OF INJURIES SUSTAINED BY VOTOR PATIENTS 15
9. IN-HOSPITAL OUTCOMES OF VOTOR PATIENTS 17
10. LONGTERM OUTCOMES 19
   10.1 Follow up cohort and follow-up rates 19
   10.2 Function 19
   10.3 Return to work 19
   10.4 Pain 19
   10.5 Health related Quality of Life 19
   10.6 Quality of Life Measures According to Injury Group 19
11. SUMMARY 33
12. APPENDICES 34
   APPENDIX A Figures and Tables 34
   APPENDIX B Investigators and Staff 34
   APPENDIX C Publications and Presentation list for 2016–2017 34
   APPENDIX D Awards and Degrees 34

The contents of this report may not be published or used without permission. Any enquiries or comments regarding this publication including requests regarding use or reproduction should be directed to:
Pre-Hospital Emergency and Trauma Research Unit
Department of Epidemiology and Preventive Medicine
Monash University
553 St Kilda Rd, Melbourne Vic 3004
Phone +61 3 9903 1656
Email: Ben.Beck@monash.edu, or Anna.Devlin@monash.edu

Suggested citation:
We are pleased to provide the fifth annual report of the Victorian Orthopaedic Trauma Outcomes Registry (VOTOR). This registry was initially established in 2003 as a collaboration between the two Victorian level one adult trauma centres (Royal Melbourne and Alfred hospitals), and the Monash University Department of Epidemiology and Preventive Medicine. In 2007 the Northern Hospital and University Hospital Geelong were invited to complement the dataset as representatives of busy metropolitan and regional centres. Oversight is provided by a steering committee comprising orthopaedic trauma surgeons, epidemiologists and researchers. All are actively involved in trauma management and evaluating outcomes of orthopaedic injury management.

The purpose of the Registry is to collect baseline and follow-up data at six, 12 and 24-months following injury. These data provide the basis for generating new knowledge to inform the development of evidence-informed guidelines for the optimal treatment of traumatic injury. The Registry is generously funded by the Transport Accident Commission (TAC). The Registry is seen as a leading resource in the field of trauma research both nationally and internationally. It has continued to be very productive with 21 publications in peer-reviewed journals over the previous 12 months.

I hope you enjoy reading this year’s annual report which provides a comprehensive analysis of the VOTOR dataset, and we invite interested researchers to consider future collaborations to help further improve the outcomes of trauma patients.

“...the registry is seen as one of the leaders in the field of trauma research both nationally and internationally...”

Associate Professor Martin Richardson
Surgeon Educator
Epworth HealthCare Clinical School, University of Melbourne
Orthopaedic Trauma Surgeon, Royal Australian Navy Reserve
2. EXECUTIVE SUMMARY

An overview of the profile, treatment and outcomes of orthopaedic admissions from July 2011 to June 2017 is provided in this report. This report provides six-month and 12-month follow-up data for all patients who survived to hospital discharge.

In July 2013 the registry began 24-month follow up data collection, and hence data pertaining to the 24-month follow-up are provided for patients injured from 2011–12 to 2014–15 (excluding patients aged ≥60 years with a hip fracture resulting from a low fall, and patients aged ≥80 years injured via a low fall).

Patients registered in VOTOR
- From July 1st 2011 to June 30th 2017, 38,546 cases were registered by VOTOR (54% male; mean age 57 years). The number of registered patients per year has risen consistently over the past three years from 6321 in 2014–15, to 6739 patients in 2015–16 and 7031 patients in 2016–17. The average age of patients, and the ratio of men to women has remained consistent.

Types of injuries
- In 2016–17, most injuries were the result of a low fall (43%), road trauma (30%) or a high fall (13%) (a fall from a height ≥ one metre).
- While the proportion of injuries related to road trauma decreased from 32 to 30 per cent, an increase in the proportion of low and high falls was observed.

In-Hospital outcomes
- Three per cent of patients died in-hospital in 2016–17, and 10 per cent of patients were admitted to an intensive care unit. The proportion of patients being discharged directly home was similar to previous years (ranging from 55 to 58 per cent in the past six years, with 57 per cent discharged home in 2016–17).
- In 2016–17, the proportion of patients discharged to home versus in-patient rehabilitation was similar for the two major trauma hospitals, whereby 58 per cent were discharged home and 35 per cent were discharged to inpatient rehabilitation.

Long term functional and work outcomes
- Patients with poorer long-term outcomes, or who were less likely to recover, included those with multiple orthopaedic injuries, especially those involving the spine, and those who underwent amputation. In 2016–17, the best functional outcomes were found for patients with soft tissue injuries and isolated upper extremity injuries.
- The predicted probability of a good functional recovery has increased from six to 12-months post-injury for the typical VOTOR patient, adjusting for a range of demographic and injury factors, for each financial year.
- The probability of returning to work has remained consistent over time with 73 to 75 per cent returning to work at six-months, and 78 to 80 per cent returning to work at 12-months.
Pain

- Since 2011–12, the proportion of patients who reported moderate/severe pain severity (i.e., a score ≥5/10 on a numeric rating scale) at six and 12-months following injury has remained relatively stable, ranging from 17 to 21 per cent at six-months compared to 16 to 20 per cent at 12 months.
- An increase in the prevalence of reported problems with daily pain and discomfort between 12 and 24-months post-injury was found for patients with spine and upper extremity injuries, spine and lower extremity injuries, multiple upper injuries and patients who underwent amputation.

Health-related quality of life

- Since 2011–12, health-related quality of life outcomes have consistently improved for all patient groups, except those who underwent amputation or sustained spinal injuries, with improved quality of life from six to 12 to 24-months post-injury.
- Patients with spinal injuries and patients who underwent amputation were least likely to demonstrate improvements in quality of life scores from 12 to 24-months.
- A larger proportion of patients reported problems with self-care at 24-months compared to 12-months for patients across all injury groups except for patients with isolated upper extremity injuries.
- Overall, patients with soft tissue injuries, upper and lower extremity injuries and multiple upper extremity injuries reported the best health-related quality of life outcomes.

Summary

The consistent increase in the annual number of patients registered on VOTOR, and the long-term burden of orthopaedic trauma, support the ongoing need for VOTOR which provides a platform for research that aims to improve patient outcomes, and to evaluate the impact of changes in clinical practice on patient outcomes over time.
3. ABOUT THIS REPORT

This is the fifth annual report prepared for public release by the Victorian Orthopaedic Trauma Outcomes Registry (VOTOR). Data collected during the period of 1st July 2011 to 30th June 2017 are reflected in this report with a particular focus on the profile, treatment and outcomes of orthopaedic admissions in the 2016–17 financial year. Comparisons with previous years are also presented. As data continue to be updated for all new and historical patients in VOTOR, slight differences in case numbers are expected when compared with previous reports.
4. BACKGROUND

4.1 Overview of the Victorian Orthopaedic Trauma Outcomes Registry

The Victorian Orthopaedic Trauma Outcomes Registry (VOTOR) is a sentinel site, clinical quality registry, developed and managed through a collaboration between hospitals and academic institutions. The Registry is a comprehensive database of orthopaedic injuries, treatment, complications and outcomes based on admissions to the Alfred, Royal Melbourne, University Hospital Geelong and the Northern Hospital. The Registry first started as a collaborative project between the Alfred and Royal Melbourne Hospital and the Department of Epidemiology and Preventive Medicine at Monash University in 2003 and in 2007 was expanded to include University Hospital Geelong and the Northern Hospital. The registry is a robust monitoring system for orthopaedic trauma in Victoria, and is funded by the Transport Accident Commission (TAC).

The Registry provides a mechanism to monitor the profile of patients with orthopaedic injuries admitted to the participating hospitals, including how they are treated and the short and long-term outcomes of these injuries. The Registry also provides the opportunity to identify injuries, procedures and patient populations who are at risk for poorer outcomes, and to examine variations in clinical practice and their impact on patient outcomes.

4.2 Eligible patients

The Victorian Orthopaedic Trauma Outcomes Registry captures data about all patients with an emergency admission (>24 hours) to the participating hospitals for an orthopaedic injury. Patients with a pathological fracture related to metastatic disease are excluded. Eligible patients are identified by the discharge diagnosis through ICD-10-AM reports from the hospitals.

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.

4.3 Data Collection

Data are obtained as electronic files from the participating hospitals. The data collected include information about the patient’s demographics, how they were injured, the injuries sustained, how the injuries were managed, any complications or pre-existing conditions and short-term outcomes such as how long the patient stayed in hospital, admission to an intensive care unit and their discharge destination.

In addition to the data received from the participating hospitals, further data about the outcomes of injury are collected by trained VOTOR staff using a standardised telephone interview which is completed at six and 12-months after injury for all patients. In circumstances where the patient is unable to complete the interview (i.e., if the person experiences cognitive or physical problems that precludes them from participating) an abbreviated proxy interview of their immediate next of kin or designated carer is undertaken.

At the start of the 2013–14 financial year, 24-month follow-up phone calls commenced for people with an injury date in 2011. The data collected by telephone interview includes the patient’s level of disability and work status prior to injury, pain levels at follow-up, whether they have returned to work and any work disability still experienced, health-related quality of life and levels of physical functioning. All patients are followed up to 24-months post-injury, except patients aged ≥60 years with a hip fracture in a low fall, or cases aged ≥80 years injured in a low fall.

Data quality is reviewed quarterly to ensure that any potential issues with the admission data submitted from the hospitals are identified and corrected.

4.4 Patient Confidentiality

The Registry was established under the National Statement on Ethical Conduct in Human Research of the National Health and Medical Research Council (NHMRC) to ensure confidentiality and patient privacy are maintained at all times. An opt-out consent approach is used which is defined in the National Statement on Ethical Conduct in Human Resources (2007 and updated March 2014), as a method used in the recruitment of participants into research where information is provided to the potential participant regarding the research and their participation is presumed unless they take action to decline to participate. Ethics approval for VOTOR has been granted by Human Research Ethics Committees of the Department of Health and Human Services, each participating hospital and Monash University.
5. PATIENT DEMOGRAPHICS

5.1 Overview of patients registered in 2016–17

A total of 7,031 adults were admitted to the participating hospitals for orthopaedic trauma in the 2016-17 financial year, and were registered to VOTOR. The number of patients admitted to the four hospitals from July 2011 to June 2017, including the total number across hospitals, are presented in Figure 1. The number of patients remained relatively stable from July 2011 to June 2014 and an upward trend was observed from 2014 to 2017. The overall number of patients with orthopaedic trauma in the dataset has increased by 4.2 per cent since 2015–2016. The Alfred continues to contribute the highest number of cases, followed by the Royal Melbourne Hospital (RMH), University Hospital Geelong (UHG) and The Northern Hospital. This pattern has been consistent for the past six years of the Registry.

Figure 1 – Number of registered VOTOR patients over time

![Graph showing number of registered VOTOR patients over time from 2011 to 2017, with distinct lines for each hospital and an overall trend line.]
6. AGE AND SEX PROFILE OF PATIENTS REGISTERED BY VOTOR

Table 1 – Demographic profile of VOTOR patients over time

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HOSPITAL n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alfred</td>
<td>2,469 (38.9)</td>
<td>2,372 (38.6)</td>
<td>2,376 (39.8)</td>
<td>2,480 (39.3)</td>
<td>2,724 (40.4)</td>
<td>2,893 (41.1)</td>
</tr>
<tr>
<td>UHG</td>
<td>1,237 (19.5)</td>
<td>1,270 (20.7)</td>
<td>1,207 (20.2)</td>
<td>996 (15.8)</td>
<td>978 (14.5)</td>
<td>1,043 (14.8)</td>
</tr>
<tr>
<td>The Northern</td>
<td>741 (11.7)</td>
<td>648 (10.5)</td>
<td>613 (10.3)</td>
<td>660 (10.4)</td>
<td>673 (10.0)</td>
<td>750 (10.7)</td>
</tr>
<tr>
<td>RMH</td>
<td>1,899 (29.9)</td>
<td>1,858 (30.2)</td>
<td>1,770 (29.7)</td>
<td>2,181 (34.5)</td>
<td>2,363 (35.1)</td>
<td>2,345 (33.4)</td>
</tr>
<tr>
<td>Total</td>
<td>6,346</td>
<td>6,148</td>
<td>5,966</td>
<td>6,317</td>
<td>6,738</td>
<td>7,031</td>
</tr>
</tbody>
</table>

SEX

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>3,428 (54.0)</td>
<td>3,005 (53.8)</td>
</tr>
<tr>
<td>Female</td>
<td>2,918 (46.0)</td>
<td>2,843 (46.2)</td>
</tr>
</tbody>
</table>

AGE (YEARS)

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>56.5 (23.7)</td>
</tr>
</tbody>
</table>

During 2016–17, males comprised more than half of registered patients (54.7 per cent, n = 3,845) and this gender distribution has remained consistent over the past six years (Table 1). The average age of patients in the registry population from July 2011 to June 2017 was 49.2 years (SD = 22.0) for male patients, and 65.9 years (SD = 22.0) for female patients. In 2016–17 the average age of VOTOR patients was 56.9 years (SD = 23.1). The average age has also remained consistent over the past six years.

A greater proportion of male patients with orthopaedic trauma were admitted to the major trauma hospitals (The Alfred and RMH) compared to the patients admitted to UHG and The Northern Hospital (Table 2). Furthermore, a larger proportion of male patients were admitted to The Alfred and RMH and were more commonly younger than patients admitted to UHG and The Northern Hospital. This is consistent with previous years (Table 2).

Table 2 – Demographic profile of VOTOR patients by hospital 2016–17

<table>
<thead>
<tr>
<th>HOSPITAL</th>
<th>Alfred (n = 2,893)</th>
<th>RMH (n = 2,345)</th>
<th>UHG (n = 1,043)</th>
<th>The Northern (n = 750)</th>
<th>Overall (n = 7,031)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDER n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1,677 (58.0)</td>
<td>1,406 (60.0)</td>
<td>456 (43.7)</td>
<td>306 (40.8)</td>
<td>3,845 (54.7)</td>
</tr>
<tr>
<td>Female</td>
<td>1,216 (42.0)</td>
<td>939 (40.0)</td>
<td>587 (56.3)</td>
<td>444 (59.2)</td>
<td>3,186 (45.3)</td>
</tr>
</tbody>
</table>

AGE (YEARS)

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>56.4 (22.9)</td>
</tr>
</tbody>
</table>
7. CAUSE AND LOCATION OF INJURIES SUSTAINED
BY VOTOR PATIENTS

7.1 Cause of injury

This section describes the causes of orthopaedic trauma for patients in VOTOR. In 2016–17, 43 per cent of cases were the result of a low fall (defined as a fall from standing or <1m), high fall (falls from height >1m) (13%), and motor vehicle crashes (12%) (Figure 2). In total, road trauma (motor vehicle, motorcycle, pedal cyclist, pedestrian and “other transport” events) contributed 30 per cent of VOTOR cases, which is a 2 per cent reduction compared with the previous year.

The pattern of causes of injury over the past six years is shown in Table 3 and has remained consistent over time, with low falls, motor vehicle crashes and high falls being the predominant causes each year. While the overall proportion of injuries from road trauma decreased from 32 per cent in 2015–2016 to 30 per cent in 2016–17, an increase in the proportion of pedestrian injuries was observed. The proportion of patients admitted to hospital for high and low falls also increased between 2015–16 and 2016–17, from 55 per cent to 56 per cent, respectively. High falls in 2015–2016 and 2016–2017 were the second most common cause of injury behind low falls surpassing the proportion of injuries from motor-vehicle crashes.
Table 3 – Cause of injury of VOTOR patients over time

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CAUSE OF INJURY n (%)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low fall</td>
<td>2,722 (43.1)</td>
<td>2,598 (42.4)</td>
<td>2,460 (41.3)</td>
<td>2,853 (45.7)</td>
<td>2,878 (42.8)</td>
<td>3,039 (43.5)</td>
</tr>
<tr>
<td>High fall</td>
<td>739 (11.7)</td>
<td>803 (13.1)</td>
<td>725 (12.2)</td>
<td>708 (11.3)</td>
<td>794 (11.8)</td>
<td>896 (12.8)</td>
</tr>
<tr>
<td>Motor vehicle</td>
<td>844 (13.4)</td>
<td>732 (12.0)</td>
<td>794 (13.3)</td>
<td>736 (11.8)</td>
<td>927 (13.8)</td>
<td>816 (11.7)</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>531 (8.4)</td>
<td>507 (8.3)</td>
<td>546 (9.2)</td>
<td>537 (8.6)</td>
<td>596 (8.9)</td>
<td>570 (8.2)</td>
</tr>
<tr>
<td>Pedal cyclist</td>
<td>284 (4.5)</td>
<td>413 (6.7)</td>
<td>330 (5.5)</td>
<td>399 (6.4)</td>
<td>401 (6.0)</td>
<td>396 (5.7)</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>260 (4.1)</td>
<td>233 (3.8)</td>
<td>235 (4.0)</td>
<td>226 (3.6)</td>
<td>250 (3.7)</td>
<td>317 (4.5)</td>
</tr>
<tr>
<td>Struck person or object</td>
<td>281 (4.5)</td>
<td>241 (3.9)</td>
<td>217 (3.6)</td>
<td>285 (4.6)</td>
<td>272 (4.1)</td>
<td>328 (4.7)</td>
</tr>
<tr>
<td>Other</td>
<td>655 (10.4)</td>
<td>599 (9.8)</td>
<td>649 (10.9)</td>
<td>501 (8.0)</td>
<td>604 (9.0)</td>
<td>630 (9.0)</td>
</tr>
</tbody>
</table>

*Cause unspecified in <1% of patients each year, "Low fall – fall at the same level or from < one metre, "High fall – fall from a height ≥ to one metre

Low falls continue to be the most common cause of injury at each VOTOR hospital, with the proportion of cases with an injury from a low fall being approximately two-fold higher at the Northern Hospital and UHG compared with the major trauma service hospitals (Table 4).

The proportion of cases injured in high falls was greater at the Alfred and RMH compared to The Northern Hospital and UHG. The vast majority of road trauma (motor vehicle, pedestrian, pedal cyclist and motorcycle) patients were managed at the Alfred and RMH, reflecting the Victorian State Trauma System pre-hospital triage guidelines.

Table 4 – Cause of injury of VOTOR patients by hospital 2016–2017

<table>
<thead>
<tr>
<th>HOSPITAL</th>
<th>Alfred (n = 2,890)</th>
<th>UHG (n = 1,009)</th>
<th>The Northern (n = 750)</th>
<th>RMH (n = 2,343)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAUSE OF INJURY n (%)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low fall</td>
<td>1,076 (37.2)</td>
<td>718 (71.2)</td>
<td>484 (64.5)</td>
<td>761 (32.5)</td>
</tr>
<tr>
<td>High fall</td>
<td>428 (14.8)</td>
<td>70 (6.9)</td>
<td>78 (10.4)</td>
<td>320 (13.7)</td>
</tr>
<tr>
<td>Motor vehicle</td>
<td>382 (13.2)</td>
<td>31 (3.1)</td>
<td>20 (2.7)</td>
<td>383 (16.4)</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>243 (8.4)</td>
<td>37 (3.7)</td>
<td>45 (6.0)</td>
<td>245 (10.5)</td>
</tr>
<tr>
<td>Pedal cyclist</td>
<td>212 (7.3)</td>
<td>28 (2.8)</td>
<td>14 (1.9)</td>
<td>142 (6.1)</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>140 (4.8)</td>
<td>12 (1.2)</td>
<td>7 (0.9)</td>
<td>158 (6.7)</td>
</tr>
<tr>
<td>Struck person or object</td>
<td>142 (4.9)</td>
<td>55 (5.5)</td>
<td>23 (3.1)</td>
<td>108 (4.6)</td>
</tr>
<tr>
<td>Other</td>
<td>267 (9.2)</td>
<td>58 (5.8)</td>
<td>79 (10.5)</td>
<td>226 (9.7)</td>
</tr>
</tbody>
</table>

*Cause unspecified in <1% of patients at each hospital
### 7.2 Place of injury

This section describes the place of injury for orthopaedic trauma patients admitted to VOTOR participating hospitals. During 2016–17, the most common places where VOTOR patients sustained their injuries were on a road, street or highway (32.5 per cent) or at home (34.0 per cent). Residential institutions (6.8 per cent) and athletics or sports area (5.0 per cent) represented the third most common place of injury (Figure 3).

![Figure 3 – Place of injury of VOTOR patients 2016-2017](image)

Over the past six years, the most common places of injury have been a road, street or highway and the home (Table 5). The high number of injuries occurring at home reflects the prevalence of injuries related to low falls shown in Table 3.
Table 5 – Place of injury of VOTOR patients over time

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PLACE OF INJURY n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>1,840 (33.2)</td>
<td>1,761 (33.0)</td>
<td>1,735 (32.6)</td>
<td>1,859 (33.7)</td>
<td>1,951 (33.5)</td>
<td>2,044 (34.0)</td>
</tr>
<tr>
<td>Road, street or highway</td>
<td>1,860 (33.6)</td>
<td>1,823 (34.1)</td>
<td>1,835 (34.4)</td>
<td>1,818 (32.9)</td>
<td>2,028 (34.9)</td>
<td>1,955 (32.5)</td>
</tr>
<tr>
<td>Residential institution</td>
<td>474 (8.6)</td>
<td>486 (9.1)</td>
<td>440 (8.3)</td>
<td>443 (8.0)</td>
<td>416 (7.2)</td>
<td>411 (6.8)</td>
</tr>
<tr>
<td>School, other institution</td>
<td>38 (0.7)</td>
<td>20 (0.4)</td>
<td>34 (0.6)</td>
<td>36 (0.7)</td>
<td>31 (0.5)</td>
<td>35 (0.6)</td>
</tr>
<tr>
<td>Hospital/health service</td>
<td>153 (2.8)</td>
<td>151 (2.8)</td>
<td>180 (3.4)</td>
<td>165 (3.0)</td>
<td>261 (4.5)</td>
<td>277 (4.6)</td>
</tr>
<tr>
<td>Athletics/sports area</td>
<td>341 (6.2)</td>
<td>319 (6.0)</td>
<td>262 (4.9)</td>
<td>312 (5.7)</td>
<td>274 (4.7)</td>
<td>302 (5.0)</td>
</tr>
<tr>
<td>Trade/service area</td>
<td>242 (4.4)</td>
<td>239 (4.5)</td>
<td>262 (4.9)</td>
<td>247 (4.5)</td>
<td>275 (4.7)</td>
<td>319 (5.3)</td>
</tr>
<tr>
<td>Industrial or construction</td>
<td>99 (1.8)</td>
<td>80 (1.5)</td>
<td>88 (1.7)</td>
<td>106 (1.9)</td>
<td>89 (1.5)</td>
<td>108 (1.8)</td>
</tr>
<tr>
<td>Other</td>
<td>361 (6.5)</td>
<td>278 (5.2)</td>
<td>344 (6.5)</td>
<td>333 (6.0)</td>
<td>346 (5.9)</td>
<td>427 (7.1)</td>
</tr>
<tr>
<td>Farm</td>
<td>81 (1.5)</td>
<td>91 (1.7)</td>
<td>82 (1.5)</td>
<td>83 (1.5)</td>
<td>87 (1.5)</td>
<td>83 (1.4)</td>
</tr>
<tr>
<td>Place of recreation</td>
<td>46 (0.8)</td>
<td>93 (1.7)</td>
<td>69 (1.3)</td>
<td>121 (2.2)</td>
<td>62 (1.1)</td>
<td>47 (0.8)</td>
</tr>
</tbody>
</table>

*Missing cases from 2011-12 (n = 811, 12.8%), 2012-13 (n = 807, 13.1%), 2013-14 (n = 635, 10.6%), 2014-15 (n = 794, 12.6%), 2015-16 (n = 918, 13.7%), 2016-17 (n = 1,023, 14.6%).

The proportion of patients injured on a road, street or highway was higher in patients admitted to the Alfred (38.4 per cent) and RMH (44.7 per cent) compared to UHG (7.0 per cent) and The Northern Hospital (9.8 per cent). This is consistent with the higher proportion of road trauma managed at the major trauma service hospitals. The largest proportion of patients managed at UHG (49.6 per cent) and The Northern Hospital (55.0 per cent) were injured at home (Table 6).

Admissions to hospital for orthopaedic trauma sustained at residential institutions were higher at UHG and The Northern Hospital compared to the major trauma services, which is consistent with the older age of patients and the preponderance of low fall related injuries presenting to these hospitals (Table 6). This pattern is consistent with previous years.

Table 6 – Place of injury of VOTOR patients by hospital 2016-2017

<table>
<thead>
<tr>
<th>HOSPITAL</th>
<th>Alfred (n = 2,547)</th>
<th>UHG (n = 980)</th>
<th>The Northern (n = 580)</th>
<th>RMH (n = 1,901)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLACE OF INJURY n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road, street or highway</td>
<td>978 (38.4)</td>
<td>71 (7.2)</td>
<td>57 (9.8)</td>
<td>849 (44.7)</td>
</tr>
<tr>
<td>Home</td>
<td>762 (29.9)</td>
<td>486 (49.6)</td>
<td>319 (55.0)</td>
<td>477 (25.1)</td>
</tr>
<tr>
<td>Athletics or sports arena</td>
<td>110 (4.3)</td>
<td>66 (6.7)</td>
<td>19 (3.3)</td>
<td>107 (5.6)</td>
</tr>
<tr>
<td>Hospital/health service</td>
<td>135 (5.3)</td>
<td>24 (2.5)</td>
<td>33 (5.7)</td>
<td>85 (4.5)</td>
</tr>
<tr>
<td>Residential institution</td>
<td>141 (5.5)</td>
<td>120 (12.2)</td>
<td>84 (14.5)</td>
<td>66 (3.5)</td>
</tr>
<tr>
<td>Trade or service area</td>
<td>112 (4.4)</td>
<td>113 (11.5)</td>
<td>20 (3.5)</td>
<td>74 (3.9)</td>
</tr>
<tr>
<td>Industrial or construction</td>
<td>53 (2.1)</td>
<td>26 (2.7)</td>
<td>3 (0.5)</td>
<td>26 (1.4)</td>
</tr>
<tr>
<td>Farm</td>
<td>48 (1.9)</td>
<td>4 (0.4)</td>
<td>8 (1.4)</td>
<td>23 (1.2)</td>
</tr>
<tr>
<td>Place for recreation</td>
<td>19 (0.8)</td>
<td>11 (1.1)</td>
<td>2 (0.3)</td>
<td>15 (0.8)</td>
</tr>
<tr>
<td>School, other institution</td>
<td>13 (0.5)</td>
<td>8 (0.8)</td>
<td>5 (0.9)</td>
<td>9 (0.5)</td>
</tr>
<tr>
<td>Other</td>
<td>176 (6.9)</td>
<td>51 (5.2)</td>
<td>30 (5.2)</td>
<td>170 (9.0)</td>
</tr>
</tbody>
</table>

* Missing patients from the Alfred (n = 346, 12.0%), RMH (n = 444, 19.0%), UHG (n = 63, 6.0%), The Northern (n = 170, 22.7%)
8. TYPES OF INJURIES SUSTAINED BY VOTOR PATIENTS

The ICD-10-AM classifications are used to describe injuries sustained by VOTOR patients. In 2016-17, 54 per cent of patients were admitted for management of an isolated upper or lower extremity injury, with 35 per cent of all registered patients sustaining an isolated lower extremity injury (Figure 4). Patients with spinal injuries accounted for 29 per cent of cases, and 10 per cent of patients had sustained injuries to multiple body regions (Figure 4).

Figure 4 – Orthopaedic injury profile of VOTOR patients 2016-2017

The pattern of orthopaedic injuries sustained by VOTOR patients has remained consistent over the past six years (Table 7).
Table 7 – Injury profile of VOTOR patients over time

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ORTHOPAEDIC INJURY n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolated lower extremity</td>
<td>2,377 (37.5)</td>
<td>2,241 (36.5)</td>
<td>2,266 (38.0)</td>
<td>2,362 (37.4)</td>
<td>2,415 (35.8)</td>
<td>2,462 (35.0)</td>
</tr>
<tr>
<td>Isolated upper extremity</td>
<td>1,230 (19.4)</td>
<td>1,255 (20.4)</td>
<td>1,136 (19.0)</td>
<td>1,191 (18.9)</td>
<td>1,252 (18.6)</td>
<td>1,362 (19.4)</td>
</tr>
<tr>
<td>Spinal injuries only</td>
<td>996 (15.7)</td>
<td>999 (16.3)</td>
<td>1,025 (17.2)</td>
<td>1,178 (18.7)</td>
<td>1,278 (19.0)</td>
<td>1,330 (18.9)</td>
</tr>
<tr>
<td>Multiple lower extremity</td>
<td>450 (7.1)</td>
<td>422 (6.9)</td>
<td>388 (6.5)</td>
<td>376 (6.0)</td>
<td>449 (6.7)</td>
<td>456 (6.5)</td>
</tr>
<tr>
<td>Upper and lower extremity</td>
<td>299 (4.7)</td>
<td>313 (5.1)</td>
<td>304 (5.1)</td>
<td>320 (5.1)</td>
<td>300 (4.5)</td>
<td>320 (4.6)</td>
</tr>
<tr>
<td>Spine and lower extremity</td>
<td>236 (3.7)</td>
<td>221 (3.6)</td>
<td>224 (3.8)</td>
<td>222 (3.5)</td>
<td>287 (4.3)</td>
<td>311 (4.4)</td>
</tr>
<tr>
<td>Multiple upper extremity</td>
<td>224 (3.5)</td>
<td>226 (3.7)</td>
<td>223 (3.7)</td>
<td>225 (3.6)</td>
<td>236 (3.5)</td>
<td>244 (3.5)</td>
</tr>
<tr>
<td>Spine and upper extremity</td>
<td>203 (3.2)</td>
<td>200 (3.3)</td>
<td>185 (3.1)</td>
<td>190 (3.0)</td>
<td>223 (3.3)</td>
<td>247 (3.5)</td>
</tr>
<tr>
<td>Spine, upper and lower extremity</td>
<td>117 (1.8)</td>
<td>111 (1.8)</td>
<td>98 (1.6)</td>
<td>104 (1.7)</td>
<td>134 (2.0)</td>
<td>143 (2.0)</td>
</tr>
<tr>
<td>Soft tissue or other injuries</td>
<td>187 (3.0)</td>
<td>137 (2.2)</td>
<td>99 (1.7)</td>
<td>127 (2.0)</td>
<td>143 (2.1)</td>
<td>133 (1.9)</td>
</tr>
<tr>
<td>Amputation (with or without other orthopaedic injuries)</td>
<td>27 (0.4)</td>
<td>23 (0.4)</td>
<td>18 (0.3)</td>
<td>22 (0.4)</td>
<td>21 (0.3)</td>
<td>23 (0.3)</td>
</tr>
</tbody>
</table>

Consistent with the Victorian State Trauma System triage guidelines and the higher prevalence of road transport-related injuries at the major trauma services, the proportion of isolated lower extremity fractures was lower at major trauma service hospitals compared to The Northern Hospital and UHG (Table 8). Isolated extremity fractures accounted for 78 per cent of the Northern Hospital patients and 73 per cent of UHG patients, compared to 45 per cent of cases at The Alfred, and 50 per cent at RMH (Table 8). The UHG and the Northern Hospital also managed a much lower proportion of patients with spinal injuries compared to the major trauma services (Table 8).

Table 8 – Injury profile of VOTOR patients by hospital 2016-2017

<table>
<thead>
<tr>
<th>HOSPITAL</th>
<th>Alfred (n = 2,893)</th>
<th>UHG (n = 1,043)</th>
<th>The Northern (n = 750)</th>
<th>RMH (n = 2,345)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORTHOPAEDIC INJURY n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolated lower extremity</td>
<td>776 (26.8)</td>
<td>526 (50.4)</td>
<td>448 (59.7)</td>
<td>712 (30.4)</td>
</tr>
<tr>
<td>Isolated upper extremity</td>
<td>527 (18.2)</td>
<td>233 (22.3)</td>
<td>136 (18.1)</td>
<td>466 (19.9)</td>
</tr>
<tr>
<td>Spinal injuries only</td>
<td>722 (25.0)</td>
<td>104 (10.0)</td>
<td>59 (7.9)</td>
<td>445 (19.0)</td>
</tr>
<tr>
<td>Multiple lower extremity</td>
<td>180 (6.2)</td>
<td>75 (7.2)</td>
<td>44 (5.9)</td>
<td>157 (6.7)</td>
</tr>
<tr>
<td>Upper and lower extremity</td>
<td>138 (4.8)</td>
<td>42 (4.0)</td>
<td>18 (2.4)</td>
<td>122 (5.2)</td>
</tr>
<tr>
<td>Spine and lower extremity</td>
<td>173 (6.0)</td>
<td>8 (0.8)</td>
<td>7 (0.9)</td>
<td>123 (5.3)</td>
</tr>
<tr>
<td>Spine and upper extremity</td>
<td>122 (4.2)</td>
<td>15 (1.4)</td>
<td>3 (0.4)</td>
<td>107 (4.6)</td>
</tr>
<tr>
<td>Multiple upper extremity</td>
<td>115 (4.0)</td>
<td>28 (2.7)</td>
<td>19 (2.5)</td>
<td>82 (3.5)</td>
</tr>
<tr>
<td>Spine, upper and lower extremity</td>
<td>74 (2.6)</td>
<td>1 (0.1)</td>
<td>1 (0.1)</td>
<td>67 (2.9)</td>
</tr>
<tr>
<td>Soft tissue or other injuries</td>
<td>57 (2.0)</td>
<td>10 (1.0)</td>
<td>12 (1.6)</td>
<td>54 (2.3)</td>
</tr>
<tr>
<td>Amputation (with or without other orthopaedic injuries)</td>
<td>9 (0.3)</td>
<td>1 (0.1)</td>
<td>3 (0.4)</td>
<td>10 (0.4)</td>
</tr>
</tbody>
</table>

In general, the pattern of fractures sustained has not changed over time, with hip fractures, forearm fractures and tibial (or ankle) fractures being the three most common types of fractures admitted to VOTOR participating hospitals over the past six years (Table 9). However, there was an increase in thoracic spine fractures from 11 per cent in 2011-12 to 14 per cent in 2016-17.
### Table 9 – Ten most common fractures sustained by VOTOR patients over time

<table>
<thead>
<tr>
<th>YEAR</th>
<th>2011–12 (n = 6,184)</th>
<th>2012–13 (n = 6,028)</th>
<th>2013–14 (n = 5,890)</th>
<th>2014–15 (n = 6,206)</th>
<th>2015–16 (n = 6,609)</th>
<th>2016–17 (n = 6,911)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTOR</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Forearm fracture</td>
<td>1,052 (17.0)</td>
<td>1,053 (17.5)</td>
<td>944 (16.0)</td>
<td>953 (15.4)</td>
<td>983 (14.9)</td>
<td>1,074 (15.5)</td>
</tr>
<tr>
<td>Tibial or ankle fracture</td>
<td>947 (15.3)</td>
<td>909 (15.1)</td>
<td>902 (15.3)</td>
<td>898 (14.5)</td>
<td>986 (14.9)</td>
<td>1,027 (14.9)</td>
</tr>
<tr>
<td>Hip fracture</td>
<td>940 (15.2)</td>
<td>935 (15.5)</td>
<td>964 (16.4)</td>
<td>973 (15.7)</td>
<td>924 (14.0)</td>
<td>952 (13.8)</td>
</tr>
<tr>
<td>Thoracic spine</td>
<td>703 (11.4)</td>
<td>699 (11.6)</td>
<td>703 (11.9)</td>
<td>783 (12.6)</td>
<td>880 (13.3)</td>
<td>969 (14.0)</td>
</tr>
<tr>
<td>Lumbar spine</td>
<td>663 (10.7)</td>
<td>655 (10.9)</td>
<td>643 (10.9)</td>
<td>712 (11.5)</td>
<td>805 (12.2)</td>
<td>892 (12.9)</td>
</tr>
<tr>
<td>Pelvis fracture</td>
<td>733 (11.9)</td>
<td>694 (11.5)</td>
<td>676 (11.5)</td>
<td>701 (11.3)</td>
<td>817 (12.4)</td>
<td>846 (12.2)</td>
</tr>
<tr>
<td>Cervical spine</td>
<td>589 (9.5)</td>
<td>555 (9.2)</td>
<td>567 (9.6)</td>
<td>608 (9.8)</td>
<td>680 (10.3)</td>
<td>683 (9.9)</td>
</tr>
<tr>
<td>Humerus fracture</td>
<td>503 (8.1)</td>
<td>473 (7.9)</td>
<td>491 (8.3)</td>
<td>503 (8.1)</td>
<td>500 (7.6)</td>
<td>527 (7.6)</td>
</tr>
<tr>
<td>Clavicle fracture</td>
<td>357 (5.8)</td>
<td>391 (6.5)</td>
<td>317 (5.4)</td>
<td>390 (6.3)</td>
<td>456 (6.9)</td>
<td>450 (6.5)</td>
</tr>
<tr>
<td>Foot fracture</td>
<td>385 (6.2)</td>
<td>383 (6.4)</td>
<td>357 (6.1)</td>
<td>344 (5.5)</td>
<td>429 (6.5)</td>
<td>436 (6.3)</td>
</tr>
</tbody>
</table>

Consistent with previous annual reports, the proportion of spinal and pelvic fractures was higher at the major trauma services when compared to UHG and the Northern Hospital (Table 10). Hip fractures accounted for 23 per cent of all fractures at UHG and 25 per cent at The Northern Hospital, compared to 11 per cent of fractures at RMH and 10 per cent of fractures at the Alfred (Table 10).

### Table 10 – Most common fractures sustained by VOTOR patients by hospital 2016-2017

<table>
<thead>
<tr>
<th>HOSPITAL</th>
<th>Alfred (n = 2,893)</th>
<th>UHG (n = 1,043)</th>
<th>The Northern (n = 750)</th>
<th>RMH (n = 2,345)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTOR</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Hip fracture</td>
<td>278 (9.8)</td>
<td>238 (23.0)</td>
<td>183 (24.7)</td>
<td>253 (11.0)</td>
</tr>
<tr>
<td>Forearm fracture</td>
<td>415 (14.6)</td>
<td>175 (16.9)</td>
<td>99 (13.4)</td>
<td>385 (16.8)</td>
</tr>
<tr>
<td>Tibial or ankle fracture</td>
<td>364 (12.8)</td>
<td>180 (17.4)</td>
<td>143 (19.3)</td>
<td>340 (14.8)</td>
</tr>
<tr>
<td>Thoracic spine</td>
<td>511 (18.0)</td>
<td>59 (5.7)</td>
<td>27 (3.7)</td>
<td>372 (16.2)</td>
</tr>
<tr>
<td>Lumbar spine</td>
<td>465 (16.4)</td>
<td>56 (5.4)</td>
<td>42 (5.7)</td>
<td>329 (14.3)</td>
</tr>
<tr>
<td>Pelvis fracture</td>
<td>420 (14.8)</td>
<td>85 (8.2)</td>
<td>48 (6.5)</td>
<td>293 (12.8)</td>
</tr>
<tr>
<td>Cervical spine</td>
<td>403 (14.2)</td>
<td>27 (2.6)</td>
<td>13 (1.8)</td>
<td>240 (10.4)</td>
</tr>
<tr>
<td>Humerus fracture</td>
<td>231 (8.1)</td>
<td>74 (7.2)</td>
<td>51 (6.9)</td>
<td>171 (7.4)</td>
</tr>
<tr>
<td>Foot fracture</td>
<td>187 (6.6)</td>
<td>37 (3.6)</td>
<td>40 (5.4)</td>
<td>172 (7.5)</td>
</tr>
<tr>
<td>Clavicle fracture</td>
<td>206 (7.3)</td>
<td>48 (4.7)</td>
<td>14 (1.9)</td>
<td>182 (7.9)</td>
</tr>
</tbody>
</table>
9. IN-HOSPITAL OUTCOMES OF VOTOR PATIENTS

Of the 7,031 VOTOR patients registered in VOTOR in 2016-17, 188 (2.7 per cent) died during their hospital stay. Ten per cent of patients required an admission to an intensive care unit (ICU), and the median (IQR) hospital length of stay (LOS) was 4.7 (2.3-8.5) days, which is consistent with previous years. The in-hospital death rate, ICU admission rate, and hospital LOS have remained consistent over the past six years (Table 11). Of the patients who survived to hospital discharge, more than half (57.4 per cent, n = 4,033) were discharged directly home. The patients discharged home had a median (IQR) length of stay of 2.9 (1.9-5.0) days in hospital whereas patients who were discharged elsewhere had a median (IQR) length of stay of 7.8 (5.0-12.5) days. In the past three financial years, approximately one third (33.5 to 35.0 per cent) of patients have been discharged to inpatient rehabilitation (Table 11). Other discharge destinations included nursing homes, hospitals for convalescence and aged care facilities.

The in-hospital outcomes of VOTOR patients differed substantially between hospitals, reflecting the variation in case-mix of orthopaedic trauma patients managed at each hospital. The proportion of patients admitted to an ICU was highest at the Alfred (13.2 per cent), followed by RMH (11.7 per cent), and lowest at the UHG (2.7 per cent) and the Northern Hospital (3.6 per cent). The median length of stay ranged from 4.4 days at RMH to 4.8 days at the Alfred and UHG.

A lower proportion of UHG trauma patients were discharged to inpatient rehabilitation centres when compared to the major trauma services and The Northern Hospital. Inpatient rehabilitation discharge rates recorded at the Northern Hospital included patients who were discharged to extended care. As such, The Northern Hospital discharged the largest proportion of patients to inpatient rehabilitation (39.1 per cent) (Table 12). The in-hospital death rate was consistent between the Alfred, RMH and UHG but lower at The Northern Hospital (1.9%). The proportion of patients discharged to home versus in-patient rehabilitation in 2016-17 was similar for the major trauma hospitals, whereby 58 per cent were discharged home and 35 per cent were discharged to rehabilitation. However, inpatient rehabilitation discharge rates were much lower for UHG at 22 per cent.

### Table 11 – In-hospital outcomes of VOTOR patients over time

<table>
<thead>
<tr>
<th>YEAR</th>
<th>2011-12 (n = 6,346)</th>
<th>2012-13 (n = 6,148)</th>
<th>2013-14 (n = 5,966)</th>
<th>2014-15 (n = 6,317)</th>
<th>2015-16 (n = 6,738)</th>
<th>2016-17 (n = 7,027)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU* STAY n (%) yes</td>
<td>661 (10.4)</td>
<td>649 (10.6)</td>
<td>617 (10.3)</td>
<td>588 (9.3)</td>
<td>688 (10.2)</td>
<td>711 (10.1)</td>
</tr>
<tr>
<td>LOS* DAYS Median (IQR)</td>
<td>4.9 (2.4-9.6)</td>
<td>4.8 (2.5-9.1)</td>
<td>4.8 (2.5-8.7)</td>
<td>4.8 (2.4-8.9)</td>
<td>4.6 (2.4-8.4)</td>
<td>4.7 (2.3-8.5)</td>
</tr>
<tr>
<td>IN-HOSPITAL DEATH n (%) yes</td>
<td>159 (3.0)</td>
<td>154 (2.5)</td>
<td>134 (2.2)</td>
<td>142 (2.2)</td>
<td>149 (2.2)</td>
<td>188 (2.7)</td>
</tr>
<tr>
<td>DISCHARGE DESTINATION [n (%)]</td>
<td>Home 3702 (58.3)</td>
<td>3,530 (57.4)</td>
<td>3,302 (55.3)</td>
<td>3,526 (55.8)</td>
<td>3,855 (57.2)</td>
<td>4,033 (57.4)</td>
</tr>
<tr>
<td></td>
<td>Inpatient rehab 1,514 (23.9)</td>
<td>1,547 (25.2)</td>
<td>1,871 (31.4)</td>
<td>2,209 (35.0)</td>
<td>2,263 (33.6)</td>
<td>2,353 (33.5)</td>
</tr>
<tr>
<td></td>
<td>Other 971 (15.3)</td>
<td>917 (14.9)</td>
<td>659 (11.0)</td>
<td>440 (7.0)</td>
<td>473 (7.0)</td>
<td>453 (6.4)</td>
</tr>
</tbody>
</table>

* ICU, intensive care unit; * LOS, length of hospital stay; * Survivors to hospital discharge only.

### Table 12 – In-hospital outcomes of VOTOR patients by hospital 2016-2017

<table>
<thead>
<tr>
<th>HOSPITAL</th>
<th>Alfred (n = 2,889)</th>
<th>UHG (n = 1,017)</th>
<th>The Northern (n = 750)</th>
<th>RMH (n = 2,345)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU* STAY n (%) yes</td>
<td>382 (13.2)</td>
<td>27 (2.7)</td>
<td>27 (3.6)</td>
<td>275 (11.7)</td>
</tr>
<tr>
<td>LOS* DAYS Median (IQR)</td>
<td>4.8 (2.4-8.7)</td>
<td>4.8 (2.3-8.5)</td>
<td>4.8 (2.8-7.2)</td>
<td>4.4 (2.1-8.8)</td>
</tr>
<tr>
<td>IN-HOSPITAL DEATH n (%) yes</td>
<td>87 (3.0)</td>
<td>26 (2.6)</td>
<td>14 (1.9)</td>
<td>61 (3)</td>
</tr>
<tr>
<td>DISCHARGE DESTINATION [n (%)]</td>
<td>Home 1,676 (58.0)</td>
<td>623 (61.3)</td>
<td>367 (48.9)</td>
<td>1,367 (58.3)</td>
</tr>
<tr>
<td></td>
<td>Inpatient rehab 1,014 (35.1)</td>
<td>232 (22.8)</td>
<td>293 (39.1)</td>
<td>814 (35.7)</td>
</tr>
<tr>
<td></td>
<td>Other 112 (3.9)</td>
<td>162 (15.9)</td>
<td>76 (10.1)</td>
<td>103 (4.4)</td>
</tr>
</tbody>
</table>

* ICU, intensive care unit; * LOS, length of hospital stay; * Survivors to hospital discharge only,

*d Inpatient rehab includes patients who were discharged to extended care at The Northern Hospital.*
10. LONG TERM OUTCOMES

This section describes longer term patient outcomes following orthopaedic trauma. All survivors to hospital discharge are followed-up via telephone interview at six, 12 and 24-months after injury to capture functional status, work outcomes, pain and health-related quality of life. In circumstances where the patient is unable to complete the interview (i.e., if the person experiences cognitive or physical problems that precludes them from participating) an abbreviated proxy interview of their immediate next of kin or designated carer is undertaken.

All patients, except patients aged 60 years and older with a hip fracture (neck of femur and trochanteric fractures) resulting from a low fall and those patients aged 80 years and older injured via a low fall, are also followed up at 24 months after injury. Therefore, outcome measures for patients aged ≥60 years with a hip fracture (neck or femur and trochanteric fractures) resulting from a low fall and those patients aged 80 years and older injured via a low fall were not included in the analysis below.

10.1 Follow up cohort and follow-up rates

Consistent with the previous report, the focus of this section of the report is on the most recent five year cohort of patients who survived to hospital discharge and were eligible for 6-month, 12-month and 24-month follow-up. For this year’s report this means patients with a date of admission between July 1 2011 and June 30 2016, and represents 77 per cent of the total VOTOR cohort in the time period (n = 24,300). The demographic profile of patients included in the follow-up analyses are presented in Table 13. This cohort of patients are younger and more commonly male, compared to the total VOTOR population (see Table 1).

Table 13 – Demographic profile of VOTOR patients eligible for 24-month follow-up

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HOSPITAL n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alfred</td>
<td>1,977 (41.1)</td>
<td>1,888 (40.4)</td>
<td>1,953 (43.0)</td>
<td>1,932 (41.0)</td>
<td>2,165 (41.8)</td>
</tr>
<tr>
<td>UHG</td>
<td>794 (16.5)</td>
<td>844 (18.1)</td>
<td>780 (17.2)</td>
<td>599 (12.7)</td>
<td>619 (12.0)</td>
</tr>
<tr>
<td>The Northern</td>
<td>473 (9.8)</td>
<td>397 (8.5)</td>
<td>385 (8.5)</td>
<td>410 (8.7)</td>
<td>421 (8.1)</td>
</tr>
<tr>
<td>RMH</td>
<td>1,572 (32.6)</td>
<td>1,546 (33.1)</td>
<td>1,427 (31.4)</td>
<td>1,770 (37.6)</td>
<td>1,969 (38.1)</td>
</tr>
<tr>
<td>GENDER n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2,970 (61.7)</td>
<td>2,866 (61.3)</td>
<td>2,711 (59.6)</td>
<td>2,896 (61.5)</td>
<td>3,164 (61.2)</td>
</tr>
<tr>
<td>Female</td>
<td>1,846 (38.3)</td>
<td>1,809 (38.7)</td>
<td>1,834 (40.4)</td>
<td>1,815 (38.5)</td>
<td>2,010 (38.8)</td>
</tr>
<tr>
<td>AGE (YEARS) n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>47.8 (20.1)</td>
<td>48.5 (19.7)</td>
<td>49.4 (20.4)</td>
<td>48.4 (19.8)</td>
<td>48.3 (20.0)</td>
</tr>
</tbody>
</table>

Between 2011-12 and 2015-16, 86 per cent of VOTOR patients were followed-up at six-months, ranging from 77 per cent to 92 per cent follow-up at each of the participating hospitals. Eighty-five per cent of VOTOR patients were followed-up at 12 months, ranging from 78 per cent to 92 per cent at each of the participating hospitals. Twenty-four month follow up calls commenced in July 2013 and hence data are available for patients injured from 2011-12 to 2014-15 for the present report. Eighty-one per cent of VOTOR patients were followed-up at 24 months, ranging from 77 per cent to 87 per cent follow-up at each of the participating hospitals. Twenty-four month follow-up rates were lowest for The Northern Hospital, followed by RMH (Figure 5).
Figure 5 – Follow-up rates over time. Twenty-four-month follow-up calls commenced in July 2013 and hence data are available for patients injured from 2011-12 to 2014-15.
The Glasgow Outcome Scale – Extended (GOS-E) rates the function of the patient into eight categories ranging from death (GOS-E=1) to upper good recovery (GOS-E=8). A good recovery is represented by a score of 7 (lower good recovery) or 8 (upper good recovery). This section includes data on patients who made a good recovery which indicates a return to normal activities of daily life, including occupational and social activities, without any residual deficits related to their injury.

Since 2013-2014, the proportion of patients achieving a good recovery remained relatively stable at 6 and 12-months (Figure 6). The proportion of patients achieving a good recovery at 24-months reduced from 52 per cent in 2011-2012, and 2012-2013 to 49 per cent in 2014-2015.

The proportion of VOTOR patients injured from 2011–12 and 2014–15 reporting a good functional recovery on the GOS-E scale in each injury group, at six-months and 12-months post-injury, are shown in Figure 7. For all injury groups, except the amputation group, the proportion of patients who achieved a good recovery increased from six to 12 to 24-months post-injury.

Overall, 12month functional outcomes were best for soft tissue injuries, upper and lower extremity and multiple upper extremity injuries (Figure 7). The patients with the poorest recovery outcomes at 1-months were those who had sustained spine and upper extremity injuries as well as patients who underwent amputation. Compared to six-month follow-up, patients who underwent amputation and spinal injuries demonstrated the least change in functional recovery at 24-months post-injury (Figure 7).

Figure 7 – Percentage of patients (95% CI) achieving a good functional recovery for VOTOR patients injured between 2011–12 and 2014–15 by orthopaedic injury group. Twenty-four-month follow up data are available for patients injured between 2011–12 and 2014–15.
Taking into account factors such as age, sex, pre-existing comorbidities, pre-injury disability, compensable status, types of injuries and mechanism of injury, the probability of experiencing a good functional recovery can be predicted for a typical VOTOR patient. For each financial year, the predicted probability of a good functional recovery has increased between six and 12-months post-injury for the typical VOTOR patient (Figure 8).

In 2014-15, the probability of a good recovery at 24-months post-injury was 50 per cent. Since 2011-12, the predicted probability of a good functional recovery at six-months post-injury varied from 46 to 43 per cent. At 12-months post-injury, the predicted probability of a good functional recovery was stable at 48 per cent except for in 2012-2013 where the probability of a good recovery was 51 per cent. There was no change in the probability of experiencing a good recovery at 12-months compared to 24-months in 2014-15, indicating minimal improvement occurred from 12 to 24-month follow up.

Figure 8 – Predicted probability (95% CI) of a good functional recovery for VOTOR patients adjusted for demographic and injury factors. Twenty-four-month follow up are available for patients injured from 2011-12 to 2014-15.
10.3 Return to work

The proportion of VOTOR patients that were eligible for 24-month follow-ups who were working 24-months post injury remained fairly consistent over time; with 64 per cent (n=2,862) in 2011-12, 62 per cent (n=2,654) in 2012-13, 62 per cent (n=2,542) in 2013-14, 61 per cent (n=2,642) in 2014-15, and 61 per cent (n=2,800) in 2015-16.

The proportion of patients returning to work has remained consistent for both the six-month and 12-month time points over the past five years (Figure 9). In 2015-16, the six-month return to work rate was 75 per cent (n=1,868) and 80 per cent (n=1,972) had returned to work at 12 months.

Over the last five years the proportion of patients who returned to work was higher at 12-months than at six-months post-injury and for 2012-13 and 2013-14 was higher at 24-months than 12-months post-injury (Figure 9).

In 2015-16, 87 per cent (n=1,623) of patients who returned to work at 6-months, and 82 per cent (n=1,611) of patients who returned to work at 12-months, had returned to the same role within their pre-injury workplace. These proportions have remained fairly consistent over time (Table 14).

### Table 14 – VOTOR patients returning to same role by year

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTOR</td>
<td>Still working</td>
<td>Still working</td>
<td>Still working</td>
<td>Still working</td>
<td>Still working</td>
</tr>
<tr>
<td>6 months</td>
<td>1,658 (85.3)</td>
<td>1,588 (87.9)</td>
<td>1,469 (85.4)</td>
<td>1,623 (88.0)</td>
<td>1,623 (87.0)</td>
</tr>
<tr>
<td>12 months</td>
<td>1,693 (84.1)</td>
<td>1,617 (84.9)</td>
<td>1,559 (83.6)</td>
<td>1,597 (85.0)</td>
<td>1,611 (81.7)</td>
</tr>
<tr>
<td>24 months</td>
<td>1,571 (79.0)</td>
<td>1,472 (78.9)</td>
<td>1,416 (78.5)</td>
<td>1,391 (78.3)</td>
<td>1,391 (78.3)</td>
</tr>
</tbody>
</table>

* Proportion of those patients who had returned to work. ^Twenty-four-month follow up calls commenced in July 2013 and hence data are available for patients injured from 2011-12 to 2015-16.

The return to work rate at six, 12 and 24-months, for patients injured between 2011–12 and 2014–15, was highest for soft tissue or other injuries and isolated upper extremity fractures (Figure 10). Return to work rates were lower for patients with amputation (with or without orthopaedic injuries), in addition to spine, upper and lower extremity fractures (Figure 10).
The probability of returning to work for a typical VOTOR patient is shown in Figure 11 adjusting for age, sex, pre-existing comorbidities, pre-injury disability, and compensable status, type of injury and mechanism of injury. Each year, the predicted probability of returning to work increases from six, to 12 to 24-months post injury for the typical VOTOR patient (Figure 11). Across injury years, the predicted probability of returning to work at six-months post-injury ranged from 77 to 78 per cent, and at 12 months ranged from 81 to 83 per cent.

Figure 11 – Predicted probability (95% CI) of returning to work for VOTOR patients adjusted for demographic and injury factors. Twenty-four-month follow up calls commenced in July 2013 and hence data are available for patients injured from 2011–12 to 2014–15.
10.4 Pain

A numerical rating scale was used to collect information about pain at follow-up. The patient was asked to rate their pain at the time of interview on a scale from zero (no pain at all) to 10 (worst possible pain). A score of five or higher represents moderate to severe pain. This information was collected at the time of interview from the patient only, and was not collected in proxy interviews. The proportion of patients reporting moderate/severe pain (≥5/10) at six and 12-months following injury has remained relatively stable since 2011-12 ranging from 17 to 21 per cent at six-months compared to 16 to 20 per cent at 12-months (Table 15). The proportion of 2011-12 and 2013-14 patients reporting moderate/severe persistent pain decreased from six-months to 24-months following injury but remained fairly consistent over time for those patients followed up in 2012-13 and 2014-15.

Table 15 – Pain outcomes of VOTOR patients by year

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTOR n (%)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD) score</td>
<td>1.9 (2.7)</td>
<td>1.8 (2.5)</td>
<td>2.0 (2.7)</td>
<td>1.8 (2.5)</td>
<td>1.9 (2.5)</td>
</tr>
<tr>
<td>None/Mild pain</td>
<td>2,768 (80.1)</td>
<td>2,762 (82.0)</td>
<td>2,604 (79.2)</td>
<td>2,743 (82.8)</td>
<td>2,830 (82.3)</td>
</tr>
<tr>
<td>Moderate/Severe</td>
<td>687 (19.9)</td>
<td>608 (18.0)</td>
<td>685 (20.8)</td>
<td>569 (17.2)</td>
<td>607 (17.7)</td>
</tr>
<tr>
<td>12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD) score</td>
<td>1.8 (2.7)</td>
<td>1.6 (2.5)</td>
<td>1.7 (2.6)</td>
<td>1.6 (2.4)</td>
<td>1.8 (2.5)</td>
</tr>
<tr>
<td>None/Mild pain</td>
<td>2,710 (79.8)</td>
<td>2,664 (83.8)</td>
<td>2,472 (81.7)</td>
<td>2,641 (84.1)</td>
<td>2,684 (81.8)</td>
</tr>
<tr>
<td>Moderate/Severe</td>
<td>685 (20.2)</td>
<td>517 (16.3)</td>
<td>557 (18.4)</td>
<td>497 (15.9)</td>
<td>596 (18.2)</td>
</tr>
<tr>
<td>24 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD) score</td>
<td>1.5 (2.5)</td>
<td>1.6 (2.6)</td>
<td>1.6 (2.5)</td>
<td>1.7 (2.5)</td>
<td>–</td>
</tr>
<tr>
<td>None/Mild pain</td>
<td>2,665 (84.0)</td>
<td>2,469 (82.7)</td>
<td>2,350 (83.6)</td>
<td>2,336 (83.3)</td>
<td>–</td>
</tr>
<tr>
<td>Moderate/Severe</td>
<td>507 (16.0)</td>
<td>516 (17.3)</td>
<td>461 (16.4)</td>
<td>470 (16.8)</td>
<td>–</td>
</tr>
</tbody>
</table>

Table 15 summarises VOTOR patient pain scores over time, and Table 16 shows the profile of pain scores at six-months and 12-months according to hospital of definitive care during 2015-2016. Mean pain scores were lower at UHG compared to at the Alfred, RMH and The Northern Hospital. Patients from UHG also reported the lowest proportion of moderate/severe persistent pain at six-months and this proportion remained the same at 12-months. In 2015-16 at UHG and The Northern Hospital there was a decrease in the prevalence of moderate/severe persistent pain at six-months compared to 12-months, while at the major trauma hospitals an increase was found (Table 16).

Table 16 – Pain outcomes of VOTOR patients by hospital 2015-2016

<table>
<thead>
<tr>
<th>HOSPITAL</th>
<th>Alfred</th>
<th>UHG</th>
<th>The Northern</th>
<th>RMH</th>
<th>All cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTOR n (%)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD) score</td>
<td>1.8 (2.4)</td>
<td>1.7 (2.3)</td>
<td>2.2 (2.6)</td>
<td>1.9 (2.5)</td>
<td>1.9 (2.5)</td>
</tr>
<tr>
<td>None/Mild pain</td>
<td>1,149 (83.3)</td>
<td>380 (83.9)</td>
<td>203 (76.9)</td>
<td>1,098 (81.9)</td>
<td>2,830 (82.3)</td>
</tr>
<tr>
<td>Moderate/Severe</td>
<td>231 (16.7)</td>
<td>73 (16.1)</td>
<td>61 (23.1)</td>
<td>242 (18.1)</td>
<td>607 (17.7)</td>
</tr>
<tr>
<td>12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD) score</td>
<td>1.8 (2.5)</td>
<td>1.5 (2.3)</td>
<td>2.0 (2.6)</td>
<td>1.9 (2.5)</td>
<td>1.8 (2.5)</td>
</tr>
<tr>
<td>None/Mild pain</td>
<td>1,158 (82.3)</td>
<td>359 (86.0)</td>
<td>199 (79.9)</td>
<td>968 (80.2)</td>
<td>2,684 (81.8)</td>
</tr>
<tr>
<td>Moderate/Severe</td>
<td>249 (17.7)</td>
<td>58 (13.9)</td>
<td>50 (20.1)</td>
<td>239 (19.8)</td>
<td>596 (18.8)</td>
</tr>
</tbody>
</table>

The proportion of patients injured between 2011–12 and 2014–15 reporting moderate to severe pain for each injury group is shown in Figure 12.

Most injury groups showed a decrease in the prevalence of moderate to severe pain between six, 12 and 24-months post-injury except for patients who underwent amputation, patients with soft tissue injuries and patients with spine and lower extremity injuries. For the amputation group, 25 per cent of patients reported moderate to severe pain at six-months, which increased to 31 per cent at 12-months and 34 per cent at 24-months. For patients with spine and upper injuries, and spine and lower injuries, a larger proportion reported pain at 24 months compared to 12-months. At six-months post-injury, patients with injuries involving the spine had the highest reported levels of moderate/severe pain.

The greatest improvements in self-reported levels of pain from six to 24-months were found for patients with multiple upper extremity injuries and patients with spine and lower extremity injuries. The group reporting the lowest prevalence of moderate/severe pain at six-months were patients with soft tissue injuries (Figure 12). However, of the patients with soft tissue or other injuries, the prevalence of moderate to severe pain was highest at 12-month follow-up compared to six.
Figure 12 – 6-month, 12-month and 24-month moderate/severe pain outcomes of VOTOR patients injured between 2011–12 and 2014–15 by orthopaedic injury group. Twenty-four-month follow up calls are available for patients injured from 2011–12 to 2014–15.

The probability of experiencing moderate to severe pain for a typical VOTOR patient is shown in Figure 13. Factors such as age, sex, pre-existing comorbidities, pre-injury disability, compensable status, types of injuries, and mechanism of injury are taken into account.

The predicted probability of experiencing moderate to severe pain at six-months post-injury ranged from 15 to 19 per cent, and at 12-months ranged from 14 to 18 per cent (Figure 13). At 24-months, the predicted probability of experiencing moderate to severe pain for the typical VOTOR patient ranged from 13 to 15 per cent.

Figure 13 – Predicted probability (95% CI) of moderate to severe pain for VOTOR patients adjusted for demographic and injury factors. Twenty-four -month follow up calls commenced in July 2013 and hence data are available for patients injured from 2011–12 to 2014–15.
10.5 Health related Quality of Life

Health-related quality of life was measured using the EQ-5D-3L, which asks patients to rate their level of problems across five domains for that day (mobility, self-care, usual activities, pain/discomfort and depression/anxiety (feeling worried, sad or unhappy)). Patients respond according to a three point likert scale from “none”, “some”, and “a lot”. These responses were dichotomised for analysis as ‘No Problems’ and ‘Problems’. Health related quality of life data at 24-month follow-up is available for patients injured from 2011-2012 to 2014-2015.

Figure 14 shows the percentage of patients reporting problems within each of the five domains over time. In the past three years there has been a steady increase annually in the proportion of patients reporting problems at six-months-post injury across all domains. For example, in 2015-2016 at six-months post-injury 59 per cent of patients reported problems with pain compared to 49 per cent in 2013-2014. Problems with usual activities were reported by 56 per cent of patients at six-months post-injury in 2014-15, and this increased to 65 per cent in 2015-16.

In 2014-15 patients reported an increase in problems from 12-months to 24-months across all five domains indicating a decline in health-related quality of life at 24-months. This decline was most prominent for problems with usual activities and self-care (Figure 14.3 and 14.5 respectively).
Figure 14 – EQ-5D-3L outcomes of VOTOR patients over time (95% CI). Twenty-four-month follow up data is available for patients injured from 2011-2012 to 2014-2015.

14.1 – Percentage of patients reporting problems with mobility.

14.2 – Percentage of patients reporting problems with anxiety/depression.

14.3 – Percentage of patients reporting problems with usual activities.

14.4 – Percentage of patients reporting problems with pain/discomfort.

14.5 – Percentage of patients reporting problems with self-care.
10.6 Quality of Life Measures According to Injury Group

Figure 15 shows the prevalence of problems within each domain across injury groups for patients injured between 2011–12 and 2014–15 who were followed up at six, 12 and 24-months. For the mobility domain, patients more commonly reported problems if their injuries involved the lower limb compared to those without lower limb injuries. Increases in problems with mobility between 12 and 24-month follow up were observed for patients with spinal injuries, patients who underwent amputation and patient with isolated and multiple upper limb injuries (Figure 15.1).

For self-care, the highest prevalence of problems was reported by patients with spine, upper and lower extremity injuries and those who underwent amputation. The patients with soft tissue injuries were least likely to report problems with self-care. An increase in problems related to self-care were observed from 12 to 24-months for patients across all injury groups except for patients with isolated upper extremity injuries (Figure 15.2).

For the usual activities domain, there were improvements from six-months to 12-months post-injury for all injury groups. At 12-months, problems with usual activities were most commonly reported by patients with spine, upper and lower extremity injuries and patients who underwent amputation (Figure 15.3). An increase in problems from 12 to 24-month follow up was found for patients who underwent amputation, patients with injuries pertaining to the spine and lower extremity, and patients with upper and lower extremity injuries (Figure 15.3).

At six-month post-injury there was a high prevalence of pain or discomfort amongst patients with all types of injuries except for patients with soft tissue injuries and patients with isolated upper extremity injuries (Figure 15.4). The proportion of patients reporting pain or discomfort improved from six-months to 12-months across all injury groups except for those patients who underwent amputation. Reductions in daily problems with pain or discomfort were less noticeable from 12 to 24-months compared to six to 12-months. Reported problems with pain or discomfort increased from 12 to 24-months for patients who underwent amputation, patients with spine and lower extremity injuries and patients with multiple upper extremity injuries (Figure 15.4).

For the anxiety/depression domain, patients who underwent amputation, and those patients with spine and upper and lower extremity injuries had the highest prevalence of problems at six and 24-months post-injury. Patients with soft tissue or other injuries and patients with isolated upper extremity injuries reported the least problems with anxiety/depression (Figure 15.5).
Figure 15.4 – Percentage of patients reporting problems with pain/discomfort

Figure 15.5 – Percentage of patients reporting problems with anxiety/depression
The EQ-5D-3L summary score provides a single score summarising all five quality of life domains. The EQ-5D-3L summary score is normalised to population scores, ranging from -0.59 to 1. Scores less than zero reflect a health state worse than death, a score of zero reflects a health state equivalent to death and a score of one reflects perfect health. Overall, mean EQ-5D summary scores were less than 1.0 at all time-points, ranging from 0.69 to 0.76 (Figure 16).

Mean scores at six and 12-months post-injury were stable until 2015-2016, however there was a decline in the mean score at 24-months for each year. In 2015-16 there was minimal difference in the mean EQ-5D score at six-months and 12-months post-injury. There was also an overall decline in mean summary score in this year compared with all previous years.

Figure 16 – Mean EQ-5D summary scores of VOTOR patients over time.
Figure 17 presents mean EQ-5D summary scores, normalised to population scores, for VOTOR patients injured between 2011–12 and 2014–15 according to injury group. Across all injury groups, EQ-5D scores were lower than 1.0, ranging from 0.59 to 0.85. Across most injury groups, EQ-5D scores were similar at six, 12 and 24-months post-injury. Health-related quality of life was highest in patients with soft tissue injuries, isolated upper extremity injuries and multiple upper extremity injuries, and lowest in patients with spine, upper and lower extremity injuries and patients who underwent amputation. In particular, compared to other injury groups, patients with spinal injuries and patients who underwent amputation were least likely to demonstrate improvements in quality of life from 12 to 24-months.

Figure 17 – Mean EQ-5D summary scores of VOTOR patients injured between 2011–12 and 2014–15 by orthopaedic injury group. Twenty-four month follow up calls are available for patients injured from 2011–12 to 2014–15.
11. SUMMARY

This report provides a detailed overview of data from the Victorian Orthopaedic Trauma Outcomes Registry (VOTOR) from July 2011 to June 2017. The data provided in this report focuses on: providing an overview of the VOTOR population and their outcomes over time; comparing the profile of VOTOR patients by participating hospital; and describing the long-term outcomes of orthopaedic trauma patients managed at the VOTOR participating hospitals. This report provides 24-month follow-up data in addition to 6-month and 12-month data. Less than one per cent of cases have opted-off from the registry. In the financial years from July 2011 to June 2015, 86 per cent of patients were successfully followed-up at six-months, 85 per cent at 12 months and 81 per cent at 24 months, which continues to ensure robust coverage of the patient population and their outcomes. From July 1 2011 to June 30 2017, 38,546 cases were registered by VOTOR (54% male; mean age 57 years). The number of registered patients per year has consistently risen in the past three years from 5968 (2013-14), to 6321 (2014-15), 6739 (2015-16) and 7031 patients in 2016-17. The average age of patients, and ratio of men to women has been consistent in the past six years.

In 2016-17, most cases were the result of a low fall (43%), road trauma (30%) or high fall (12.8%). While the proportion of injuries from road trauma decreased from 32 to 30 per cent, and an increase in the proportion of low and high falls was found. Consistent with previous reports, in 2016-17 the majority of patients were treated for injuries pertaining to the isolated lower extremity (35%) and isolated upper extremity (19%). Patients with spinal injuries accounted for 29 per cent of cases, and 10 per cent of patients sustained injuries to multiple body regions. Consistent with previous years, the most common location for injuries to occur in 2016-17 were at home (34%) and on a road, street or highway (33%).

The in-hospital death rate was three per cent in 2016-17, and the rate of admission to an intensive care unit was 10 per cent in 2016-17. The proportion of patients being discharged directly home was similar to previous years (ranging from 55 to 58 per cent in the past six years, with 57 per cent discharged home in 2016-17). In 2016-17, the proportion of patients discharged to home versus in-patient rehabilitation was similar for the major trauma hospitals, whereby 58 per cent were discharged home and 35 per cent were discharged to inpatient rehabilitation. It is important to investigate health outcomes according to discharge destination in order to determine the value of inpatient rehabilitation, particularly when approximately one third of patients were discharged to inpatient rehabilitation over the past three years.

Examination of six, 12, and 24-month follow-up data confirms that patient function continues to improve with time for all years except for patients injured in 2014-15 who demonstrated minimal change in function from 12 to 24-months. Patients with poorer long-term outcomes, who were less likely to demonstrate improvements in functional outcomes, included patients with multiple orthopaedic injuries, especially patients with injuries involving the spine, and patients who underwent amputation. The best outcomes were found for patients with soft tissue injuries and isolated upper extremity injuries.

Adjusting for a range of demographic and injury factors, the probability of experiencing a good recovery 6-months post injury was consistent ranging from 43 to 46 per cent since 2011-2012. At 12-months post-injury the probability of experiencing a good recovery has been consistent since 2011-2012, ranging from 48 to 51 per cent. At 24-months post-injury there was an improvement in recovery rates relative to 12-months post-injury for all years except 2014-15. In 2014-15 there was no change in expected recovery rates from 12-months to 24-month follow up. The probability of returning to work has remained consistent over time. These outcomes may reflect an improvement in services that facilitate a gradual return to work for patients during their recovery process.

The majority of patients showed a decrease in the prevalence of self-reported pain (as indicated on numeric rating scale) from six to 12-months post-injury except for patients who underwent amputation, and patients with soft tissue injuries. An increase in the prevalence of pain severity from 12 to 24-months post-injury was observed for patients who underwent amputation and patients with soft tissue or other injuries.

Examination of six, 12 and 24-month follow-up data confirmed that each year, health-related quality of life improved from six to 12 to 24-months for all injury groups except for patients who underwent amputation and patients with spinal injuries. Compared to other injury groups, patients with spinal injuries and patients who underwent amputation were less likely to demonstrate improvements in quality of life from 12 to 24-months post-injury. An increase in problems related to self-care was observed from 12 to 24-months for patients across all injury groups except for patients with isolated upper extremity injuries. The proportion of patients who reported problems with daily pain or discomfort increased between 12 and 24-months post-injury for patients with spine and upper extremity injuries, spine and lower extremity injuries, multiple upper injuries and patients who underwent amputation. Overall, 12-month functional outcomes were best for patients with soft tissue injuries, upper and lower extremity injuries and multiple upper extremity injuries.
12. APPENDICES

APPENDIX A Figures and Tables

List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Number of registered VOTOR patients over time</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Cause of injury of VOTOR patients 2016–17</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Place of injury of VOTOR patients 2016–2017</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Orthopaedic injury profile of VOTOR patients 2016–2017</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Follow-up rates over time</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Percentage of patients (95% CI) who achieved a good functional recovery by year.</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Functional recovery outcomes of VOTOR patients injured between 2011–12 and 2014–15 by orthopaedic injury group</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Predicted probability (95% CI) of a good functional recovery for VOTOR patients adjusted for demographic and injury factors</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Return to work outcomes of VOTOR patients over time (95% CI)</td>
</tr>
<tr>
<td>Figure 10</td>
<td>Return to work outcomes of VOTOR patients injured between 2011–12 and 2014–15 by orthopaedic injury group</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Predicted probability (95% CI) of returning to work for VOTOR patients adjusted for demographic and injury factors</td>
</tr>
<tr>
<td>Figure 12</td>
<td>6-month, 12-month and 24-month moderate/severe pain outcomes of VOTOR patients injured between 2011–12 and 2014–15 by orthopaedic injury group</td>
</tr>
<tr>
<td>Figure 13</td>
<td>Predicted probability (95% CI) of moderate to severe pain for VOTOR patients adjusted for demographic and injury factors</td>
</tr>
<tr>
<td>Figures 14.1–14.4</td>
<td>EQ-5D-3L outcomes of VOTOR patients over time (95% CI)</td>
</tr>
<tr>
<td>Figures 15.1–15.5</td>
<td>EQ-5D-3L outcomes of VOTOR patients injured between 2011–12 and 2014–15 by orthopaedic injury group</td>
</tr>
<tr>
<td>Figure 16</td>
<td>Mean EQ-5D summary scores of VOTOR patients over time</td>
</tr>
<tr>
<td>Figure 17</td>
<td>Mean EQ-5D summary scores of VOTOR patients injured between 2011–12 and 2014–15 by orthopaedic injury group</td>
</tr>
</tbody>
</table>

List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Demographic profile of VOTOR patients over time</td>
</tr>
<tr>
<td>Table 2</td>
<td>Demographic profile of VOTOR patients by hospital 2016-17</td>
</tr>
<tr>
<td>Table 3</td>
<td>Cause of VOTOR patients over time</td>
</tr>
<tr>
<td>Table 4</td>
<td>Cause of VOTOR patients by hospital 2016-2017</td>
</tr>
<tr>
<td>Table 5</td>
<td>Place of injury of VOTOR patients over time</td>
</tr>
<tr>
<td>Table 6</td>
<td>Place of injury of VOTOR patients by hospital 2016-2017</td>
</tr>
<tr>
<td>Table 7</td>
<td>Injury profile of VOTOR patients over time</td>
</tr>
<tr>
<td>Table 8</td>
<td>Injury profile of VOTOR patients by hospital 2016-2017</td>
</tr>
<tr>
<td>Table 9</td>
<td>Ten most common fractures sustained by VOTOR patients over time</td>
</tr>
<tr>
<td>Table 10</td>
<td>Most common fractures sustained by VOTOR patients by hospital 2016-2017</td>
</tr>
<tr>
<td>Table 11</td>
<td>In-hospital outcomes of VOTOR patients over time</td>
</tr>
<tr>
<td>Table 12</td>
<td>In-hospital outcomes of VOTOR patients by hospital 2016-2017</td>
</tr>
<tr>
<td>Table 13</td>
<td>Demographic profile of VOTOR patients eligible for 24-month follow-up</td>
</tr>
<tr>
<td>Table 14</td>
<td>VOTOR patients returning to same role by year</td>
</tr>
<tr>
<td>Table 15</td>
<td>Pain outcomes of VOTOR patients by year</td>
</tr>
<tr>
<td>Table 16</td>
<td>Pain outcomes of VOTOR patients by hospital 2015-2016</td>
</tr>
</tbody>
</table>
APPENDIX B  Investigators and Staff

VOTOR Investigators

Professor Belinda Gabbe
Professor Peter Cameron
Associate Professor Elton Edwards
Professor Richard de Steiger
Associate Professor Martin Richardson
Associate Professor Sue Liew
Professor Richard Page
Associate Professor Raphael Hau
Associate Professor Andrew Bucknill
Mr Andrew Oppy

Additional Steering Committee Members

Mr David Attwood
Dr Christina Ekegren
Dr Melita Giummarra
Dr Ben Beck

Project Coordinator

Ms Melissa Hart

Staff

Ms Mimi Morgan
Reshma Karunakaran
Follow up staff
Dr Anna Devlin
Dr Lara Kimmel

APPENDIX C  Publications and Presentation list for 2016-2017

Note that some reports, publications and presentations listed below may overlap with prior or subsequent annual reports given that outputs may be accepted and then finalised (published/presented) across subsequent financial years.

Articles


APPENDIX C continued...

**Articles**


**Conference Presentations**


Ekegren CL, Gabbe BJ, Edwards ER, de Steiger R, Page R. Incidence, costs and outcomes of non-union, delayed union and mal-union following long bone fracture. Poster presented at: Trauma 2017, the 21st Annual Scientific Meeting of the Australasian Trauma Society and the 4th Joint Meeting with the Trauma Association of Canada; 2017 April 21-23, Melbourne, Australia.

### Awards

<table>
<thead>
<tr>
<th>Name</th>
<th>Award Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Ben Beck</td>
<td>2017 Trauma Conference (the 21st Annual Scientific Meeting of the Australasian Trauma Society and the 4th Joint Meeting with the Trauma Association of Canada) – Best non-medical poster award.</td>
</tr>
<tr>
<td>Dr Ben Beck</td>
<td>Monash University School of Public Health and Preventive Medicine Early Career Excellence Award for 2016.</td>
</tr>
<tr>
<td>Dr Melita Giummarra</td>
<td>Rising Star Award from the Australian Pain Society, 2017.</td>
</tr>
<tr>
<td>Dr Melita Giummarra</td>
<td>Ian Potter Travel Grant to attend the World Congress on Pain, 2016.</td>
</tr>
<tr>
<td>Dr Lara Kimmel</td>
<td>2016. Alfred Hospital Recognising excellence awards: individual category winner for “Research and Education”</td>
</tr>
<tr>
<td>Dr Christina Ekegren</td>
<td>April 2017: Best Medical Oral Presentation Award ($350 prize) at Trauma 2017, the 21st Annual Scientific Meeting of the Australasian Trauma Society and the 4th Joint Meeting with the Trauma Association of Canada</td>
</tr>
<tr>
<td>Dr Christina Ekegren</td>
<td>October 2016: Best Oral Presentation ($500 prize) at Alfred Medical Research and Education Precinct Early-Mid Career Researcher Conference 2016.</td>
</tr>
</tbody>
</table>

### Degrees

<table>
<thead>
<tr>
<th>Name</th>
<th>Degree Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Lara Kimmel</td>
<td>PhD: “Assessing the discharge disposition of orthopaedic trauma patients and its influence on patient outcomes”. Monash University. Faculty of Medicine, Nursing and Allied Health. Department of Epidemiology and Preventive Medicine. Awarded in October 2016.</td>
</tr>
</tbody>
</table>
VOTOR Registry, Monash University
Access to Registry data.
Requests for information from the VOTOR Registry are welcome.

Applications should be made to:
VOTOR Project Office
School of Public Health and Preventive Medicine
Monash University
553 St Kilda Rd
Melbourne, VIC 3004
Email: Melissa.Hart@monash.edu
Phone: (03) 9903 0113
Mobile: 0428 346 767