Australian Government
Australian Institute of Health and Welfare

Flinders UNIVERSITY

Use of emergency department data to improve routine injury surveillance

Technical report 2013–14

AIHW

Australian Government
Australian Institute of Health and Welfare

Injury research and statistics series
Number 119

Use of emergency department data to improve routine injury surveillance

Technical report 2013–14

Australian Institute of Health and Welfare
Canberra
Cat. no. INJCAT 199

The Australian Institute of Health and Welfare is a major national agency whose purpose is to create authoritative and accessible information and statistics that inform decisions and improve the health and welfare of all Australians.

This publication is part of the Australian Institute of Health and Welfare's Injury research and statistics series. A complete list of the Institute's publications is available from the Institute's website <www.aihw.gov.au>.

ISSN 2205-510X (PDF)
ISSN 1444-3791 (Print)
ISBN 978-1-76054-460-7 (PDF)
ISBN 978-1-76054-461-4 (Print)

Suggested citation

AIHW: Henley G & Harrison JE 2018. Use of emergency department data to improve routine injury surveillance: technical report 2013–14. Injury research and statistics series no. 119. Cat. no. INJCAT 199. Canberra: AIHW.

Any enquiries relating to copyright or comments on this publication should be directed to:
Australian Institute of Health and Welfare
GPO Box 570
Canberra ACT 2601
Tel: (02) 6244 1000
Email: info@aihw.gov.au

Published by the Australian Institute of Health and Welfare

This publication is printed in accordance with ISO 14001 (Environmental Management Systems) and ISO 9001 (Quality Management Systems). The paper is sourced from sustainably managed certified forests.

MIX
From responsible sources
FSC® C017269

Please note that there is the potential for minor revisions of data in this report. Please check the online version at <www.aihw.gov.au> for any amendments.

Contents

Acknowledgments iv
Abbreviations v
Symbols v
Summary vi
1 Introduction 1
2 Methods 3
3 Description of the data 5
4 Exploration and application of the data 18
5 Admission proportions 41
Appendix A: Data issues 46
Appendix B: Mean probability of death 49
Appendix C: Count tables 50
Appendix D: Trauma centres 55
Appendix E: ED case admission proportions 56
Glossary 62
References 64
List of tables 65
List of figures 67
Related publication 68

Acknowledgments

This report was produced by the Australian Institute of Health and Welfare (AIHW) National Injury Surveillance Unit (NISU) at Flinders University, with assistance from the unit's administration officer Stacey Avefua.

Members of the AIHW National Injury Surveillance Unit Advisory Committee provided valuable comments.

The team would like to thank AIHW staff from the Hospitals, Resourcing and Classifications Group for peer reviewing the manuscript.

Abbreviations

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
AIHW	Australian Institute of Health and Welfare
ASGS	Australian Statistical Geography Standard
ATR	Australian Trauma Registry
DSP	diagnosis-specific survival probability
ED	emergency department
ICD-9-CM	International Classification of Diseases, 9th revision, clinical modification
ICD-10-AM	International Classification of Diseases and Health Related Problems, 10th revision, Australian modification
METeOR	Metadata Online Registry
MDB	major diagnostic block
NAPEDCD	National Non-admitted Patient Emergency Department Care Database
NHMD	National Hospital Morbidity Database
NSW	New South Wales
NT	Northern Territory
Qld	Queensland
SA	South Australia
SA2	Statistical Area Level 2
SEIFA	Socio-Economic Indexes for Areas
SES	socioeconomic status
SNOMED-CT	Systematized Nomenclature of Medicine, Clinical Terms
Tas	Tasmania
Vic	Victoria
WA	Western Australia

Symbols

. .	not applicable
no.	number
—	zero

Summary

This report looks at routinely collected national data on injury cases who attended a public hospital emergency department (ED) in Australia in 2013–14, which are collected in the National Non-admitted Patient Emergency Department Care Database (NAPEDCD). It describes and illustrates possible applications of these data for injury surveillance.

Description of the data

Diagnosis is not coded according to the same system for all records in the NAPEDCD. Two very different systems have been applied: ICD and SNOMED-CT. In addition, several editions of ICD-10-AM were used as was an earlier edition of ICD, ICD-9-CM.

Of the nearly 7.2 million records in the database, 68% included a principal diagnosis coded according to ICD-10-AM, 26% were reported as SNOMED-CT (all in New South Wales), 0.6% were coded according to ICD-9-CM and 5% had a missing diagnosis value.

Use of different coding systems made identification of injury cases difficult in some instances. Conversion of SNOMED-CT terms to equivalent ICD-10-AM codes is not straightforward for certain types of injury.

The data did not include a field for external cause of injury (such as fall or traffic crash). The lack of this item markedly reduced the value of the data for injury surveillance.

Exploration and application

More than 1.3 million ED presentations in 2013–14 were assigned at least 1 ICD-10-AM diagnosis code in the injury and poisoning range S00–T98 (27% of all presentations that were assigned an ICD-10-AM diagnosis code). Of these presentations, almost 93% (1.2 million) were assigned a principal diagnosis in the injury range S00–T75 or T79 (community injury), the usual scope of AIHW injury reports.

For presentations assigned a principal diagnosis of S00–T75 or T79, 22% were assigned a principal diagnosis for a soft-tissue injury, and 21% were assigned a principal diagnosis for a fracture. Overall, almost 18% of ED injury cases were admitted to hospital. Admission proportions varied widely by nature of injury. Among frequently occurring injuries, the proportion admitted ranged from 95% for fracture of the femur to 1.7% for dislocations, sprains, and strains of joints and ligaments at the wrist or hand. ED admission proportions can supplement and add value to reports based on admitted patient data.

Comparisons were made between data from EDs at hospitals with and without a level 1 trauma centre. Differences in patterns of cases generally aligned with expectations, providing some evidence of the face validity of the ED data. For example, the percentage of injury ED cases admitted to the same hospital where a person presented was much higher in level 1 trauma service hospitals (26%) than other hospitals (13%), and high urgency cases were concentrated at the EDs of hospitals with trauma centres.

While linked data studies are needed to provide a more complete assessment of ED injury data, the results presented in this report suggest that the source has value for injury surveillance. The analysis of ED injury data in this report will enable the NAPEDCD to be used for injury surveillance based on more recently available annual ED data sets. The utility of the data source would be improved by including external cause data in the NAPEDCD, and by specifying the coding better, which varied markedly among states and territories.

1 Introduction

This report describes possible applications of data from the 2013–14 National Non-admitted Patient Emergency Department Care Database (NAPEDCD) for injury reporting.

At the time of writing, the NAPEDCD contained diagnosis information for emergency department (ED) presentations to public hospitals up to 2016–17 (AIHW 2017). The analysis of ED injury data in this report aims to enable the use of the NAPEDCD for injury surveillance based on more recently available annual ED data sets.

The NAPEDCD is compiled by the Australian Institute of Health and Welfare (AIHW) from data supplied by the state and territory health authorities. It is a collection of electronic confidentialised summary records of presentations to public hospital EDs. The database is based on the Non-admitted Patient Emergency Department Care National Minimum Data Set.

For 2013–14, the NAPEDCD scope was patients registered for care in EDs in public hospitals where the ED:

- had a purposely designed and equipped area with designated assessment, treatment, and resuscitation areas
- was able to provide resuscitation, stabilisation, and initial management of all emergencies
- had medical staff in the hospital 24 hours a day 7 days a week
- had designated ED nursing staff and a nursing unit manager 24 hours a day 7 days a week.

Data coverage is estimated by comparing the number of ED presentations in the NAPEDCD with the number of non-admitted patient emergency occasions of service in the National Public Hospital Establishments Database, which includes data for all public hospitals, regardless of whether they have an ED.

The coverage estimate is only indicative, as not all emergency occasions of service are provided through formal EDs. For 2013–14, a preliminary estimate was that about 88% of emergency occasions of service were reported to the NAPEDCD (AIHW 2014).

Type of visit

The type of visit describes the reason the patient presented to the ED. It can be reported as:

- *Emergency presentation:* attendance for an actual or suspected condition that is serious enough to require acute unscheduled care
- *Return visit, planned:* a planned presentation that is a result of a previous ED presentation or return visit
- *Pre-arranged admission:* an admission that has been pre-arranged by the referring medical officer for either clerical, nursing, or medical processes, and which has a bed allocated
- *Patient in transit:* where the ED is responsible for care and treatment of a patient awaiting transport to another facility
- *Dead on arrival:* a patient who is dead on arrival, and an ED clinician certifies the death of the patient.

Of the almost 7.2 million presentations reported to the NAPEDCD for 2013–14, about 97% were *Emergency presentations*, and 2.6% were *Return visit, planned* (AIHW 2014).

The reporting of information about patients who were *Dead on arrival* varies between states and territories. For South Australia and the Northern Territory, patients who are *Dead on arrival* are not managed or reported by EDs. For Western Australia, EDs only occasionally manage and report patients who are *Dead on arrival*, as the majority of these patients are taken directly to the state morgue.

Availability of emergency department injury information

Data on presentations to public hospital EDs in Australia due to injury have been available to third party users via collection systems that operate in some states.

For example, the Queensland Injury Surveillance Unit has, for many years, obtained information on ED injury presentations via injury screens of the Emergency Department Information System, used in various hospitals across Queensland.

The Victorian Injury Surveillance Unit obtains information on ED presentations to all Victorian public hospitals via the Victorian Emergency Minimum Dataset.

These and other injury surveillance systems have focused on obtaining information about aspects of the external causes of injuries, which is particularly important for prevention. The data sets used by the systems are commonly based on the AIHW National Data Standards for Injury Surveillance.

The inclusion of diagnosis information in the NAPEDCD data for 2013–14 provided the first opportunity to use nationwide ED data for injury surveillance and related purposes. This technical report provides findings of an initial set of investigations designed to describe aspects of the data relevant to these uses, and to develop and test some techniques to summarise, present, and interpret them. Diagnosis information continues to be included in the NAPEDCD on an ongoing basis.

2 Methods

The main data used in this report were from the 2013–14 NAPEDCD held by the AIHW. In this report, these data are referred to as emergency department data or ED data. Data for the same period from the National Hospital Morbidity Database (NHMD) on admitted patient care were used for some comparisons.

Patients who were dead on arrival were in scope if an ED clinician certified the death of the patient. Patients who left the ED after being triaged, and then advised of alternative treatment were also in scope. The scope includes only physical presentations to EDs. Advice provided by telephone or videoconferencing was not in scope. The NAPEDCD only includes presentations to EDs in public hospitals.

The NAPEDCD data were assessed for content and relevant aspects of quality, especially including diagnosis availability, usability, and specificity (Chapter 3). This provided the basis to develop injury case selection criteria, and the selected subsets of records were summarised and described.

The main injury case set was described and summarised statistically (Chapter 4). This work included use of several methods to assess the coherence and face validity of the data.

Data from the NAPEDCD were used to estimate the proportion of cases with particular injury diagnoses who were admitted to hospital in 2013–14. ED data indicate the number of cases who were admitted to the hospital in which the ED was located. These cases provided the basis for calculating the estimated percentage of cases admitted. Cases who were transferred to another acute care hospital were also included, because these transfers would likely have resulted in admission.

The numbers of injury cases reported in NAPEDCD as having been admitted were compared with numbers of NHMD cases with the same diagnoses admitted to the same set of hospitals in the same period.

The expectation was that the numbers and characteristics (such as the age-distribution of cases) from the 2 sources should be similar. But the greater uncertainty in diagnosis information in the NAPEDCD might result in marked differences in counts for some types of injury when compared with the NHMD.

In some sections of this report, hospitals are classified according to whether they provided a level 1 trauma service. This was done because the pattern of injury cases attending the EDs of these hospitals, and characteristics of those ED injury cases (such as proportions admitted) are expected to differ from the patterns for other EDs.

These expected differences provided a basis for certain assessments of face validity. There were 27 designated trauma centres located in Australian hospitals at the relevant time, according to the Australian Trauma Registry (Ford 2016).

An expected difference was that cases attending the EDs of hospitals with a specialised trauma service would, on average, be more life-threatening than those attending other EDs.

This expectation was assessed by means of a variation on the method used in many AIHW injury reports to identify a high threat to life subset of admitted injury cases. In this method, a large set of NHMD records is used to produce diagnosis-specific survival risk ratios (that is, proportions who are discharged alive).

In this report, survival risk ratios were applied to ED cases with the relevant ICD-10-AM injury diagnosis codes. The mean of 1 survival risk ratio was used as an index of threat to life of subsets of ED cases. Comparison of this index between certain subsets of ED cases—such as those that had been assigned different urgency ratings—provides a further basis for face validation.

While the NAPEDCD provides information, for nearly all cases, on whether the person was admitted to a hospital after presenting to its ED, it does not provide information on whether the person was admitted into the care of the hospital's specialised trauma service (if it has one), which restricted the assessments described in this section.

A known weakness of the NAPEDCD for injury surveillance is that it does not provide data on the external causes of injury. Limited exceptions to that omission are described in the report. Methods have sometimes been used to estimate external causes from injury diagnosis data, or vice-versa. A worked example of a method of that type is presented in Chapter 5 'Admission proportions'.

For the main aspects of analysis, ED cases were classified as injury cases if at least 1 diagnosis code was an ICD-10-AM code of S00–T75 or T79. This is the same as the criterion used in most AIHW reports on hospitalised injury cases.

Comparisons were also made between injury cases in the NAPEDCD and NHMD, based on the presence of an ICD-10-AM or ICD-9-CM injury code in the principal diagnosis field of cases admitted to hospital in the NAPEDCD, and the presence of an ICD-10-AM injury code as the principal diagnosis of cases in the NHMD.

The appendixes in this report provide more detail:

- Appendix A provides further information on data issues.
- Appendix B further describes the method used to estimate probability of death.
- Tables in Appendix C provide case counts and other values that underlie figures in the body of the report.
- Appendix D lists the hospitals that provided a level 1 trauma service at the relevant time.
- Appendix E provides a summary of the ED cases with an ICD-10-AM injury code. For each 3-character ICD-10-AM category, the table provides the case count, the aspects of disposition most relevant to injury surveillance (number admitted to the attended hospital, number transferred for admission to another hospital, number who died in ED), and the percentage admitted.

3 Description of the data

This chapter presents information on some aspects of the 2013–14 ED data file that are relevant to its use for injury surveillance.

The topics considered are:

- data items
- coding schemes, particularly for diagnoses
- data quality, including completeness and use of residual values
- identification of injury cases
- prevalence and distribution of injury cases.

Data file

The data file on which this report is based is the 2013–14 NAPEDCD, which contained 7.2 million records. Further information on this file can be found in the introduction and Appendix A. An analysis of the 2013–14 data in the NAPEDCD has previously been published by the AIHW (AIHW 2014).

Data items

Table 3.1 provides a summary of data items present in the ED data collection, and useful for the analyses performed in this project. For a full list of NAPEDCD data items, see METeOR identifier: 509116.

Some data items were used to derive other variables described in this report. For example, the variables for remoteness of patient's usual residence, based on the Australian Statistical Geography Standard, and the variables for socioeconomic status were derived from the *Area of usual residence (SA2)* data item.

For state-based ED data collection systems, injury causation information (that is, external cause) is not standardised; it is captured as free-text, so the identification of causes of injuries is done by interrogating the text fields (Vallmuur & Barker 2015). ED data systems generally include coded data fields on circumstances leading to patient attendance, which often includes categories for external causes of injury (for example, road crashes of various types). The NAPEDCD does not contain free-text fields or fields for the reason for attendance, so information on causes of injury is not available.

Table 3.1: Summary of data items present in the ED data collection

Variable name	Description
Demographic variables	
Age	The age of the patient in years (derived from date of birth information)
Area of usual residence (SA2)	The geographical region in which the patient usually lives based on statistical area level 2
Country of birth	The country in which the patient was born
Indigenous status	Whether a person identifies as being of Aboriginal or Torres Strait Islander origin
Sex	The gender of the patient
State of residence	The usual state or territory of residence of the patient
State of emergency department	State or territory where the hospital is located
Presentation variables	
Establishment identifier	The identifier for the establishment in which the episode or event occurred
Mode of arrival	The mode of transport by which the person arrives at the ED
Presentation date and time	The date and time at which a patient presents to a hospital ED
Episode end date and time	The date and time on which the non-admitted patient ED service episode ends
Episode end status	The status of the patient at the end of the non-admitted patient ED service episode
Triage category	The urgency of the patient's need for medical and nursing care as assessed at triage
Triage date and time	The date and time at which the person is triaged
Type of visit	The reason the patient presents to an ED
Diagnosis classification type	The type of classification used for recording ED diagnosis
Principal diagnosis	The diagnosis established at the conclusion of the patient's attendance in an ED to be mainly responsible for occasioning the attendance following consideration of clinical assessment
First additional diagnosis	A condition or complaint coexisting with the ED principal diagnosis during a patient's attendance to the ED
Second additional diagnosis	A condition or complaint coexisting with the ED principal diagnosis during a patient's attendance to the ED
Major diagnostic block	The urgency related group classification's major diagnostic block category into which the patient's ED diagnosis is grouped
Urgency related group	A patient classification scheme, which provides a means of relating the number and types of patients treated in an ED

Coding schemes for diagnoses

Diagnosis was not coded according to the same system for all records in the file. Two very different systems had been applied, which are:

- International Classification of Diseases—including several editions of the 10th revision, Australian modification (ICD-10-AM), and a previous version, the 9th edition, clinical modification (ICD-9-CM)
- Systemized Nomenclature of Medicine, Clinical Terms (SNOMED-CT).

Records were assigned to a diagnosis system (that is, ICD-10-AM, ICD-9-CM, or SNOMED-CT) based on the code present in the principal diagnosis field. In instances where the principal diagnosis field was empty or contained data that did not conform to any known coding system, records were assigned a 'missing' value for the coding scheme.

The NAPEDCD contains a field containing information on the diagnosis coding type, but this field has been shown to be unreliable.

In summary, of the 7.2 million records:

- 4.9 million (68%) included a principal diagnosis coded according to ICD-10-AM
- 1.9 million (26%) were reported as SNOMED-CT terms
- more than 45,200 (0.6%) were coded according to ICD-9-CM
- almost 382,000 (5%) had a missing value for diagnosis (Table 3.2).

Table 3.2: ED presentations, by location of ED and diagnosis coding scheme, 2013–14

	Diagnosis reporting				
Location of ED	**SNOMED-CT**	**ICD-9-CM**	**ICD-10-AM**	**Missing**	**Total**
NSW	1,872,323	12,953	582,134	179,005	2,646,415
Vic	—	32,262	1,540,525	—	1,572,787
Qld	—	—	1,351,573	—	1,351,573
SA	—	—	448,091	15,080	463,171
WA	—	—	555,349	187,266	742,615
Tas	—	—	148,278	—	148,278
NT	—	—	145,176	—	145,176
ACT	—	—	125,888	—	125,888
Australia	**1,872,323**	**45,215**	**4,897,014**	**381,351**	**7,195,903**

While diagnosis was missing for 5% of records overall, the proportion was 7% in New South Wales and 25% in Western Australia. Further, in Western Australia most missing values were due to no diagnosis information being supplied for cases at EDs in *Remote* locations, and for very few cases (fewer than 1%) at EDs in *Outer Regional* areas.

At present, the coding process in Australian EDs is not well documented. For example, do ED staff responsible for coding assign diagnosis codes from a full version or from a more condensed version of ICD-10-AM? Also, are cases in some EDs coded initially using SNOMED-CT, and then mapped to the equivalent ICD-10-AM code? Answers to these questions might help explain some of the data quality issues in the NAPEDCD.

SNOMED-CT

A little over two-thirds of New South Wales records had been assigned codes for SNOMED-CT terms rather than ICD diagnosis codes. The fundamental difference between the 2 systems is that ICD-10 is a classification, whereas SNOMED-CT is a terminology.

We assessed the feasibility of using these records in conjunction with ICD-coded records. The key requirements were to:

- be able to identify SNOMED-CT coded cases with similar scope to the ICD-10-AM injury chapter
- group the identified cases in a way that is compatible with ICD-10-AM.

ICD-10-AM is designed to allow all cases in a set to be assigned, each to only 1 category. As cases typically have a variety of characteristics that, at face value, could suggest their assignment to various categories, precise and sometimes complex rules, supplemented by coding conventions, are required for good quality ICD-coding.

SNOMED-CT, as a terminology, has a distinctly different purpose—that is, to allow each of what might be many characteristics of the case to be recorded in a standard way. There is no necessary constraint on assigning multiple SNOMED-CT terms to the same case. Nor is there a requirement to prioritise any of those (for example, as 'main condition or principal diagnosis').

It is feasible to identify some SNOMED-CT terms that are, at face value, similar to particular ICD-10-AM injury categories. Published SNOMED-to-ICD maps assert a relationship of each of these terms and particular ICD-10-AM categories in the injury chapter.

This implies there is an overlap of the sets referenced by the named SNOMED term and by the specified ICD-10-AM categories. The extent of the overlap is less clear. Unfortunately, the ED data provide no direct way to assess this, because they do not include records with both SNOMED and ICD codes.

In some instances, the relationship between ICD-10 and SNOMED-CT constructs appears to be fairly straightforward. For example, the International Health Terminology Standards Development Organisation online map asserts a relationship between the SNOMED term *Sprain of ankle (disorder)* (code 44465007) and ICD-10 category S93.4 *Sprain and strain of ankle*. The ICD-10 code S93.4 was the most commonly assigned principal diagnosis code among EDs that used ICD-10-AM coding.

In contrast, some commonly used SNOMED terms illustrate the complexity of using this system to summarise injury cases. For example, the International Health Terminology Standards Development Organisation online map asserts a relationship between *Injury of head (disorder)* (code 82271004) and ICD-10 category S09.9 *Unspecified injury of head*. But other SNOMED terms and ICD-10 categories also refer to head injuries, and, unlike S09.9, the SNOMED category is not restricted to 'unspecified' cases. The map asserts that *Minor head injury (disorder)* (code 274164006) also has a relationship with ICD-10 S09.9. But *Minor head injury* is not specified in ICD-10.

As a result, it is not practicable or safe to combine the SNOMED-CT coded cases with the ICD coded cases in this project.

National diagnosis reporting scheme for Australian EDs

The Independent Hospital Pricing Authority has developed a principal diagnosis shortlist to provide a nationally consistent approach to principal diagnosis reporting for EDs (IHPA 2017).

The shortlist is intended to be a key component of the new emergency care classification, replacing inconsistencies from states and territories developing localised shortlists and reporting principal diagnosis using SNOMED-CT, various editions of ICD-10-AM, and ICD-9-CM.

While providing more consistency between states and territories in reporting diagnoses, the shortlist will likely result in the loss of some specificity. It will be interesting to see what effect the introduction of this new coding scheme from 2018 will have on the issues surrounding the use of different coding systems previously employed by EDs in Australian hospitals.

Data quality

This section describes some aspects of the available data fields that are relevant to their use for injury surveillance and related purposes.

Diagnosis is the most important variable in the context of this report. That is because diagnoses provide the main basis for identifying which ED records relate to injury cases.

The urgency related group and major diagnostic blocks (MDBs) can also be used to identify injury cases. They have less specificity than diagnosis codes in identifying the nature of the injury (as they are generally derived from diagnosis information), so have not been used in this report to identify injury cases.

Three diagnosis fields are available:

- principal diagnosis (93% of cases)
- first additional diagnosis (1.4% of cases)
- second additional diagnosis (0.2% of cases).

A description of MDBs and their possible use in identifying injury cases is provided at the end of this chapter.

Specificity of ICD-10-AM diagnosis codes

The ICD-10-AM classification can be used to code injury diagnoses to various levels of specificity. For example, the 3-character code S02 means *Fracture of skull and facial bones*.

Subcategories at 4th and 5th character levels provide for greater specificity of coding. For example, S02.6 means *Fracture of the mandible*, and code S02.65 means *Fracture of the angle of the jaw*. It was necessary to assess the level of specificity of coding available in the ED data before proceeding to analysis.

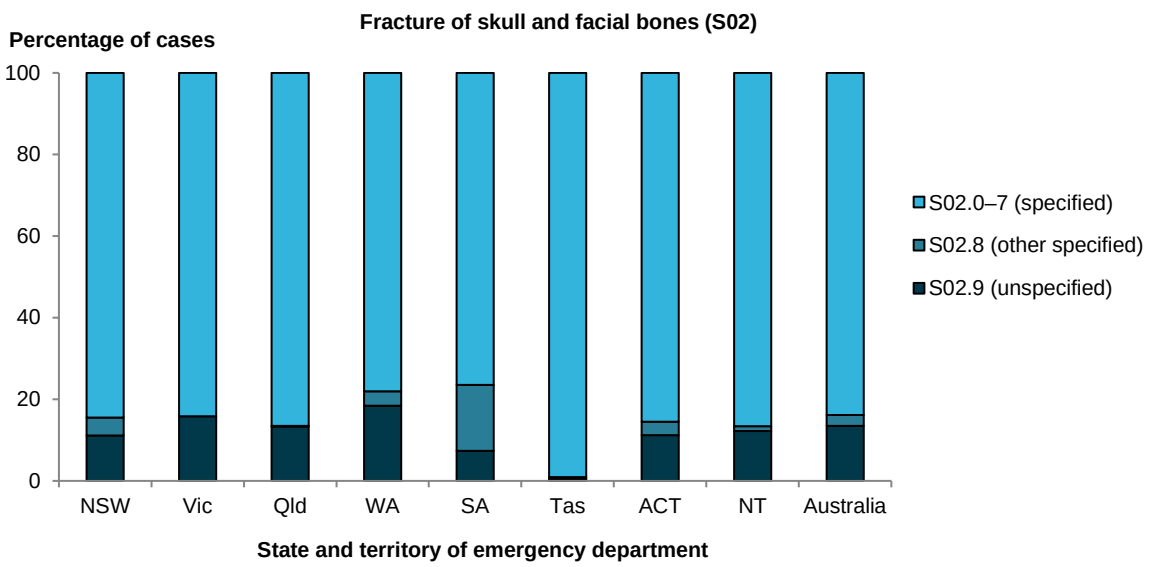
The number of characters in diagnosis codes is not necessarily a reliable guide to coding specificity. For example, if the 4th character is 9 (unspecified) then there is no useful specificity at this level.

Useful specificity at the 4th character was found in some records, but not with enough consistency to be a sound basis for analysis and reporting.

We looked at the 4th character values of 3-character diagnosis codes S02 *Fracture of skull and facial bones*, S06 *Intracranial injury*, S72 *Fracture of femur*, and T20–T25 *Burns of external body surface, specified by site*.

For EDs in all states and territories, the level of specificity of diagnosis coding was relatively high for cases assigned an ICD-10-AM principal diagnosis of S02 *Fracture of skull and facial bones* (Figure 3.1).

Specific codes of S02.0–S02.7 were assigned for at least 76% of cases in all jurisdictions, with the highest percentage of almost 98% recorded for Tasmania. South Australia had the highest percentage of cases (16%) assigned to S02.8 *Fractures of other skull and facial bones*, while Western Australia had the highest percentage of cases (18%) assigned to S02.9 *Fractures of skull and facial bones, part unspecified*.

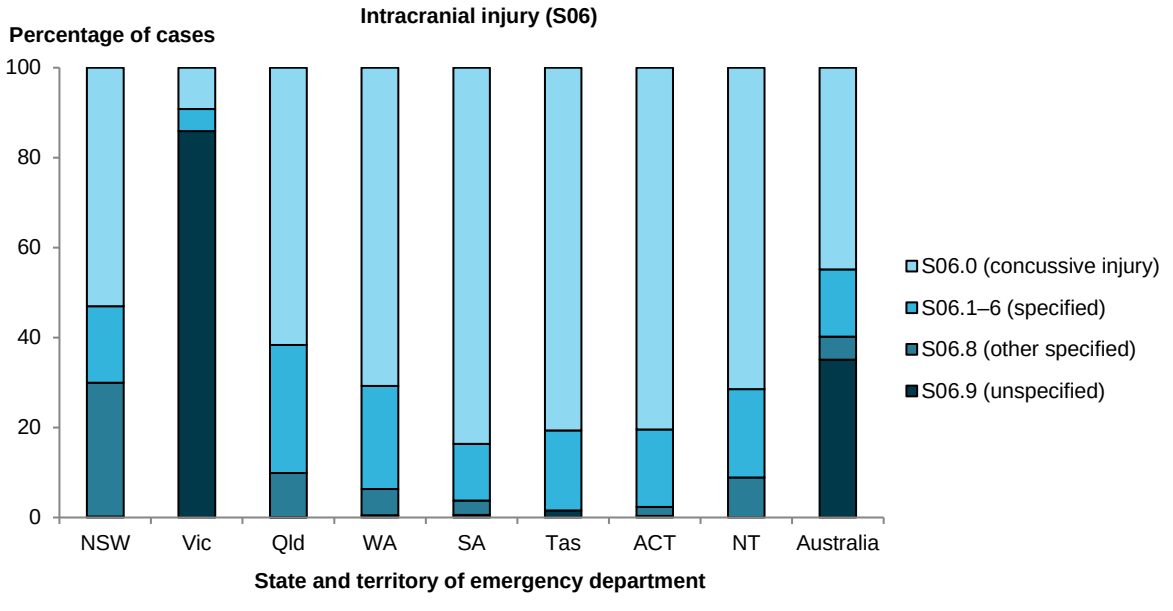


Note: For counts underlying this table, see Appendix C, table C1.

Figure 3.1: Cases with principal diagnosis of fracture of skull and facial bones, by level of specificity and state or territory of ED, 2013–14

A similar pattern to S02 assigned cases was seen for cases assigned an ICD-10-AM principal diagnosis of S06 *Intracranial injury,* although with some notable differences (Figure 3.2). The percentage of cases assigned to specific codes of S06.0–S06.6 (particularly S06.0) was high for all jurisdictions, apart from Victoria.

In Victoria, almost 86% of cases were assigned to S06.9 *Intracranial injury*, *unspecified*, while in New South Wales, almost 30% of cases were assigned to S06.8 *Other intracranial injuries*.

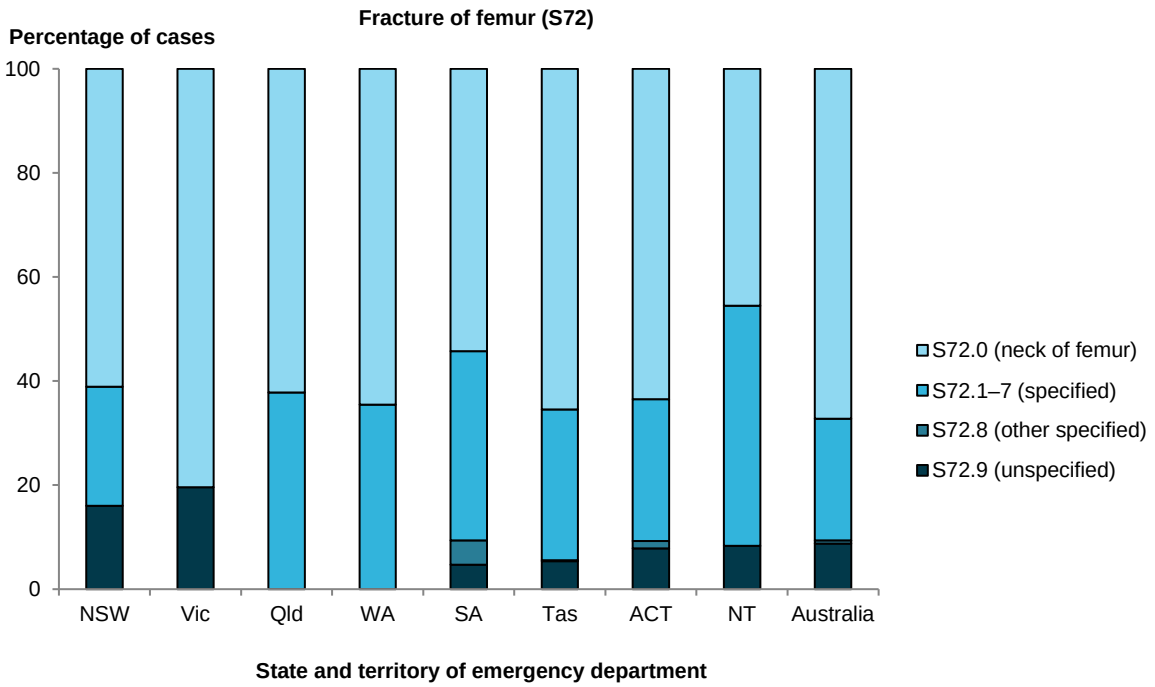


Note: For counts underlying this table, see Appendix C, table C2.

Figure 3.2: Cases with principal diagnosis of intracranial injury, by level of specificity and state or territory of ED, 2013–14

The level of specificity of diagnosis coding was also relatively high across all jurisdictions for cases assigned an ICD-10-AM principal diagnosis of S72 *Fracture of femur* (Figure 3.3). All

cases in both Queensland and Western Australia were assigned specific codes in the range S72.0–S72.7, while Victoria had the highest percentage of cases (20%) assigned to S72.9 *Fracture of femur, part unspecified*.



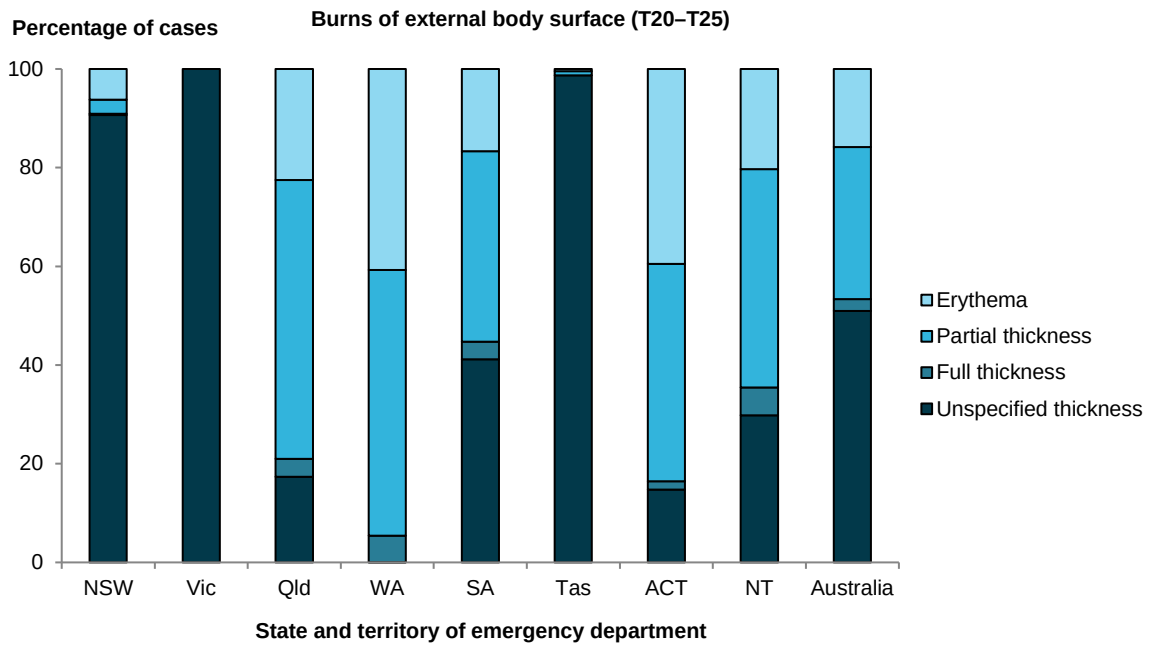
Note: For counts underlying this table, see Appendix C, tables C3.

Figure 3.3: Cases with a principal diagnosis of fracture of femur, by level of specificity and state or territory of ED, 2013–14

The level of specificity of diagnosis coding for cases assigned an ICD-10-AM principal diagnosis of T20–T25 *Burns of external body surface* varied markedly across states and territories (Figure 3.4).

Nearly all cases in New South Wales, Victoria, and Tasmania were assigned codes indicating that burn thickness (which is indicated by the 4th character in the diagnosis code) was unspecified. For cases where burn thickness was specified (that is, erythema, partial thickness, or full thickness) Western Australia (100%), the Australian Capital Territory (85%) and Queensland (83%) had the highest percentages of cases.

These findings, and similar findings for other injury codes, prompted a decision to restrict most analysis to the 3-character level of ICD-10-AM codes, taking account of the 4th character selectively.



Note: For counts underlying this table, see Appendix C, tables C4.

Figure 3.4: Cases with a principal diagnosis of burns of external body surface, by level of specificity and state or territory of ED, 2013–14

External cause codes

The data set analysed for this project does not include variables that are intended to contain information on the events, such as road crashes and falls that result in the occurrence of injury conditions. This is the single greatest weakness of the data collection for injury surveillance. In contrast, the NHMD includes data fields for external cause of injury, type of place of occurrence, and type of activity when injured.

Some alphanumeric codes starting with the letters V, W, X, and Y appear in the diagnosis fields in the ED data file. They seem to be ICD-10-AM external cause codes, which we did not expect to see in the ED collection (no field requires them), nor in the diagnosis fields (external causes are not diagnoses). We assessed these codes to answer whether they were ICD-10-AM external cause codes, and whether useable information could be obtained from them.

On further scrutiny, the values in diagnosis fields that start with the letters V, W, X, and Y were found to be consistent with ICD-10-AM external cause codes.

Less than 1% of ICD-10-AM coded cases have external cause codes (42,679; 0.87%). The design logic of ICD-10-AM is that external cause codes can be used in addition to injury diagnosis codes.

The external cause codes had not been used in that way in the ED data. In almost all of the records with an external cause code, it was the only ICD-10-AM code present. Those records with an external cause code are likely to have referred to cases in which injury was present, but were allocated an external cause code instead of an injury diagnosis code.

A very restricted set of ICD-10-AM external cause codes makes up the bulk of the instances in which any has been used (Table 3.3). In nearly one-third of instances, the external cause code is X84 *Intentional self-harm by unspecified means*. Almost another one-third have codes for W19 *Unspecified falls*, W57 *Bitten/stung by non-venomous insects and other arthropods*, and W54 *Bitten or struck by dog*.

Table 3.3: ED presentations[(a)] assigned an ICD-10-AM external cause code in the range V00–Y98 in a diagnosis field, 2013–14

Code	Description	No.	%
X84	Intentional self-harm by unspecified means	13,499	31.7
W19	Unspecified fall	6,059	14.2
W57	Bitten/stung by non-venomous insect/arthropod	2,852	6.7
W54	Bitten or struck by dog	2,767	6.5
W54.0	Bitten by dog	1,689	4.0
V89.9	Person in unspecified vehicle accident	1,517	3.6
W55.9	Bitten or struck by unspecified mammal	1,267	3.0
Y04.09	Assault by bodily force by unspecified person	1,233	2.9
Y82	Other and unspecified medical devices associated with misadventures	1,211	2.9
W46	Contact with hypodermic needle	1,075	2.5
	Other external cause codes	9,510	22.0
Total	**All records with an external cause code**	**42,679**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

The proportion of all ICD-10-AM coded cases that are external cause codes differs between states and territories, ranging from none in Victoria to about 2% in Queensland and New South Wales. Queensland and New South Wales accounted for 86% of all instances where external cause codes were assigned to diagnosis fields.

It is unclear whether all instances in which certain types of external cause were present were coded to the external cause, rather than to the injury that resulted from it, or whether to a subset. If the latter, it is unknown what was the basis on which a decision was made to code the external cause rather than the injury. This further complicates interpretation of these cases.

The Independent Hospital Pricing Authority has developed a principal diagnosis shortlist to provide a nationally consistent approach to principal diagnosis reporting for EDs (IHPA 2017). This new approach does not foreshadow the introduction of new fields in the NAPEDCD to record external causes of injury.

Identification of injury cases

The way in which diagnoses are recorded in the data set determines and limits the identification of injury cases.

First, some records lack any diagnosis information, and they cannot be assessed as to whether the ED attendance was due to injury.

Second, several different schemes have been applied to the case data to record diagnoses. Most records (68%; 92% for Australia except New South Wales) had been assigned a category from a version of ICD-10-AM.

Incidence of injury cases

It is possible that, in some instances, an injured person might present to an ED, be discharged without admission, and later present to the same or a different ED for treatment for the same injury. In other instances, a person might present to an ED of 1 hospital and then be transferred to another.

In both these instances, the same injury results in 2 presentations to an ED. So an estimate of the number of ED injury cases based on the number of presentations to an ED might overestimate the true incidence of injury cases reporting to EDs.

Diagnosis fields

A total of 1.3 million ED records were coded according to ICD-10-AM, and had been assigned at least 1 diagnosis code from the injury chapter of that classification (that is, codes starting with S or T). These records are the main focus of later parts of this report.

Coding had been reported variously to 3, 4, or 5-character ICD-10-AM codes. In this report, diagnosis codes have generally been truncated to 3 characters to enable wider comparability within the data set, and because of poor specificity at the 4th and 5th character levels (see also ‘Specificity of ICD-10-AM diagnosis codes’, in this chapter).

It was practicable to summarise and report on the records that had been assigned to diagnosis categories derived from ICD-10-AM. It was much less practicable to do that with records to which SNOMED-CT terms had been assigned (see section on SNOMED-CT), and these were not included when analysing ED injury cases.

The small proportion of cases coded to ICD-9-CM could have been mapped to ICD-10-AM. But it was not considered necessary to do so for this technical assessment of the data, and those records were omitted from analysis of injury cases.

Major diagnostic blocks

Diagnosis codes provide the main basis for identifying which ED records relate to injury cases. Another data item, referred to as major diagnostic block (MDB), is derived from the diagnosis fields. Its purpose is to enable derivation of urgency related groups, which provide a summary of the complexity and type of patients treated in an ED.

MDBs are described in this section, because they might sometimes be useful for injury surveillance based on NAPEDCD.

First, they might provide a basis for summarising injury cases, irrespective of which coding system had been used in the NAPEDCD diagnosis fields, noting that more than 1 system is in use (Table 3.2). Second, circumstances might arise in which diagnosis field data are not available, but MDB data are available.

As MDBs are derived from both ICD codes and SNOMED-CT terms, they might be usable as a bridge between those systems, in terms of which injury conditions might be summarised.

The feasibility and meaningfulness of doing this depends on understanding which diagnosis codes relevant to injury are mapped to which MDBs, and on whether the MDBs represent injury in a way that can be interpreted in terms of conventional and widely used methods, particularly the injury chapter of ICD-10-AM.

The full title of the MDB concept is *Emergency department stay—urgency related group major diagnostic block,* item 449585 in METeOR. For brevity, the item is called MDB in this report. The METeOR entry for this item defines it as 'The urgency related group major diagnostic block category into which the patient's ED diagnosis is grouped, as represented by a code'. This is further explained by a linked entry in METeOR (identifier: 496744), saying that urgency related groups provide a summary of the complexity and type of patients treated in an ED. ED episodes of care are grouped into urgency related groups based on:

- the reason the patient reports to an ED, which is captured by the type of visit
- the disposition recorded at the end of the patient's ED stay, which is captured by the episode end status
- the urgency of the patient's need for care, which is captured by the triage category
- the nature of the patient's diagnosis, which is captured by the MDB, drawing on the diagnosis fields.

The urgency related groups might sometimes be relevant to injury surveillance, particularly when considering cost of care and related matters. But the focus in this report is the MDBs and their relationship to the ICD-10-AM injury chapter.

Meaningful MDBs were reported for 87% of cases, while the variable was poorly specified in 8% of cases, and missing in 5%.

More than 307,000 cases were missing both a principal diagnosis and an MDB. These cases represented 64% of all cases missing a principal diagnosis (477,688), and 91% of all cases missing an MDB (336,296).

The titles of several MDBs refer to conditions that can be expected to be in scope for the injury chapter of ICD-10-AM. They are:

- *Poisoning, comatose*
- *Poisoning, conscious*
- *Injury, multiple sites*
- *Injury, single site, major*
- *Injury, single site, minor*.

In addition, the following groups might be in scope for the injury chapter:

- *Drug reaction*
- *Alcohol/drug abuse and alcohol/drug induced mental disorders*.

The grouping according to which MDBs were derived from ICD-10-AM diagnosis codes in the 2013–14 data year largely confirmed these expectations (Table 3.4).

Of the 1.3 million NAPEDCD cases in 2013–14 that included a code from the ICD-10-AM injury chapter in 1 or more of the 3 diagnosis fields, almost 1.1 million (82%) had an MDB for injury or poisoning.

Looked at another way, 91% of the almost 1.2 million cases with an MDB for injury or poisoning had a diagnosis code from the ICD-10-AM injury chapter.

Table 3.4: ED presentations, by major diagnostic block and presence of ICD-10-AM injury code, Australia[(a)], 2013–14

	ICD-10-AM injury code		
Major diagnostic block	**No**	**Yes**	**Total**
Injury and poisoning	100,236	1,073,013	1,173,249
Drug reaction or abuse[(b)]	44,545	2,589	47,134
Other MDB	2,913,533	175,327	3,088,860
Poorly specified	429,122	62,116	491,238
Missing	95,465	1,068	96,533
Total	**3,582,901**	**1,314,113**	**4,897,014**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

(b) Includes mental disorders induced by alcohol or other drugs.

The next section describes some characteristics of the cases in which the grouping of NAPEDCD cases 2013–14 did not follow this expectation.

ICD-10-AM injury chapter codes not grouped to the injury and poisoning MDBs

A total of 175,327 ED presentations were assigned an ICD-10 injury code in at least 1 of the diagnosis fields (almost 98% in the principal diagnosis field), but were assigned an MDB other than injury or poisoning. Of these presentations:

- more than 49% were to EDs in Queensland hospitals
- almost 28% were assigned a diagnosis code relating to effects of a foreign body entering through a natural orifice
- almost 21% were assigned a diagnosis code relating to a head injury.

Of all ICD-10-AM coded presentations assigned to the MDB *Illness of the eyes*, more than 28% were cases with an ICD-10-AM code for a type of eye injury.

ICD-10-AM codes not from the injury chapter that were grouped to the injury and poisoning MDBs

In 100,236 NAPEDCD cases from EDs at which ICD-10-AM was used to code diagnoses, the MDB was injury or poisoning, but the principal diagnosis field did not contain an ICD-10-AM injury diagnosis code. Of these presentations:

- more than 81% (81,542) were to EDs in Queensland hospitals
- almost 30% (29,758) had been assigned an ICD-10-AM code from the *External causes of morbidity and mortality* chapter in the principal diagnosis field, of which:
  - almost 39% were for intentional self-harm
  - 21% were for a fall-related injury
  - 11% for being bitten or struck by a dog
- 70% (70,478) had been assigned, as the principal diagnosis, an ICD-10-AM code from a chapter other than injury or external causes of injury. Of those, just over 9% were assigned a code from the *Factors influencing health status and contact with health services* chapter, of which about a quarter (26%) were codes relating to injury.

For NAPEDCD records assigned an external cause code, 70% (29,922) were assigned to an MDB signifying injury and poisoning, and 0.9% (378) were assigned to an MDB signifying a reaction to drugs, drug/alcohol abuse, and drug/alcohol induced mental disorders.

While there was substantial alignment in 2013–14 NAPEDCD data between MDBs titled injury and poisoning and diagnosis codes from the ICD-10-AM injury chapter, it was incomplete enough to deter further exploration in this report of the potential to use MDBs as a 'bridge' between records coded to ICD-10-AM and to SNOMED-CT.

A check of the 2014–15 NAPEDCD data revealed a closer correspondence than in 2013–14 between the presence of ICD-10-AM codes from the injury chapter and the assignment of the records to injury and poisoning MDBs.

The 2014–15 NAPEDCD data had been processed using version 1.4 of the grouper software (AIHW 2015). This might provide a basis to continue to explore the potential use of MDBs for injury surveillance in a future report.

4 Exploration and application of the data

Introduction

Identification of injury cases in the ED data file was considered in Chapter 3. ICD-10-AM diagnosis codes were available for more than two-thirds of all cases, including the great majority of cases for all jurisdictions other than New South Wales.

For reasons given in Chapter 3, it was not feasible to integrate the various types of classification and terminology in a way that would enable statistical exploration of the data.

The analysis that follows is restricted to records that were classified according to ICD-10-AM, except where stated otherwise. This enables all or nearly all ED records for Victoria, Queensland, South Australia, Tasmania, the Northern Territory, and the Australian Capital Territory to be analysed. It also enables most cases for Western Australia to be analysed, apart from those in the more remote parts of the state. The minority of New South Wales cases that were classified to ICD-10-AM were also used.

Five themes are looked at in this chapter. Each focuses on an aspect of the ED injury cases. Together, they comprise an exploration of features of the ED data that are particularly important when considering use of this data source for injury surveillance. The themes are:

- description of injury cases, with characteristics including age, sex, nature of injury, and the remoteness and socioeconomic status of the areas on which patients lived
- ED and admitted cases, to assess whether there is plausible numerical coherence between the ED injury cases reported as having been admitted and the admitted cases identified from the NHMD for the same year and part of Australia
- characteristics of the hospitals at which ED injury cases were seen, in particular, whether the profile of ED injury cases is related to whether the hospital is a level 1 trauma service
- disposition of ED injury cases, to assess where the cases go when they leave ED, which can be used to calculate admission proportions for injury conditions, which, in turn, might be used to extend analyses that can be based on the NHMD
- the severity of ED injury cases to determine how this can be assessed, and whether the more severe cases were managed differently to other cases.

Themes 1 and 2 are described in separate sections in this chapter, while themes 3–5 are described within 1 section in this chapter, as they are interrelated.

Statistical description of ED injury cases

ICD-10-AM injury diagnosis codes

More than 1.3 million ED presentations in 2013–14 had at least 1 assigned diagnosis code that was an ICD-10-AM code in the injury range S00–T98 (Table 4.1). These presentations represented about 27% of all ED presentations (4.9 million) that were coded to ICD-10-AM.

Of presentations assigned an injury diagnosis code, more than 1.2 million (93%) were assigned a principal diagnosis of S00–T75 or T79. This range includes injuries most likely sustained in the community, as distinct from conditions resulting from complications of medical care or sequelae of trauma. It is used in most AIHW publications on injury, and is the code range used in this section of the report.

A further 1% (12,563) of presentations were assigned a code of S00–T75 or T79 only as an additional diagnosis, while more than 6% (81,378) of presentations had either a principal diagnosis or additional diagnosis of T78 or of T80–T98. This range includes ED presentations involving certain types of adverse effects, complications of surgical and medical care and sequelae (late effects) of injury, poisoning, and of other consequences of external causes.

Another 42,679 presentations, which had been assigned an ICD-10-AM external cause code, are likely also to refer to cases with conditions codable to the injury chapter of ICD-10-AM (see Chapter 3). They have not been included in this section of the report, because they lacked any diagnosis codes.

Table 4.1: ICD-10-AM injury diagnosis codes for ED presentations[(a)], by injury classification and sex, 2013–14

Injury classification	Males	Females	Persons
Principal diagnosis of S00–T75 or T79	711,001	509,116	1,220,172
Additional diagnosis of S00–T75 or T79	6,993	5,570	12,563
Any diagnosis of T78 or T80–T98[(b)]	40,698	40,677	81,378
Total	**758,692**	**555,363**	**1,314,113**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

(b) Excludes presentations where principal or additional diagnosis was in the range S00–T75 or T79.

Principal diagnosis of S00–T75 or T79

Of ED presentations with a principal diagnosis of S00–T75 or T79:

- more than 58% were males
- more than one-quarter (28%) were aged 0–14
- more than 61% were aged 34 or younger
- fewer than 12% were aged 65 or older (Table 4.2).

The number of ED presentations with a principal diagnosis of S00–T75 or T79 as a percentage of all ED presentations for which all ICD-10-AM coded diagnoses are available varied markedly by age and sex (Figure 4.1).

For males, this percentage was highest among those aged 15–24 (45%), and was lower for each successive age group, down to 13% for men aged 75 and older.

There was less variation for females, with a high of 29% for girls aged 0–14, and a low of 17% for women aged 25–34.

Table 4.2: ED presentations[(a)] with principal diagnosis of S00–T75 or T79, by age group and sex, 2013–14

Age group	Males	Females	Persons (no.)	Persons (%)
0–14	193,834	142,636	336,478	27.6
15–24	151,736	82,168	233,907	19.2
25–34	114,034	62,037	176,079	14.4
35–44	84,326	52,406	136,745	11.2
45–54	63,809	47,556	111,370	9.1
55–64	43,076	38,815	81,904	6.7
65–74	28,223	29,835	58,062	4.8
75+	31,963	53,663	85,627	7.0
Total	**711,001**	**509,116**	**1,220,172**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

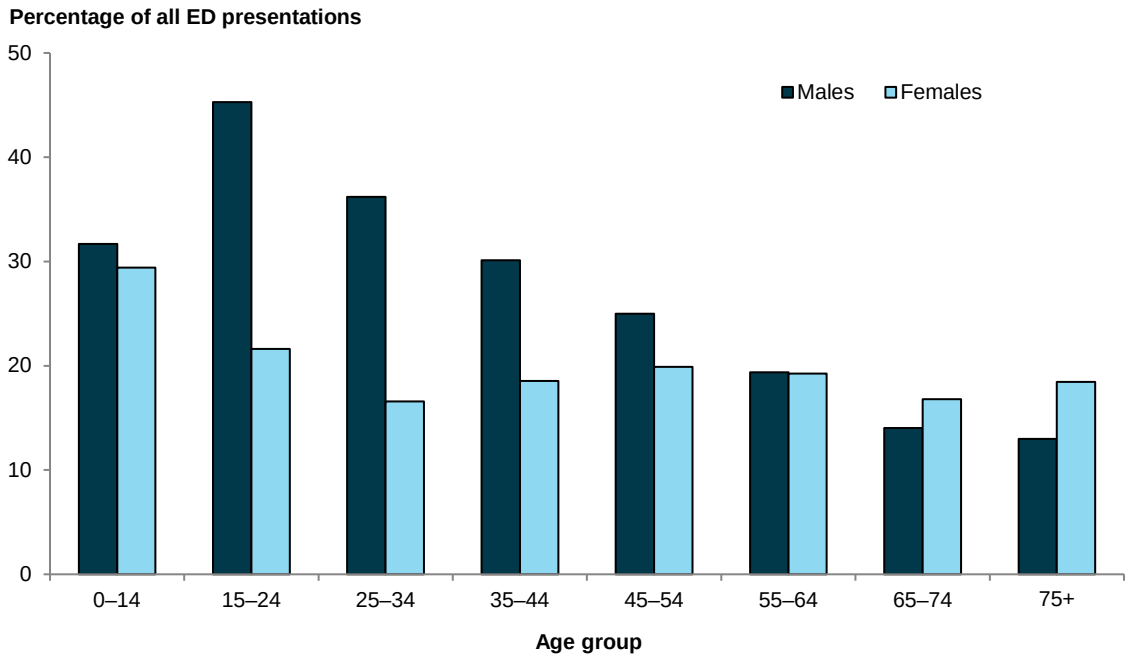


Figure 4.1: ED presentations with principal diagnosis of S00–T75 or T79, as a percentage of all ED presentations for which all ICD-10-AM coded diagnoses are available, by age group and sex, 2013–14

A total of 30% of ED presentations with a principal diagnosis of S00–T75 or T79 were residents of Queensland, while just over 29% were residents of Victoria (Table 4.3). The percentage of cases for New South Wales (11%) was low, because SNOMED-CT, rather than ICD-10-AM, had been assigned to most cases at most EDs in that state.

Table 4.3: ED presentations[(a)] with principal diagnosis of S00–T75 or T79, by state or territory of usual residence and sex, 2013–14

State or territory of usual residence	Males	Females	Persons (no.)	Persons (%)
NSW	81,924	53,774	135,703	11.1
Vic	207,238	149,909	357,147	29.3
Qld	211,534	154,220	365,776	30.0
SA	59,720	44,750	104,472	8.6
WA	89,819	62,963	152,803	12.5
Tas	21,949	16,001	37,950	3.1
ACT	15,442	12,065	27,508	2.3
NT	15,318	10,254	25,573	2.1
Other territories[(b)]	448	291	739	0.1
Overseas resident, resident at sea, or no fixed address	6,961	4,483	11,444	0.9
Unknown	648	406	1,057	0.1
Total	**711,001**	**509,116**	**1,220,172**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

(b) Other territories include Norfolk Island, Christmas Island and Cocos (Keeling) Islands.

A total of 63% of ED presentations with a principal diagnosis of S00–T75 or T79 lived in *Major cities*, while a further 23% lived in *Inner regional* areas (Table 4.4). Just 1.0% of ED presentations lived in *Very remote* areas. The percentages shown in Table 4.4 might have differed had New South Wales injury cases been coded to SNOMED-CT, and had injury cases with a blank principal diagnosis field been included.

Table 4.4: ED presentations[(a)] with principal diagnosis of S00–T75 or T79, by remoteness area of usual residence and sex, 2013–14

Remoteness area of usual residence	Males	Females	Persons (no.)	Persons (%)
Major cities	443,300	325,176	768,512	63.0
Inner regional	163,504	114,689	278,200	22.8
Outer regional	74,587	50,036	124,629	10.2
Remote	10,559	7,072	17,633	1.4
Very remote	6,921	5,161	12,083	1.0
Not reported	12,130	6,982	19,115	1.6
Total	**711,001**	**509,116**	**1,220,172**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

The percentage of ED injury presentations with a principal diagnosis of S00–T75 or T79 was markedly lower for the 20% of the population with the highest socioeconomic status (SES), as compared to all other socioeconomic groups, for which percentages of ED injury cases were similar to percentages of the population (Table 4.5). The percentages shown in Table 4.5 might have differed had New South Wales injury cases been coded to SNOMED-CT, and had injury cases with a blank principal diagnosis field been included.

Table 4.5: ED presentations[(a)] with principal diagnosis of S00–T75 or T79, by socioeconomic status and sex, 2013–14

SES	Males	Females	Persons (no.)	Persons (%)
1—lowest	150,915	108,612	259,534	21.3
2	150,740	107,461	258,214	21.2
3	146,546	105,304	251,857	20.6
4	143,013	102,816	245,842	20.1
5—highest	107,432	77,819	185,262	15.2
Not reported	12,355	7,104	19,463	1.6
Total	**711,001**	**509,116**	**1,220,172**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

More than 22% of ED presentations with a principal diagnosis of S00–T75 or T79 were as a result of soft-tissue injuries, and a further 21% were as a result of fractures (Table 4.6). For presentations where the principal diagnosis indicated fracture, almost 56% involved a fracture to the shoulder or arm region, including the wrist and hand.

Table 4.6: ED presentations[(a)] with principal diagnosis of S00–T75 or T79, by nature of injury and sex, 2013–14

Nature of injury	Males	Females	Persons (no.)	Persons (%)
Fractures	142,150	110,836	252,996	20.7
Dislocation	20,603	12,851	33,458	2.7
Soft-tissue injury	140,618	131,636	272,266	22.3
Open wound	150,983	73,623	224,612	18.4
Intracranial injury	13,836	8,155	21,992	1.8
Internal organ or vessel of trunk	2,281	913	3,194	0.3
Burn	15,692	11,675	27,368	2.2
Superficial injury	90,907	68,563	159,477	13.1
Poisoning or toxic effect	21,402	25,524	46,930	3.8
Other specified	78,707	40,862	119,575	9.8
Unspecified	33,822	24,478	58,304	4.8
Total	**711,001**	**509,116**	**1,220,172**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

For ED presentations with a principal diagnosis of S00–T75 or T79, some nature of injury types with small numbers of presentations had high admission proportions (Table 4.7).

For example, the highest percentages admitted to hospital were for those sustaining injuries to internal organs or vessel of trunk (86%), followed by poisonings or exposure to toxins (45%), and intracranial injuries (44%). These 3 natures of injury were responsible for less than 6% of ED presentations with a principal diagnosis of S00–T75 or T79.

Conversely, soft-tissue injuries and open wounds, which were responsible for more than 40% of ED presentations with a principal diagnosis of S00–T75 or T79, recorded admission percentages of 8% and 13%, respectively.

Table 4.7: ED presentations[(a)] with principal diagnosis of S00–T75 or T79, by nature of injury and episode end status, 2013–14

	Episode end status					
Nature of injury	Admitted, this hospital	Completed, not admitted	Completed, to another hospital	Other	Total	Admission (%)
Fractures	68,065	177,160	6,858	913	252,996	29.6
Dislocation	5,823	27,007	437	191	33,458	18.7
Soft-tissue injury	20,058	249,256	999	1953	272,266	7.7
Open wound	27,150	192,118	2,983	2361	224,612	13.4
Intracranial injury	8,859	12,024	831	278	21,992	44.1
Internal organ or vessel of trunk	2,439	413	296	46	3,194	85.6
Burn	3,331	23,144	657	236	27,368	14.6
Superficial injury	17,525	138,985	1,096	1,871	159,477	11.7
Poisoning or toxic effect	19,847	24,649	1,120	1,314	46,930	44.7
Other specified	16,210	99,799	2,302	1,264	119,575	15.5
Unspecified	9,680	46,030	1,272	1,307	58,289	18.8
Total	**198,989**	**990,598**	**18,851**	**11,734**	**1,220,172**	**17.9**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

More than 81% of ED presentations with a principal diagnosis of S00–T75 or T79 were not admitted to hospital after completing their treatment (Table 4.8). More than 16% of those presenting were admitted to the same hospital as the ED, while 1.5% were transferred to another hospital for admission.

Table 4.8: ED presentations[(a)] with principal diagnosis of S00–T75 or T79, by episode end status and sex, 2013–14

Episode end status	Males	Females	Persons (no.)	Persons (%)
Admitted, this hospital	108,503	90,478	198,989	16.3
Completed, not admitted	583,639	406,916	990,598	81.2
Completed, to another hospital	11,472	7,376	18,851	1.5
Did not wait	896	540	1,436	0.1
Left at own risk	6,345	3,695	10,041	0.8
Died in ED as a non-admitted patient	98	70	168	—
Dead on arrival	. .	. .	5	—
Not stated	. .	. .	84	—
Total	**711,001**	**509,116**	**1,220,172**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

Almost 85% of ED presentations with a principal diagnosis of S00–T75 or T79 were to *Principal referral hospitals, Public acute group A hospitals*, or *Public acute group B hospitals* (Table 4.9). These 3 peer groups accounted for almost half (88) of the 177 hospitals included in this analysis. The percentages shown in Table 4.9 might have differed had New South Wales injury cases been coded to SNOMED-CT, and had injury cases with a blank principal diagnosis field been included.

Table 4.9: ED presentations[(a)] with principal diagnosis of S00–T75 or T79, by hospital peer group and sex, 2013–14

Hospital peer group	Males	Females	Persons (no.)	Persons (%)
Principal referral hospitals	187,534	131,869	319,419	26.2
Public acute group A hospitals	283,141	208,047	491,206	40.3
Public acute group B hospitals	140,780	101,689	242,484	19.9
Public acute group C hospitals	37,008	24,793	61,803	5.1
Public acute group D hospitals	8,171	5,491	13,664	1.1
Children's hospitals	38,863	27,751	66,616	5.5
Other women's and children's hospitals	7,174	5,538	12,712	1.0
Women's hospitals	9	349	358	—
Other acute specialised hospitals	5,082	1,699	6,781	0.6
Very small hospitals	680	366	1,046	0.1
Outpatient hospitals	52	24	76	—
Unknown	2,507	1,500	4,007	0.3
Total	**711,001**	**509,116**	**1,220,172**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

Additional diagnosis of S00–T75 or T79

A small number of ED cases were assigned an injury diagnosis in the ICD-10-AM range S00–T75 or T79 in at least 1 of the 2 additional diagnosis fields, but not as a principal diagnosis. These are cases where injury was likely to be a contributing cause, rather than the principal cause for the person presenting to an ED.

Just under 56% of ED presentations with an additional diagnosis of S00–T75 or T79 were males (Table 4.10). This was similar to the percentage of 58% for ED presentations with a principal diagnosis of S00–T75 or T79.

More than 51% of these ED presentations were aged 0–34, while just over 14% were aged 65 or older. This compares with 61% and 12%, respectively, for with a principal diagnosis of S00–T75 or T79 were.

Table 4.10: ED presentations[(a)] with at least 1 diagnosis other than principal diagnosis of S00–T75 or T79, by age group and sex, 2013–14

Age group	Males	Females	Persons (no.)	Persons (%)
0–14	1,249	984	2,233	17.8
15–24	1,318	861	2,179	17.3
25–34	1,186	822	2,008	16.0
35–44	975	779	1,754	14.0
45–54	894	700	1,594	12.7
55–64	543	476	1,019	8.1
65–74	415	357	772	6.1
75+	413	591	1,004	8.0
Total	**6,993**	**5,570**	**12,563**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

Just over 54% of ED presentations with an additional diagnosis of S00–T75 or T79 had a principal diagnosis beginning with Z09 *Follow-up examination and treatment for conditions other than malignant neoplasms*. A further 10% had a principal diagnosis beginning with F10 *Mental and behavioural disorders due to use of alcohol* (Table 4.11).

Table 4.11: ED presentations[(a)] with at least 1 additional diagnosis of S00–T75 or T79, by principal diagnosis, 2013–14

Principal diagnosis	Description	No.	%
Z09	Follow-up examination and treatment for conditions other than malignant neoplasms	6,812	54.2
F10	Mental and behavioural disorders due to use of alcohol	1,209	9.6
Z02	Examination and encounter for administrative purposes	289	2.3
Z04	Examination and observation for other reasons	275	2.2
R55	Syncope and collapse	247	2.0
M54	Dorsalgia	197	1.6
M79	Other soft-tissue disorders, not elsewhere classified	190	1.5
M25	Other joint disorders, not elsewhere classified	189	1.5
Z47	Other orthopaedic follow-up care	170	1.4
L03	Cellulitis	158	1.3
Other		2,827	22.5
Total		**12,563**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

Almost one-quarter (24%) of ED presentations with an additional diagnosis of S00–T75 or T79 were assigned an additional diagnosis indicating a fracture, while a further 18% were assigned an additional diagnosis indicating an open wound (Table 4.12). For presentations where an additional diagnosis indicated fracture, more than 52% involved a fracture to the arm region, including the wrist and hand.

Table 4.12: ED presentations[(a)] with at least 1 additional diagnosis of S00–T75 or T79, by nature of injury and sex, 2013–14

Nature of injury	Males	Females	Persons (no.)	Persons (%)
Fractures	1,643	1,415	3,058	24.3
Dislocation	148	84	232	1.8
Soft-tissue injury	984	958	1,942	15.5
Open wound	1,441	868	2,309	18.4
Intracranial injury	110	81	191	1.5
Internal organ or vessel of trunk	12	8	20	0.2
Burn	284	229	513	4.1
Superficial injury	614	479	1,093	8.7
Poisoning or toxic effect	259	268	527	4.2
Other specified	1,282	992	2,274	18.1
Unspecified	216	188	404	3.2
Total	**6,993**	**5,570**	**12,563**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

Codes for adverse effects, complications, and sequelae

Some ED cases were assigned ICD-10-AM code T78, or codes of T80–T98 as a principal diagnosis or in at least 1 of the 2 additional diagnoses. These are cases in which the person presented to an ED primarily due to a complication of surgical or medical care that was not classified anywhere else in the ICD-10-AM.

Cases were also included if the person experienced an adverse reaction—such as anaphylactic shock or an allergic reaction of an unspecified nature—or sequelae of injury or poisoning.

A total of 20% of these ED presentations were aged 0–14. Presentations for all other age groups were broadly evenly distributed (Table 4.13). The numbers of male and female presentations were almost identical.

Table 4.13: ED presentations[(a)] with any diagnosis of T78 or T80–T98, by age group and sex, 2013–14

Age group	Males	Females	Persons (no.)	Persons (%)
0–14	9,397	6,915	16,312	20.0
15–24	4,317	6,258	10,575	13.0
25–34	4,136	6,043	10,180	12.5
35–44	3,932	5,533	9,465	11.6
45–54	4,122	5,140	9,262	11.4
55–64	4,561	4,003	8,566	10.5
65–74	4,849	3,449	8,298	10.2
75+	5,384	3,336	8,720	10.7
Total	**40,698**	**40,677**	**81,378**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

Almost 35% (28,448) of ED presentations with any diagnosis of T78 or T80–T98 had a principal diagnosis indicating the presentation was as a result of adverse effects that were not classified somewhere else in the injury and poisoning chapter of the ICD-10-AM (Table 4.14). Close to 69% (19,640) of these cases were classified as an unspecified allergy, with a further 12% (3,324) classified as an unspecified anaphylactic shock.

Close to 33% (26,751) of presentations were as a result of complications of procedures that were not classified somewhere else in ICD-10-AM (Table 4.14). Almost 47% (12,527) of these cases were a result of an infection following a procedure, and a further 16% (4,321) were a result of a haemorrhage or haematoma complicating a procedure.

For presentations relating to other complications of surgical or medical care, not elsewhere classified (16%, 13,266), more than half (53%) resulted from an unspecified adverse effect of a drug or medicament.

Table 4.14: ED presentations[(a)] with any diagnosis of T78 or T80–T98, by principal diagnosis, 2013–14

Principal diagnosis	Description	No.	%
T78	Adverse effects, not elsewhere classified	28,448	35.0
T80	Complications following infusion, transfusion, and therapeutic injection	727	0.9
T81	Complications of procedures, not elsewhere classified	26,751	32.9
T82	Complications of cardiac and vascular prosthetic devices, implants, and grafts	1,076	1.3
T83	Complications of genitourinary prosthetic devices, implants, and grafts	4,660	5.7
T84	Complications of internal prosthetic devices, implants, and grafts	539	0.7
T85	Complications of other internal orthopaedic prosthetic devices, implants, and grafts	2,775	3.4
T86	Failure and rejection of transplanted organs and tissues	140	0.2
T87	Complications peculiar to reattachment and amputation	12	—
T88	Other complications of surgical and medical care, not elsewhere classified	13,226	16.3
T89	Other complications of trauma, not elsewhere classified	1,424	1.8
T90–T98	Sequelae of injuries, of poisoning and of other consequences of external causes	528	0.7
Other		1,072	1.3
Total		**81,378**	**100.0**

(a) Restricted to records for which ICD-10-AM coded diagnoses are available (see Table 3.2).

ED presentations and admitted cases of injury

Injury cases of a severe nature are generally admitted to hospital after attending an ED. Accordingly, there should be at least some concordance between the numbers of injury cases in ED data recorded as having been admitted (to the same hospital or transferred to another hospital for admission), and estimated numbers of acute care injury admitted cases according to NHMD data.

Comparisons were made between the number of ED injury cases recorded as admitted, or transferred for likely admission at another hospital, and the number of hospitalised injury cases according to the NHMD. Criteria for inclusion of records from each of the 2 data sets are as follows.

ED injury cases:

- required the date of presentation to the ED to be between 1 July 2013 and 30 June 2014
- required the episode end status to be admitted to this hospital or admitted to another hospital
- required a principal diagnosis of S00–T75 or T79 for ICD-10-AM coded cases, and 800–904 or 910–995 for ICD-9-CM coded cases
- excluded ED presentations in New South Wales and Western Australia.

NHMD cases:

- required the date of admission to the hospital to be between 1 July 2013 and 30 June 2014
- required a principal diagnosis of S00–T75 or T79
- included any mode of admission other than statistical admission—type change
- required the urgency status at admission to be an emergency
- required the type of episode of care to be acute
- excluded hospital admissions occurring in New South Wales and Western Australia
- excluded admissions to private hospitals.

Cases for New South Wales were excluded due to the large proportion (71%) of ED presentations in this state that were coded using the SNOMED-CT terminology. Additionally, the principal diagnosis field for a further 7% of ED presentations in New South Wales did not contain a diagnosis code.

Cases for Western Australia were excluded from this part of the analysis because the records for 25% of ED presentations in that state did not contain a diagnosis code in the principal diagnosis field.

State or territory of emergency department

For 2013–14, the number of ED injury cases in which the episode ended with admission was lower than the equivalent numbers of injury-related hospitalisations for each of the 6 states and territories for which data are shown (Figure 4.2).

Proportionally, the biggest differences were for:

- the Northern Territory, where the number of ED injury cases (5,175) was 28% lower than the number of injury-related hospitalisations (7,154)
- South Australia, where the number of ED injury cases (19,533) was 26% lower than the number of injury-related hospitalisations (26,458).

The smallest proportional difference was for Victoria, where the number of ED injury cases (70,195) was 3% lower than the number of injury-related hospitalisations (72,325).

For all 6 jurisdictions combined, the number of ED injury cases (171,893) was 15% lower than the equivalent number of injury-related hospitalisations (203,383).

Comparisons between ED injury case counts and NHMD injury counts varied markedly by type of diagnosis.

For example, for a principal diagnosis of a fractured femur, counts for both data sets were similar for all jurisdictions, with the total count of NMHD cases less than 6% as high as the total count for ED injury cases.

In contrast, for a principal diagnosis of an intracranial injury, counts for NHMD injury cases were markedly higher than counts for ED injury cases for all jurisdictions except Tasmania, with the total count of NMHD cases more than 31% as high as the total count for ED injury cases.

The differences in counts for some types of injury might reflect the greater uncertainty of diagnosis in the ED when compared with diagnosis of hospital admitted cases.

More than 42,000 ED presentations were assigned an external cause code of V00–Y98 in 1 of the diagnosis fields (Table 3.3). Excluding New South Wales and Western Australia

presentations, about 8,000 of these presentations resulted in admission to hospital, and were assigned an external cause code of V00–V36 in the principal diagnosis field.

About three-quarters of these presentations were to EDs in Queensland hospitals. Assuming that many of these presentations should have been assigned a principal diagnosis of S00–T75 or T79 instead of an external cause code, this might partially account for difference in case counts between ED presentations and hospital admissions based on the NHMD.

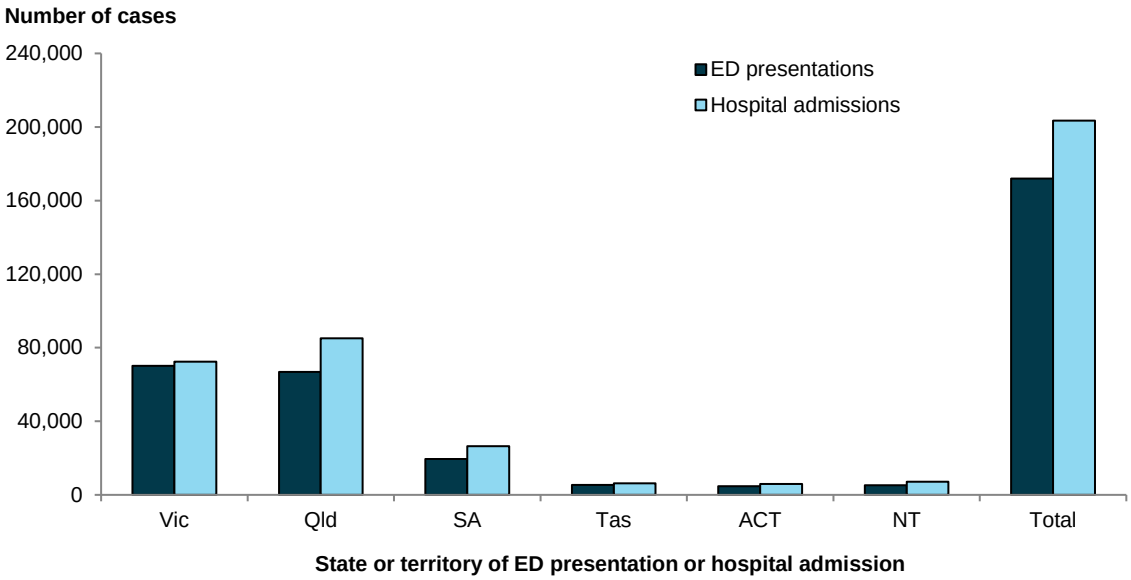


Figure 4.2: Injury-related ED presentations ending in hospital admissions, by state and territory, 2013–14

Age group

Injury incidence varies with age. To assess whether this was similar for injury cases according to the ED data and according to hospital admissions data, patient data was compared by age using both sources (Figure 4.3).

For 2013–14, the number of ED injury cases was lower than the equivalent number of injury-related hospitalisations for all age groups. But the pattern of injury case counts by age was similar for both sources, with the highest counts seen in those aged 85 and over and 20–24, and the lowest counts seen for those aged 60–74.

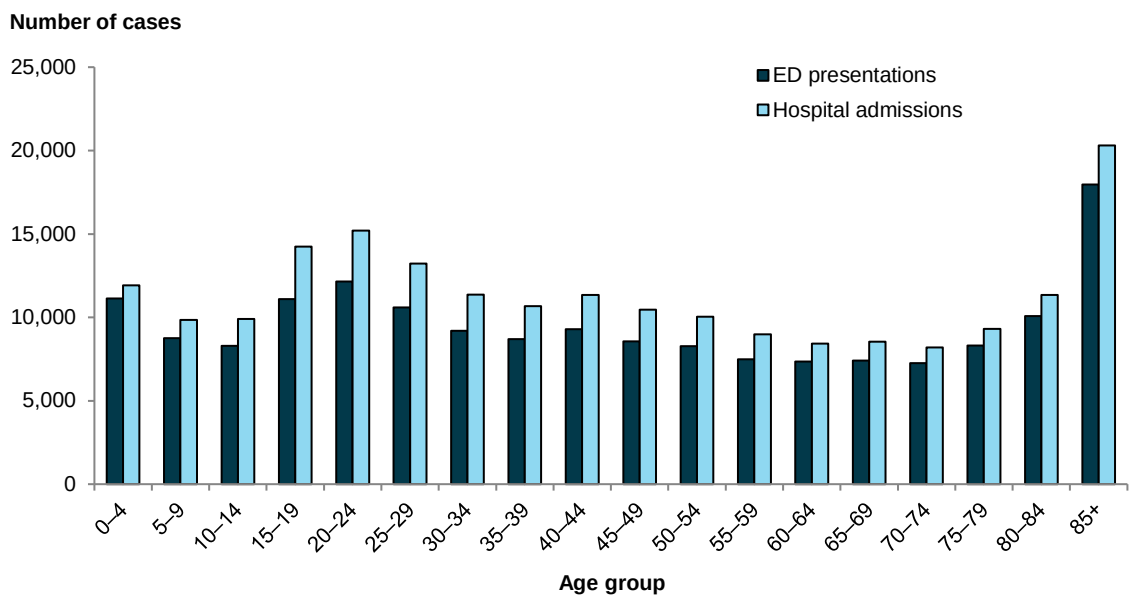


Figure 4.3: Injury-related ED presentations ending in hospital admissions, by age group, 2013–14

Transfers into an ED

One problem when using both ED presentations and hospital admissions that have not been linked to a person, is to determine the number of people injured, as distinct from the number of injured-related presentations or injury-related admissions.

Admitted cases recorded as transfers from another acute hospital might be represented by more than 1 record in the admitted patient data collection. As such, a case can be made to exclude them when comparing ED presentations with NHMD cases.

But the ED data collection includes cases in which a person attended 1 ED, and was then transferred to the ED at another hospital. Similarly, an injured person might present to an ED, leave without being admitted to hospital, then present to the same ED or another ED. Such cases might be represented by 2 or more records in the ED collection.

Without linked data, there is no obvious way to allow for such double-counting of ED injury cases. This is why NHMD data on transfers into EDs are included in this section. Analysis of data after person-based record linkage of ED and NHMD data become available is likely to resolve this problem.

Considering the NHMD in 2013–14, in the 5 states and territories for which data are shown, 9,509 injury cases were admitted to hospital after being transferred from another acute care hospital (Table 4.15).

For these cases, almost half (45%) were admitted to a Queensland hospital, and 35% were admitted to a Victorian hospital. If double-counting of NHMD injury cases was markedly more prevalent than double-counting of ED injury cases, this would partly account for the difference in the number of ED injury cases compared with the number of injury-related NHMD cases shown in figures 4.2 and 4.3.

Table 4.15: Number of injury[(a)] cases transferred from another acute care hospital, by state or territory of hospitalisation, 2013–14

State or territory of hospitalisation	No.	%
Vic	3,345	35.2
Qld	4,270	44.9
SA	1,619	17.0
Tas	150	1.6
ACT	125	1.3
Total	**9,509**	**100.0**

(a) In this instance 'injury' refers to a principal diagnosis of S00–T75 or T79.

Hospital characteristics, case disposition, and severity

Hospitals with and without level 1 trauma service

In 2013–14, across Australia, there were 27 designated level 1 trauma centres (see Appendix D) each located in a hospital (Ford 2016). In 2013–14, these trauma centres reported 7,070 cases meeting the inclusion criteria of the Australian Trauma Registry (ATR).

The NAPEDCD data set specifies the treating hospital for all included cases. This distinguishes between the EDs in hospitals that contributed to the ATR in 2013–14 and other hospitals. Only certain severe trauma cases meet the ATR inclusion criteria, and the data in NAPEDCD do not allow for these cases to be found among all of the injury ED cases at the hospitals that contribute to the ATR.

But it was anticipated that the pattern of injury cases seen at the EDs in the hospitals that contribute data to the ATR would differ from the pattern of cases at other EDs. It was expected that the injury cases attending EDs at hospitals that contribute to the ATR would include a relatively high proportion of cases with indications of high severity.

This section compares ED presentations that are followed by admission to a hospital designated as a level 1 trauma service with presentations that are admitted to other hospitals. This comparison is a way to assess the face validity of the ED data.

Analysis in this section only includes ED presentations in which the principal diagnosis is coded using ICD-10-AM (68% of NAPEDCD records in 2013–14 were coded according to ICD-10-AM).

This provides a basis for estimating how many of the 7,070 cases reported nationally to the ATR in 2013–14 were at hospitals included in the analysis of ED cases presented in this section—that is, about 4,800. The bulk of the omitted ED cases (about 90%) are SNOMED-coded presentations to New South Wales hospitals. Most of the remainder comprise presentations to non-metropolitan hospitals in Western Australia.

As trauma service cases are admitted patients, this section is largely restricted to ED cases ending with admission, whether to the hospital in which the ED was located, or with transfer to another hospital for admission.

Overview of admitted cases

Of the 1.2 million ED presentations in 2013–14 with injury as a principal diagnosis, 18% were admitted to hospital (Table 4.16). The percentage admitted to the hospital at which the person presented to the ED was higher for presentations to level 1 trauma service hospitals (26%) than for other hospitals (13%).

For ED presentations to level 1 trauma service hospitals, 0.5% were admitted to hospitals other than where the person presented, while for presentations to other hospitals, just under 2% were admitted to hospitals other than where the person presented.

Table 4.16: Hospital admissions of ED injury cases, by type of hospital, by whether admitted to same or different hospital as ED, 2013–14

Type of hospital	ED injury presentations[(a)]	Admitted same hospital		Admitted different hospital	
		No.	%	No.	%
Level 1 trauma service hospital	292,663	76,294	26.1	1,561	0.5
Other hospitals	927,509	122,695	13.2	17,290	1.9
Total	**1,220,172**	**198,989**	**16.3**	**18,851**	**1.5**

(a) Includes cases where principal diagnosis is in the range S00–T75 or T79.

Mode of arrival and triage category

Mode of arrival to ED (by ambulance or other ways) and the triage category to which cases are assigned can be expected to be associated with outcomes and treatment. This might differ according to whether hospitals have level 1 trauma services.

Almost 60% of all admitted ED injury cases requiring resuscitation were admitted to a hospital with a level 1 trauma service, despite these hospitals only accounting for 38% of all ED injury cases admitted to hospital in 2013–14 (Table 4.17). For all other triage categories (that is, emergency, urgent, semi-urgent, and non-urgent), 35%–40% of admitted cases were admitted to hospitals with a level 1 trauma centre.

Of all admitted ED injury cases requiring resuscitation, more than 91% were transported to an ED by ambulance. As the level of urgency decreased, the percentage of admitted cases arriving to an ED by ambulance also decreased.

For example, for admitted ED injury cases triaged as an emergency, 71% arrived to an ED by ambulance, while for admitted ED injury cases triaged as non-urgent, 16% arrived to an ED by ambulance.

Of injury cases presenting to an ED for which ICD-10-AM coding data are available, and who were subsequently admitted to a hospital, an estimated 4,800 were trauma service cases reported to the ATR.

These cases were among the 76,294 shown in Table 4.16 who were admitted to a hospital with a trauma centre. It is likely that the proportion of ATR cases was relatively high among the subgroup of cases who arrived by ambulance and had a triage category of *Resuscitation* or *Emergency* (18,169), but this cannot be assessed directly.

Table 4.17: ED injury cases[(a)] admitted to hospital, by type of hospital, triage category, and arrival mode, 2013–14

	Arrival by ambulance		Arrival by other means		Percentage of arrival by ambulance
Triage category	**No.**	**%**	**No.**	**%**	
Hospitals with trauma centre					
Resuscitation	4,371	9.0	299	1.1	93.6
Emergency	13,798	28.5	3,085	11.1	81.7
Urgent	22,120	45.7	10,079	36.1	68.7
Semi-urgent	7,836	16.2	12,815	45.9	37.9
Non-urgent	275	0.6	1,614	5.8	14.6
Total	**48,401**	**100.0**	**27,893**	**100.0**	**63.4**
Hospitals without trauma centre					
Resuscitation	2,772	3.9	379	0.7	88.0
Emergency	14,547	20.4	8,508	16.5	63.1
Urgent	36,679	51.5	22,114	42.9	62.4
Semi-urgent	16,745	23.5	18,423	35.8	47.6
Non-urgent	426	0.6	2,102	4.1	16.9
Total	**71,169**	**100.0**	**51,526**	**100.0**	**58.0**

(a) Excludes cases where the person was admitted to a hospital other than the hospital where they presented to the ED.

Deaths in emergency departments

In 2013–14, excluding those who were dead on arrival, 4,832 people died in EDs across Australia. Of those, 63% (3,063) had a principal diagnosis coded using ICD-10-AM, and 3% (132) had a blank principal diagnosis field.

Of the 3,063 deaths coded to ICD-10-AM, 5% (168) had a principal diagnosis in the injury range S00–T75 or T79 (Table 4.18). A further 13% (395) had a principal diagnosis indicating cause of death was ill-defined or unknown (that is, R96–R99).

Of the 168 ED injury deaths, one-third (56) had an intracranial injury, and 12% (20) had an injury to an internal organ or vessel of trunk (Table 4.21). Of the much larger group of ED injury cases in which the person was admitted to hospital (217,838), only 4.4% had an intracranial injury, and 1.3% had an injury to an internal organ or vessel of trunk.

Of the 34 ED deaths of people recorded as having *Other specified* types of injuries, almost two-thirds (22) had hypothermia, non-fatal submersion, or traumatic shock. For ED injury cases admitted to hospital due to other specified injuries, one-quarter resulted from exposure to a foreign body, 14% from crushing injury, and 12% from multiple injuries.

Of the 22 ED deaths for which the nature of injury was unspecified injuries, almost two-thirds (14) had unspecified multiple injuries. For injury cases with unspecified nature who were admitted to hospital, more than 29% involved unspecified multiple injuries.

Table 4.18: ED injury cases[(a)], by outcome and nature of injury, 2013–14

	Died in ED		Admitted to hospital	
Nature of injury	**No.**	**%**	**No.**	**%**
Fractures	20	11.9	74,923	34.4
Dislocation	—	—	6,260	2.9
Soft-tissue injury	1	0.6	21,057	9.7
Open wound	4	2.4	30,133	13.8
Intracranial injury	56	33.3	9,690	4.4
Internal organ or vessel of trunk	20	11.9	2,735	1.3
Burn	3	1.8	3,988	1.8
Superficial injury	1	0.6	18,621	8.5
Poisoning or toxic effect	7	4.2	20,967	9.6
Other specified	34	20.2	18,512	8.5
Unspecified	22	13.1	10,952	5.0
Total	**168**	**100.0**	**217,838**	**100.0**

(a) Includes cases where principal diagnosis is in the range S00–T75 or T79.

Likelihood of fatal outcome from severity

The primary focus of trauma services is to reduce death after injury. A long-established method for assessing injury severity in terms of threat to life is based on ICD-coded admitted patient data.

In this method, a large set of records is used to produce weights that represent the probability of survival to discharge from hospital for cases with each of a large number of injury diagnoses. Subtraction of the probability of survival from 1 gives the probability of death, which has a more intuitively obvious connection with severity than probability of survival, and is used in this section. The method is described further in Appendix B.

The most frequent use of such weights in AIHW injury reports is to split admitted cases in sets from a low threat to life to a high threat to life. The weights can also be used in more quantitative ways—for example, by comparing the means of the weight values for sets of cases of interest.

This is the method used in this section, with the variation that the weights derived from admitted injury cases have been applied to sets of ED injury cases. The method determines the likelihood that a person represented by an ED record in this set would die in hospital if admitted.

The method has been used in this section for 2 related reasons:

- for further face validation of the ED data
- to demonstrate a way in which the data can be used.

Triage category and age

Nearly all cases in the ED data collection are assigned to a triage category, which reflects the urgency with which the patient requires medical treatment. With the attention given by trauma services to prevent early death, cases with diagnoses that are life-threatening according to the probability of death measure would be more likely than other injury cases to have been rated as urgent according to the ED data. This section reports a test of that expectation.

It is well established that risk of death before discharge rises with age among injury cases admitted to hospital.

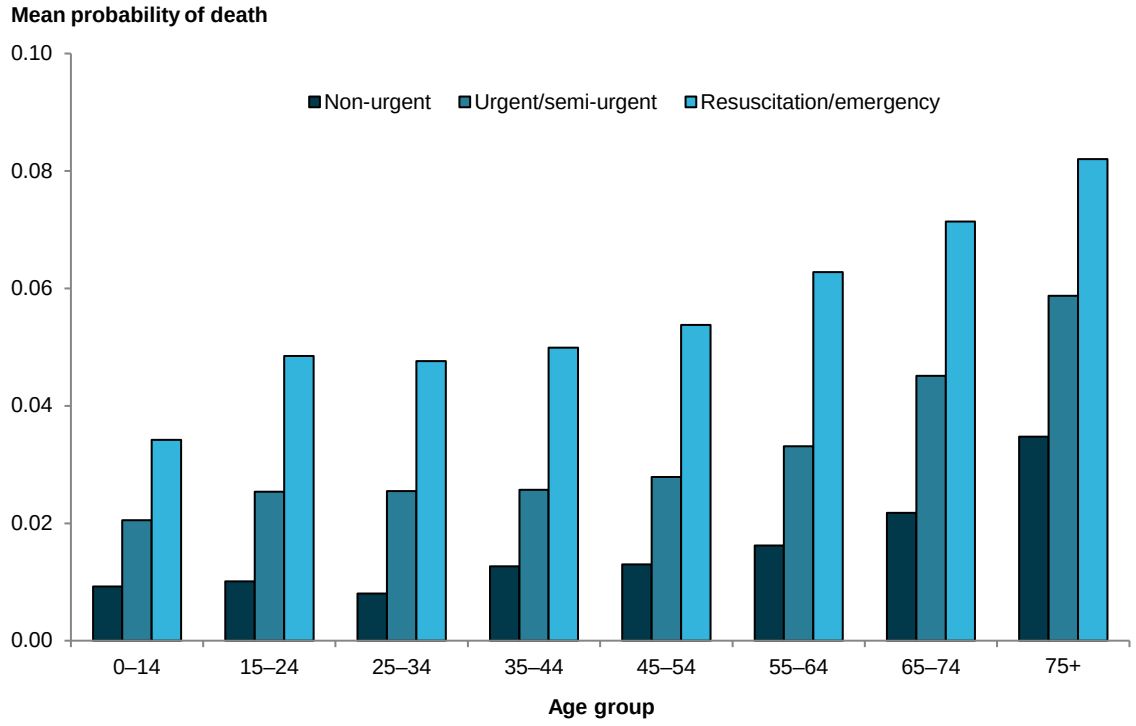
As the probability of death weights were calculated for admitted injury patients, they can be expected to perform best for the subset of ED cases who were admitted. This assessment was restricted to admitted ED cases.

As shown in Table 4.17, the most urgent cases largely attend the EDs at hospitals that have a trauma service. The assessment in this section was restricted to cases who attended the EDs in hospitals with a trauma service.

The 5 triage categories were reduced to 3 to simplify presentation. *Resuscitation* was combined with *Emergency*, and *Urgent* was combined with *Semi-urgent*.

For ED injury cases admitted to a hospital with a level 1 trauma service, diagnosis-based estimated mean probability of death rose with age, particularly for those aged 45 and over (Figure 4.4). Within each age group, mean probability of death increased markedly with the urgency rating that had been assigned by the ED.

The patterns of mean probability of death by age group were similar, regardless of whether the mode of arrival to the ED was by ambulance or by other means, although the mean probability of death for those arriving by ambulance was generally 1.5–2 times as high as the mean probability of death for those arriving by other means.



Notes

1. Excludes cases where the person was admitted to a hospital other than the hospital where they presented to the ED.
2. For counts underlying this table, see Appendix C, Table C5.

Figure 4.4: Mean probability of death of ED injury cases admitted to a level 1 trauma service hospital, by age group and triage category, 2013–14

Nature of injury and probability of death for admitted ED cases

The method applied in the previous section can be used to compare sets of ED cases formed in other ways. This section shows its application by nature of injury.

In addition, mean probability of death by nature of injury for cases admitted from ED into a hospital with a trauma centre was compared with equivalent estimates for the cases admitted from ED into a hospital without a trauma centre.

Information on diagnoses and on whether each case was admitted is from the NAPEDCD. Probability of death after admission was estimated using diagnosis-specific weights derived from admitted patient data (see Appendix B), and the hospitals with a trauma service are those listed in Appendix D.

In contrast to Figure 4.4, the following analyses categorised by nature of injury did not take account of age, a strong determinant of injury mortality.

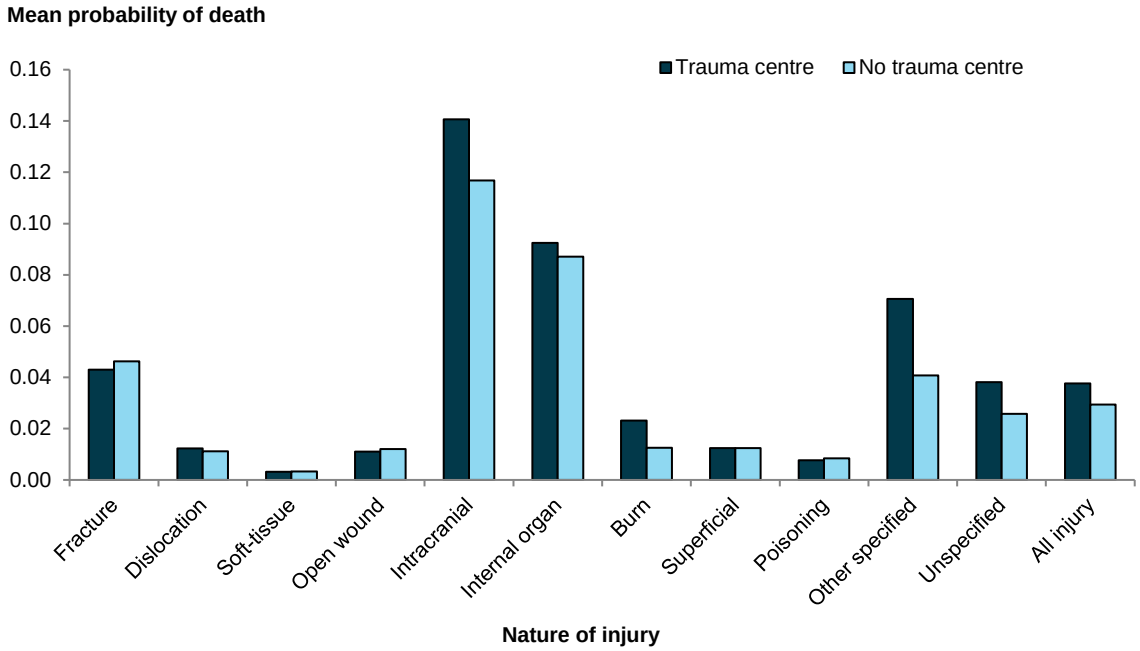
The analysis aims to assess the face validity, and find a way in which the ED data might be used. In terms of face validity, certain types of injury condition—established from previous work to be important types of life-threatening injury—were expected to show similar prominence in relevant subsets of the ED data.

A relatively small set of diagnoses is in each of the nature of injury groups. But how lethal the mix of each type of diagnoses among the cases admitted to level 1 trauma service hospitals and other hospitals can still be compared. The same set of weights has been applied to both sets of cases. So, differences between the 2 groups of EDs reflect case mix within nature groups, and not differences in survival given the same diagnosis.

The most noteworthy feature of these results is the great difference in probability of death between nature of injury categories, with the highest being for intracranial injuries and internal organ injuries (Figure 4.5). Intracranial injury is well recognised to be the leading type of life-threatening injury in Australia.

The profile of mean probability of death was similar for the 2 sets of EDs (Figure 4.5). But for burns and both of the most life-threatening broad types of injury case (intracranial and internal organ), the mean value was higher for cases admitted from an ED in a hospital with a trauma service than for cases admitted from EDs at other hospitals.

In contrast, fractures—a very frequent type of admitted injury (see Table C7), but with generally lower probability of death—did not show this pattern. This might imply that, on average, more severe cases of the more life-threatening types were admitted into the trauma centre hospitals than elsewhere. This is consistent with the intended operation of trauma systems to direct severe cases to specialist services.



Notes

1. Excludes cases where the person was admitted to a hospital other than the hospital where they presented to the ED.
2. For counts underlying this table, see Appendix C, Table C7.

Figure 4.5: Mean probability of death of ED injury cases admitted to hospital, by type of hospital and nature of injury, 2013–14

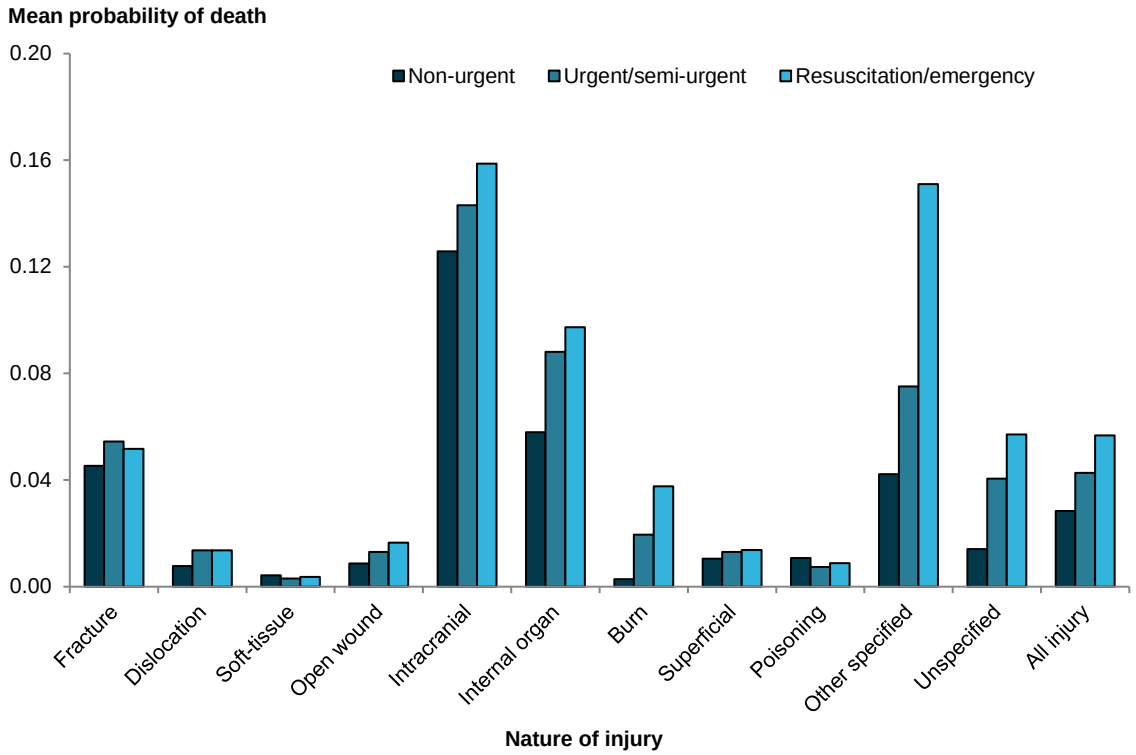
The analysis presented in this section is based only on cases broken down by nature of injury. As shown in Figure 4.4, age is also influential, so any implementation of these methods should adjust for or break down by age.

Severity, urgency, and mode of arrival at ED

Mean threat to life varies strongly with urgency (Figure 4.4). The mode of arrival at an ED (by ambulance or in another way) might also reflect the severity of cases. The analysis presented in this section includes the same cases as those in Figure 4.4 (that is, admitted injury cases who attended the ED of a hospital with a trauma service), subdivided by nature of injury (as in Figure 4.5) and triage category (as in Figure 4.4).

Figure 4.6 shows mean probability of deaths for the cases who arrived by ambulance, while the lower panel shows equivalent information for the cases who arrived in other ways.

For ED injury cases overall, the mean probability of death was 5.7% for resuscitation and emergency cases combined, 4.3% for urgent and semi-urgent cases combined, and 2.8% for non-urgent cases. Among cases who arrived by ambulance, mean probability of death increased strongly with urgency, particularly for the types of injury with the highest mean probability of death, such as intracranial injury, injury to an internal organ, or burn injury.



Notes

1. Excludes cases where the person was admitted to a hospital other than the hospital where they presented to the ED.
2. For counts underlying this table, see Appendix C, Table C8.

Figure 4.6: Mean probability of death of ED injury cases admitted to a level 1 trauma service hospital who arrived by ambulance, by nature of injury and triage category, 2013–14

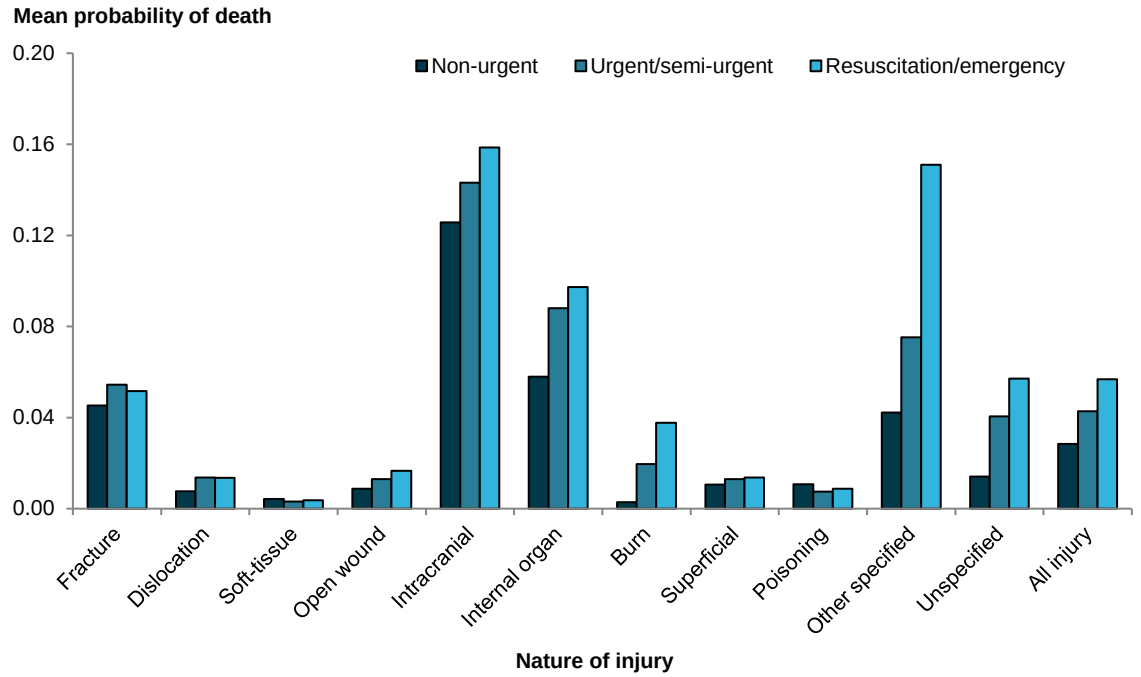
The pattern for cases who arrived at ED by means other than ambulance was similar in some ways and differed in others (Figure 4.7). The main similarities are that the same types of injury had the highest mean probability of death, and that for most types of injury, mean probability of death rose with urgency.

One difference is that the value of the mean probability of death was in general higher for the cases who arrived by ambulance than for those who arrived in other ways, which is as expected. The main exception to this was for intracranial injury cases who did not arrive by ambulance. For this type, the mean probability of death did not rise with urgency, and the mean value for cases with the lowest urgency rating was higher than that for equivalent cases who arrived by ambulance. This has not been fully explained, but might be related to small case numbers (see Appendix C, Table C8).

The values of mean probability of death were markedly higher for ambulance cases than others for the *Other specified* and *Unspecified* injury types, and rose steeply with urgency.

For the *Other specified* type of injury, this is largely due to records with an ED principal diagnosis of external causes—such as traumatic shock, hypothermia, asphyxiation, and non-fatal submersion—as well as other types of injury, including multiple injuries to various parts of the body, injuries to multiple parts of the body, and amputations.

For the *Unspecified* type of injury, the difference in mean probability of death with level of urgency of admission is largely due to admissions with a principal diagnosis in the ED indicating unspecified multiple injuries.



Notes

1. Excludes cases where the person was admitted to a hospital other than the hospital where they presented to the ED.
2. For counts underlying this table, see Appendix C, Table C8.

Figure 4.7: Mean probability of death of ED injury cases admitted to a level 1 trauma service hospital who arrived by means other than ambulance, by nature of injury and triage category, 2013–14

Outcomes for ED cases

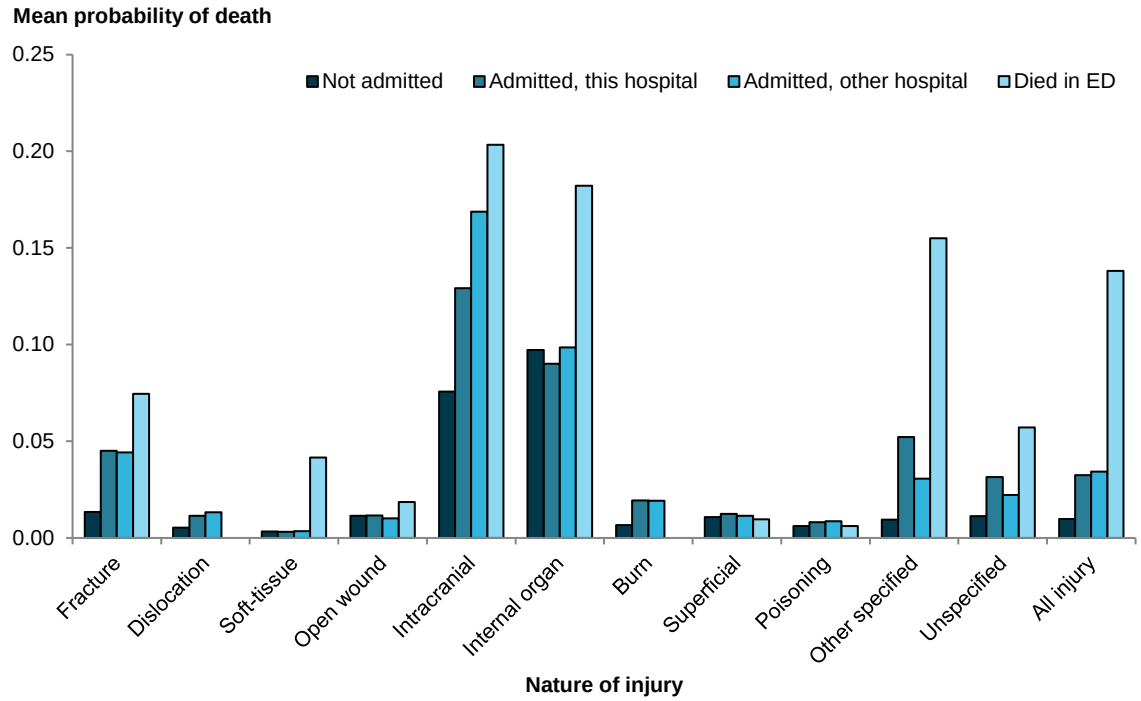
The probability of death in hospital is also likely to be associated with the disposition of cases from ED. The basis for this expectation is most obvious for cases who died in ED, but also applies to transfer and admission. The injury cases who died in ED had a high mean probability of death value (Figure 4.8). For all injuries combined, the mean probability of death was:

- almost 14% for those dying in ED
- 1% for those who left ED without being admitted to a hospital
- 3.3% for those admitted to same hospital as the ED
- 3.4% for those transferred to another hospital for admission.

When types of injury are considered, the most marked differences in mean probability of death and ED outcome were for fractures, intracranial injury, injury to internal organs, other specified injury, and unspecified injury.

The relatively high mean probability of death from *Other specified* injuries was mainly attributable to deaths resulting from hypothermia and traumatic shock, while for those from *Unspecified* injuries it was mainly due to deaths from unspecified multiple injuries. Mean probability of death for other types of injury could not be meaningfully determined due to small case numbers (see Appendix C, Table C5).

The probability of death measure used in this section is based on observed mortality in a test set of admitted cases, so can be expected to perform best for ED cases who were admitted.



Note: For counts underlying this table, see Appendix C, Table C9.

Figure 4.8: Mean probability of death of ED injury cases, by admission or mortality outcome, 2013–14

5 Admission proportions

Reports based solely on NHMD data provide valuable insights into an important part of the injury experience of a population. But admitted cases are a very incomplete part of the entire experience of injury.

ED data can be expected to include records for nearly all of the injury cases who were admitted, and many other injury cases who were not. This ED information could be used to increase the value and meaningfulness of injury reports based on NHMD data.

For example, the ED data can give insight into the proportions of particular types of injury cases that occurred in a given population and period, and were admitted. Conversely, the data can provide a better estimate of the total numbers of such cases, including cases who attended an ED but were not admitted, and those who were admitted to a hospital.

Overview

Appendix E provides a summary of the ED cases with an ICD-10-AM injury code (S00–T75 or T79). For each 3-character ICD-10-AM category, the table provides the case count, the aspects of disposition most relevant to injury surveillance (number admitted to the attended hospital; number transferred for admission to another hospital; number who died in ED), and the percentage who were admitted.

The proportion of ED cases admitted varied very widely. Considering only the 3-character ICD-10-AM categories that had 10,000 or more cases, the proportion ranged from as high as 95.5% for fracture of the femur down to 1.7% for dislocations, sprains, and strains of joints and ligaments at the wrist or hand (Table E1).

Case study: sports injury

When a report on hospitalised injury sustained while engaged in sport and related activities was being prepared, the question was raised as to whether ED data could be used to provide insight into the cases, thought to be numerous, who attended an ED but were not admitted.

This section takes that question as the basis for a case study. Estimation might be straightforward if the ED data from NAPEDCD included relevant external causes. But the NAPEDCD does not (with a minor exception) include external causes information, although such information is collected in many ED data systems.

Since most statistical reports on injury give much attention to external causes, the lack of information on that matter in NAPEDCD greatly diminishes its value for injury surveillance and related purposes. This is exemplified by this case study—no data items in NAPEDCD provide a direct basis for identifying the subset of injury cases that occurred while participating in sport.

A method exists that enables approximate estimates to be made of ED case numbers by type of external cause. It relies on the fact that the profile of injuries that results from each main type of external cause is, to some extent, characteristic of that external cause. This is most evident for a few external causes.

For example, thermal external causes, such as exposure to fire and flames or contact with hot objects or liquids, mostly result in 1 type of injury—burns. This relationship also holds, to a useful extent, in the opposite direction. That is, if nature of injury is a burn, then the external cause is most likely to have been exposure to fire and flames, or contact with hot objects or liquids.

Similar patterns are present, though less marked, for other external causes. Methods based on the relationship between profiles of injury types and their external causes have been used analytically, notably in global burden of diseases projects to estimate injury diagnosis numbers from external causes data.

A simple version of that approach is presented in this section to estimate the number of ED cases that have sports as the external cause based on NHMD data on the nature of injury and activity when injured (an aspect of external cause). The method demonstrates a process in which the proportion admitted for a set of injury case types is used to estimate the (unobserved) number and proportion of ED attendances due to sports injury.

This demonstration uses only 1 characteristic (diagnosis) as the basis for the estimate. Other variables available in both data sources, such as age, could also be used. Also, nature of injury could be considered at a more specific level than in the tables shown in this report (for example, at the 3-character level of ICD-10-AM). These simplifications were applied show tables of manageable size.

The demonstration used data for Australia, except New South Wales and Western Australia. Those states were omitted, because ICD-10-AM codes were not available for substantial proportions of the ED data.

Also, the demonstration is restricted to public hospitals, because the available ED data do not include EDs at private hospitals, which see a relatively small proportion of ED patients anyway. In line with usual practice, transfers into hospitals were omitted from breakdowns based on NHMD data, to reduce multiple counting of cases.

For injury cases, NHMD includes information on diagnoses and external causes, including, for many cases, the type of activity being undertaken when injury occurred.

One type of activity that can be distinguished is *While engaged in sports or leisure* (referred to as *Sport*). Table 5.1 shows the total number of injury cases with nature of injury, the number where activity was sport, and the proportion of injuries that were recorded as occurring during sport by nature of injury.

The proportion that were sport related varied widely, from almost 32% of soft-tissue injuries down to less than 2% of burns, and less than 1% of poisoning cases. A significant proportion of cases that meet the criteria for inclusion in Table 5.1 are assigned an ‘unspecified’ activity code. So, the counts for sport-related admitted injury cases are likely to be underestimated.

Table 5.1: Admitted injury cases, by nature of injury and activity when injured, selected states and territories (NHMD data), 2013–14

Nature of injury	No.[(a)]	Sport-related (no.)	Sport-related (%)
Fracture	80,689	13,968	17.3
Dislocation	4,484	1,160	25.9
Soft-tissue injury	15,083	4,785	31.7
Open wound	30,300	1,432	4.7
Intracranial injury	10,267	1,629	15.9
Internal organ	3,052	586	19.2
Burn	4,112	76	1.8
Poisoning or toxic effect	21,364	130	0.6
Superficial injury	12,385	720	5.8
Other specified	15,681	988	6.3
Unspecified	14,564	1,251	8.6
Total	**211,981**	**26,725**	**12.6**

(a) Includes cases admitted to public hospitals where principal diagnosis is in the range S00–T75 or T79.

The ED data can also by broken down by nature of injury. Table 5.2 shows how many ED cases were reported in ED data as having been admitted to a hospital by nature of injury.

In principle, these numbers might be expected to be similar to those in Table 5.1. But while there are broad similarities, the correspondence is not close. This reflects various differences between the sources, most notably that diagnoses arrived at in ED are often based on less complete information than diagnoses made by the end of an admitted patient episode. So, estimates of admitted injury case counts by nature of injury are different.

Table 5.2: ED cases admitted to hospital, by nature of injury, selected states and territories, 2013–14

	ED presentations				
Nature of injury	Not admitted	Admitted	Total	Admitted (%)	Percentage of all admitted cases
Fracture	137,908	57,356	195,264	29.4	33.1
Dislocation	21,905	5,207	27,112	19.2	3.0
Soft-tissue injury	207,875	19,094	226,969	8.4	11.0
Open wound	151,108	22,499	173,607	13.0	13.0
Intracranial injury	10,030	7,918	17,948	44.1	4.6
Internal organ	354	2,170	2,524	86.0	1.3
Burn	17,989	3,059	21,048	14.5	1.8
Poisoning or toxic effect	18,874	16,876	35,750	47.2	9.7
Superficial injury	105,552	15,917	121,469	13.1	9.2
Other specified	82,895	16,066	98,961	16.2	9.3
Unspecified	21,463	7,166	28,629	25.0	4.1
Total	**775,963**	**173,329**	**949,292**	**18.3**	**100.0**

(a) Includes ED presentations where principal diagnosis is in the range S00–T75 or T79.

Assuming the proportion of sport-related cases is the same among ED injury cases of a particular type (those with a particular nature of injury), whether or not the case is admitted, then the data in tables 5.1 and 5.2 can be used to estimate the number of sport-related cases among the ED injury cases.

Two sets of results are shown in Table 5.3—1 using the NHMD-based estimates of admitted injury cases by nature of injury (Table 5.1), and the other using the equivalent estimates based on the ED data (Table 5.2).

Each source has been used to calculate a crude estimate of the overall proportion of injury cases that are sport-related (that is, without allowing for the particular distribution, or casemix, of nature of injury in the admitted sport cases), and an adjusted estimate (allowing for that casemix by pro-rata adjustment).

The total estimates of sport-related ED injury cases are similar for both sources after adjusting for casemix.

Adjustment for casemix is achieved by estimating the number of sport-related injuries for each nature of injury category (for example, fracture, dislocation, and so forth) separately, and then summing the estimated numbers for each category to provide an estimated count of total sport-related ED injury cases.

The unadjusted method simply provides an estimated count of total sport-related ED injury cases without any consideration of the proportions of different natures of injury in the set of injury cases.

Table 5.3: Estimates of sport-related ED cases based on ED and NHMD values for admitted injuries, by nature of injury, selected states and territories, 2013–14

		NHMD admissions		ED admissions	
Nature of injury	**Total ED cases**	**Sport-related (%)**	**Estimated ED sports cases**	**Sport-related (%)**	**Estimated ED sports cases**
Fracture	195,264	17.3	33,802	24.4	47,553
Dislocation	27,112	25.9	7,014	22.3	6,040
Soft-tissue injury	226,969	31.7	72,005	25.1	56,879
Open wound	173,607	4.7	8,205	6.4	11,050
Intracranial injury	17,948	15.9	2,848	20.6	3,693
Internal organ	2,524	19.2	485	27.0	682
Burn	21,048	1.8	389	2.5	523
Poisoning or toxic effect	35,750	0.6	218	0.8	275
Superficial injury	121,469	5.8	7,062	4.5	5,495
Other specified	98,961	6.3	6,235	6.1	6,086
Unspecified	28,629	8.6	2,459	17.5	4,998
Total (crude estimate)	**949,292**	**12.6**	**119,680**	**15.4**	**146,368**
Total (adjusted for casemix)		**14.8**	**140,720**	**15.1**	**143,272**

Method and its limitations

The method demonstrated depends on an assumption that the proportion of sport-related cases among non-admitted ED injury cases of a particular type (in this case, a particular nature of injury) is similar to the observed proportion of sport-related cases among NHMD cases with that nature of injury. It is uncertain whether that assumption is correct.

The true proportions are likely to be more similar for specific types of injury than for categories that include many, diverse types of injury. That is because the casemix of sports injury cases differs from that of other injuries.

Use of more and finer-grained diagnosis groups than were used in this demonstration might improve estimation, as might the inclusion of other variables that are available from both data sources, such as age.

But that would not solve the fundamental uncertainty as to whether the assumption that observed proportions in 1 source (NHMD) are an adequate guide to an unobserved characteristic of another source (ED data). This uncertainty might be resolved by doing 1 or more validation studies in jurisdictions in which ED injury case data are available that include external causes and diagnosis data.

Limitations of the ED data required substantial restrictions of scope—chiefly omission of private hospitals (which provide a substantial proportion of admitted patient care for sport-related injuries), and 2 states (for which ICD-10-AM diagnosis data were incomplete ED cases).

These problems could be reduced by conceivable changes in the content of future editions of the ED file, and further development of methods to enable practicable and reliable use of diagnosis data recorded as SNOMED-CT terms in analysis, along with ICD-10-AM coded data.

Finally, even if reliable estimates can be made of ED sport-related injury cases, that would not provide a complete guide to the numbers of sport-related injuries, since many cases are treated by medical and other clinicians outside hospitals, or are not brought to the attention of a health professional.

Appendix A: Data issues

Data quality statement for the National Non-admitted Patient Emergency Department Care Database 2013–14

This section provides a summary of key issues relevant to interpretation of the NAPEDCD for 2013–14.

The full data quality statement is accessible at http://meteor.aihw.gov.au/content/index.phtml/itemId/592264

Summary of key data quality issues

- The NAPEDCD is a compilation of episode-level data for presentations to selected EDs in Australian public hospitals.
- The NAPEDCD is based on the Non-admitted Patient Emergency Department Care National Minimum Data Set.
- For 2013–14, the scope of the data set was patients registered for care in EDs in public hospitals where the ED:
  - had a purposely designed and equipped area with designated assessment, treatment, and resuscitation areas
  - was able to provide resuscitation, stabilisation, and initial management of all emergencies
  - had medical staff in the hospital 24 hours a day 7 days a week
  - had designated ED nursing staff and a nursing unit manager 24 hours a day 7 days a week.
- Patients who were dead on arrival are in scope if an ED clinician certified the death of the patient.
- Patients who leave the ED after being triaged, and then advised of alternative treatment options are in scope.
- The scope includes only physical presentations to EDs. Advice provided by telephone or videoconferencing is not in scope.
- Although there are national standards for data on non-admitted patient ED services, there are some variations in how those services are defined and counted across states and territories and over time.

Classification of remoteness area

Remoteness area in this report refers to the place of usual residence of the person who died. The remoteness areas for 2013–14 were specified according to the ABS Australian Statistical Geography Standard (ASGS).

Australian Statistical Geography Standard

The ASGS is a hierarchical classification system of geographical regions, and consists of interrelated structures. The ASGS brings all the regions for which the Australian Bureau of Statistics (ABS) publishes statistics within 1 framework. It has been used by the ABS for the collection and dissemination of geographically classified statistics from 1 July 2011. It provides a common framework of statistical geography, and enables the production of statistics that are comparable and can be spatially integrated.

Australian Statistical Geography Standard (ASGS) volume 1: main structure and greater capital city statistical areas is the first in a series of volumes that details the various structures and regions of the ASGS (ABS 2010).

Each case is allocated to 1 of 5 remoteness areas on the basis of the patient's place of usual residence according to Statistical Area Level 2 (SA2).

Most SA2s lie entirely within 1 of the 5 areas. If this was so for all SA2s, then each record could simply be assigned to the area in which its SA2 lies. But some SA2s overlap 2 or more of the areas. Records with these SA2s were assigned to remoteness areas in proportion to the area-specific distribution of the resident population of the SA2, according to the 2011 Census.

For ED cases, each record in the set having a particular SA2 code was assigned to 1 of the areas probabilistically, in proportion to the resident population of that SA2. The resulting values are integers. A SA2 to remoteness area map can be found on the ABS website (ABS 2012).

For the 2013–14 ED presentations, not all states and territories provided information on the area of usual residence of the patient in the form of a SA2 code for all presentations (AIHW 2014).

Where necessary, the AIHW mapped the supplied area of residence data for each separation to an SA2, and then to a remoteness area category based on ABS ASGS correspondences and remoteness structures for 2011. These mappings were done on a probabilistic basis, so the SA2 and remoteness areas data for individual records might not be accurate. But the overall distribution of records by geographical area is considered useful.

Socioeconomic status

Data on socioeconomic groups are defined using the ABS's Socio-Economic Indexes for Areas (SEIFA) 2011 (ABS 2013).

The SEIFA 2011 data are generated by the ABS using a combination of 2011 Census data, such as income, education, health problems/disability, access to internet, occupation/unemployment, wealth and living conditions, dwellings without motor vehicles, rent paid, mortgage repayments, and dwelling size.

Composite scores are averaged across all people living in areas, and defined for areas based on the Census collection districts. They are also compiled for higher levels of combination.

The SEIFA Index of Relative Socio-Economic Disadvantage is 1 of the ABS's SEIFA indexes. The relative disadvantage scores indicate the collective SES of the people living in an area, with reference to the situation and standards applying in the wider community at a given point in time.

A relatively disadvantaged area is likely to have a high proportion of relatively disadvantaged people. But such an area is also likely to contain people who are not disadvantaged, as well as people who are relatively advantaged.

ED case counts by SES were generated using the Index of Relative Socio-Economic Disadvantage scores for the SA2 of usual residence of the patient reported or derived for each ED record. The group labelled '1—lowest' represents the areas containing the 20% of the national population with the most disadvantage, and the group labelled '5—highest' represents the areas containing the 20% of the national population with the least disadvantage.

Breakdowns by SES group are based on the area of usual residence of the patient, not the location of the ED.

The following labels for each socioeconomic group have been used throughout this report:

Label	Socioeconomic status group
1—lowest	Most disadvantaged
2	Second most disadvantaged
3	Middle
4	Second least disadvantaged
5—highest	Least disadvantaged

Appendix B: Mean probability of death

For this report, probability of death is defined as the probability of someone dying while admitted in hospital, based on the type of injury reported in the principal diagnosis in the ED data set.

Determining probability of death involves calculating a diagnosis-specific survival probability (DSP) for each ICD-10-AM injury diagnosis code. DSPs were calculated using hospital admitted patient data, and represent the proportion of all cases, with each individual injury diagnosis code as a proportion of the total number of patients with that diagnosis code.

So, a given DSP estimates the likelihood that a patient with a particular injury will survive to discharge, provided he or she survives long enough to be admitted to hospital.

For example, if there are 1,050 cases in an admitted patient hospital data set with a particular ICD-10-AM code anywhere in the hospital record (for example, S06.4), and 107 of these cases are reported as having died in hospital, then the DSP for S06.4 is:

(1,050–107)/1,050 = 0.8981.

Some ICD-10-AM injury codes are categorised to a 5-character level (for example, S06.00). But for this report, DSPs for ICD-10-AM codes are calculated to a maximum of a 4-character level, or to a 3-character level where no 4-character codes exist (for example, T68, T71).

As a result, for ICD-10-AM codes categorised to 5 characters (for example, S06.00 to S06.05), the total cases in hospital with 1 of these codes, and the number of these cases who end up dying in hospital are combined to calculate a DSP for the 4-character code S06.0.

A detailed explanation of how DSPs are calculated using both Australian and New Zealand hospital admitted patient data has been reported previously (Stephenson et. al. 2003, where DSPs are referred to using the now superseded term of *survival risk ratio*).

Probability of death is calculated by subtracting the DSP from 1. So, for someone in the ED data set with a principal diagnosis of S06.4, the probability of death is:

1–0.8981 = 0.1019 or close to 10.2%.

The DSPs apply to admitted patients. The *Episode end status* data item in the NAPEDCD marks the ED cases that were admitted. The subset of NAPEDCD records where *Episode end status* = *Admitted this hospital* or *Completed, to another hospital for admission* was included in the part of the analysis in which mean probability of death was used to examine characteristics of the admitted ED cases. The DSPs derived from the admitted patient data were applied to these NAPEDCD records. The DSPs used here were based on all admitted injury cases, rather than only on cases admitted from an ED, as the NHMD does not include information on admission from an ED.

In this report, mean probability of death has been calculated for various types of injury. For example, the mean probability of death for the group of people whose principal diagnosis is in the intracranial injury range (that is, ICD-10-AM codes beginning with S06) is the sum of the individual probability of death values for each person in the group, divided by the total number of people in the group.

The same process was used to calculate mean probability of death by age group and nature of injury as shown in figures 4.4–4.8 in this report.

Appendix C: Count tables

Table C1: ICD-10-AM coded ED cases with principal diagnosis of S02, by 4-character categories and state and territory of ED, 2013–14

ICD-10-AM code	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
S02.0	54	—	261	21	30	21	4	8	399
S02.1	46	—	218	38	18	12	5	—	337
S02.2	267	473	1,443	623	404	158	85	84	3,537
S02.3	31	178	509	99	93	78	33	36	1,057
S02.4	23	50	301	28	57	47	13	23	542
S02.5	439	1,780	628	565	235	62	77	51	3,837
S02.6	249	191	855	490	172	64	52	238	2,311
S02.7	—	—	23	—	11	—	14	—	48
S02.8	58	—	7	84	216	2	11	6	384
S02.9	146	502	652	441	98	2	37	62	1,940
Total	**1,313**	**3,174**	**4,897**	**2,389**	**1,334**	**446**	**331**	**508**	**14,392**

Table C2: ICD-10-AM coded ED cases with principal diagnosis of S06, by 4-character categories and state and territory of ED, 2013–14

ICD-10-AM code	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
S06.0	664	822	2,940	2,110	2,011	684	484	145	9,860
S06.1	—	—	—	101	—	—	—	—	101
S06.2	33	1	3	114	6	24	4	1	186
S06.3	—	11	2	15	32	17	20	—	97
S06.4	13	67	115	38	19	8	3	1	264
S06.5	118	357	922	294	165	81	59	31	2,027
S06.6	49	—	316	123	82	21	18	7	616
S06.8	372	—	469	174	76	—	12	18	1,121
S06.9	3	7,670	4	14	14	13	2	—	7,720
Total	**1,252**	**8,928**	**4,771**	**2,983**	**2,405**	**848**	**602**	**203**	**21,992**

Table C3: ICD-10-AM coded ED cases with principal diagnosis of S72, by 4-character categories and state and territory of ED, 2013–14

ICD-10-AM code	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
S72.0	905	4,028	2,510	1,405	1,016	364	275	82	10,585
S72.1	64	—	504	259	419	60	39	25	1,370
S72.2	—	—	1	—	15	—	3	—	19
S72.3	194	—	657	313	133	73	45	41	1,456
S72.4	82	—	360	201	111	27	31	17	829
S72.7	—	—	2	—	3	1	—	—	6
S72.8	—	—	—	—	87	1	6	—	94
S72.9	237	980	—	—	88	30	34	15	1,384
Total	**1,482**	**5,008**	**4,034**	**2,178**	**1,872**	**556**	**433**	**180**	**15,743**

Table C4: ICD-10-AM coded ED cases with principal diagnosis of T20–T25, by 4-character categories and state and territory of ED, 2013–14

Burn thickness	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Unspecified thickness	1,761	5,741	1,101	1	974	696	62	175	10,511
Erythema	121	—	1,427	1,025	395	3	166	119	3,256
Partial thickness	55	—	3,583	1,356	913	6	185	260	6,358
Full thickness	5	—	228	135	84	—	7	33	492
Total	**1,942**	**5,741**	**6,339**	**2,517**	**2,366**	**705**	**420**	**587**	**20,617**

Table C5: ED injury cases admitted to level 1 trauma service hospital, by age group and triage category, 2013–14

Age group	Non-urgent	Urgent/semi-urgent	Resuscitation/emergency	Total
0–14	387	13,218	3,719	17,324
15–24	333	6,657	4,003	10,993
25–34	333	6,198	3,437	9,968
35–44	238	4,767	2,863	7,868
45–54	182	4,515	2,487	7,184
55–64	166	4,035	1,874	6,075
65–74	129	3,899	1,334	5,362
75+	121	9,561	1,836	11,518
Total	**1,889**	**52,850**	**21,553**	**76,292**

Table C6: ED injury cases presenting to a non-level 1 trauma service hospital and admitted to same or different hospital, by age group and triage category, 2013–14

Age group	Non-urgent	Urgent/semi-urgent	Resuscitation/emergency	Total
		Admitted to same hospital		
0–14	483	11,759	3,389	15,631
15–24	386	10,704	4,864	15,954
25–34	301	9,323	3,974	13,598
35–44	292	9,126	3,690	13,108
45–54	258	8,836	3,189	12,283
55–64	239	8,418	2,383	11,040
65–74	193	9,329	1,844	11,366
75+	376	26,466	2,873	29,715
Total	**2,528**	**93,961**	**26,206**	**122,695**
		Transferred to another hospital for admission		
0–14	108	2,657	1,219	3,984
15–24	95	1,549	754	2,398
25–34	75	1,189	532	1,796
35–44	62	1,075	522	1,659
45–54	53	1,083	488	1,624
55–64	43	1,007	365	1,415
65–74	35	1,093	267	1,395
75+	32	2,640	347	3,019
Total	**503**	**12,293**	**4,494**	**17,290**

Table C7: ED injury cases admitted to hospital, by type of hospital and nature of injury, 2013–14

	Level 1 trauma service		
Nature of injury	**Yes**	**No**	**Total**
Fracture	26,578	41,487	68,065
Dislocation	1,977	3,846	5,823
Soft-tissue injury	5,378	14,680	20,058
Open wound	11,591	15,559	27,150
Intracranial injury	4,630	4,229	8,859
Internal organ or vessel of trunk	1,342	1,097	2,439
Burn	2,170	1,161	3,331
Superficial injury	5,785	11,740	17,525
Poisoning or toxic effect	6,136	13,711	19,847
Other specified	6,218	9,992	16,210
Unspecified	4,489	5,191	9,680
Total	**76,294**	**122,695**	**198,989**

Table C8: ED injury cases admitted to a level 1 trauma service hospital, by nature of injury, triage category, and mode of arrival, 2013–14

Nature of injury	Non-urgent	Urgent/ semi-urgent	Resuscitation/ emergency	Total
Arrival by ambulance				
Fractures	115	12,116	5,460	17,691
Dislocation	4	842	579	1,425
Soft-tissue injury	31	2,747	916	3,694
Open wound	55	3,436	1,656	5,147
Intracranial injury	3	1,847	1,685	3,535
Internal organ or vessel of trunk	2	353	714	1,069
Burn	3	692	593	1,288
Superficial injury	12	2,201	1,486	3,699
Poisoning or toxic effect	16	2,323	2,057	4,396
Other specified	24	1,832	1,505	3,362
Unspecified	10	1,567	1,518	3,095
Total	275	29,956	18,169	48,401
Arrival by other means				
Fractures	596	7,240	1,037	8,874
Dislocation	26	377	149	552
Soft-tissue injury	92	1,468	124	1,684
Open wound	552	5,582	307	6,441
Intracranial injury	12	943	135	1,090
Internal organ or vessel of trunk	2	176	95	273
Burn	45	709	116	870
Superficial injury	75	1,748	258	2,081
Poisoning or toxic effect	15	1,123	599	1,737
Other specified	156	2,358	336	2,850
Unspecified	42	1,148	190	1,380
Total	**1,613**	**22,872**	**3,346**	**27,832**

Table C9: ED injury cases, by admission or mortality outcome, 2013–14

Nature of injury	Not admitted	Admitted, this hospital	Admitted, other hospital	Died in ED
Fractures	177,160	68,065	6,858	20
Dislocation	27,007	5,823	437	—
Soft-tissue injury	249,256	20,058	999	1
Open wound	192,118	27,150	2,983	4
Intracranial injury	12,024	8,859	831	56
Internal organ or vessel of trunk	413	2,439	296	20
Burn	23,144	3,331	657	3
Superficial injury	138,985	17,525	1,096	1
Poisoning or toxic effect	24,649	19,847	1,120	7
Other specified	99,799	16,210	2,302	34
Unspecified	46,030	9,680	1,272	22
Total	**990,598**	**198,989**	**18,851**	**168**

Appendix D: Trauma centres

Table D1: Australian hospitals incorporating a level 1 trauma service, 2013–14

State	Hospital name
NSW	The Children's Hospital at Westmead
	John Hunter Children's Hospital
	John Hunter Hospital
	Liverpool Hospital
	Royal North Shore Hospital
	Royal Prince Alfred Hospital
	St George Hospital
	St Vincent's Hospital
	Sydney Children's Hospital
	Westmead Hospital
Vic	The Alfred
	Royal Children's Hospital
	Royal Melbourne Hospital
Qld	Mater Children's Hospital
	Princess Alexandra Hospital
	Royal Brisbane and Women's Hospital
	Royal Children's Hospital
	Gold Coast University Hospital
	Townsville Hospital
WA	Princess Margaret Hospital for Children
	Royal Perth Hospital
SA	Flinders Medical Centre
	Royal Adelaide Hospital
	Women's and Children's Hospital
Tas	Royal Hobart Hospital
ACT	The Canberra Hospital
NT	Royal Darwin Hospital

Source: Ford 2016.

Appendix E: ED case admission proportions

Table E1: Hospital admissions, by principal diagnosis for ICD-10-AM coded cases, 2013–14

Principal diagnosis	Description	Admitted, this hospital	Admitted, other hospital	Died in ED	Total	Admitted (%)
S00	Superficial injury of head	9,367	374	1	56,419	17.3
S01	Open wound of head	8,172	665	1	82,474	10.7
S02	Fracture of skull and facial bones	4,274	512	4	14,402	33.2
S03	Dislocation, sprain, and strain of joints and ligaments of head	867	100	—	5,178	18.7
S04	Injury of cranial nerves	34	4	—	135	28.1
S05	Injury of eye and orbit	565	265	—	21,790	3.8
S06	Intracranial injury	8,859	831	56	21,992	44.1
S07	Crushing injury of head	92	7	—	549	18.0
S08	Traumatic amputation of part of head	9	1	—	13	76.9
S09	Other and unspecified injuries of head	4,938	314	5	25,152	20.9
S10	Superficial injury of neck	200	30	—	1,499	15.3
S11	Open wound of neck	338	38	1	1,104	34.1
S12	Fracture of neck	1,499	276	1	2,054	86.4
S13	Dislocation, sprain, and strain of joints and ligaments at neck level	1,975	96	—	16,352	12.7
S14	Injury of nerves and spinal cord at neck level	104	8	—	320	35.0
S15	Injury of blood vessels at neck level	10	—	—	17	58.8
S16	Injury of muscle and tendon at neck level	260	22	—	1,787	15.8
S17	Crushing injury of neck	72	10	—	163	50.3
S19	Other and unspecified injuries of neck	354	82	—	1,410	30.9
S20	Superficial injury of thorax	979	42	—	7,863	13.0
S21	Open wound of thorax	311	32	2	1,353	25.4
S22	Fracture of rib(s), sternum, and thoracic spine	4,815	327	4	11,330	45.4
S23	Dislocation, sprain, and strain of joints and ligaments of thorax	1,175	31	—	13,425	9.0
S24	Injury of nerves and spinal cord at thorax level	4	2	—	10	60.0
S25	Injury of blood vessels of thorax	8	3	—	20	55.0
S26	Injury of heart	17	1	1	20	90.0
S27	Injury of other and unspecified intrathoracic organs	1,143	102	16	1,441	86.4
S28	Crushing injury of thorax and traumatic amputation of part of thorax	74	7	—	206	39.3
S29	Other and unspecified injuries of thorax	457	31	1	2,305	21.2

(continued)

Table E1 (continued): Hospital admissions, by principal diagnosis for ICD-10-AM coded cases, 2013–14

Principal diagnosis	Description	Admitted, this hospital	Admitted, other hospital	Died in ED	Total	Admitted (%)
S30	Superficial injury of abdomen, lower back, and pelvis	889	81	—	4,791	20.2
S31	Open wound of abdomen, lower back, and pelvis	970	90	—	3,928	27.0
S32	Fracture of lumbar spine and pelvis	4,470	405	1	6,272	77.7
S33	Dislocation, sprain, and strain of joints and ligaments of lumbar spine and pelvis	6,571	218	—	27,432	24.7
S34	Injury of nerves and lumbar spinal cord at abdomen, lower back, and pelvis level	136	32	—	260	64.6
S35	Injury of blood vessels at abdomen, lower back, and pelvis level	24	4	—	65	43.1
S36	Injury of intra-abdominal organs	971	139	3	1,212	91.6
S37	Injury of urinary and pelvic organs	275	47	—	433	74.4
S38	Crushing injury and traumatic amputation of part of abdomen, lower back, and pelvis	206	23	—	565	40.5
S39	Other and unspecified injuries of abdomen, lower back, and pelvis	922	67	—	3,385	29.2
S40	Superficial injury of shoulder and upper arm	251	22	—	3,999	6.8
S41	Other wound shoulder and upper arm	424	40	—	2,418	19.2
S42	Fracture of shoulder and upper arm	6,655	617	3	27,139	26.8
S43	Dislocation, sprain, and strain of joints and ligaments of shoulder girdle	2,804	126	—	31,407	9.3
S44	Injury of nerves at shoulder and upper arm level	33	3	—	224	16.1
S45	Injury of blood vessels at shoulder and upper arm level	17	3	—	40	50.0
S46	Injury of muscle and tendon at shoulder and upper arm level	196	9	—	2,970	6.9
S47	Crushing injury of shoulder and upper arm	42	1	—	226	19.0
S48	Traumatic amputation of shoulder and upper arm	2	—	—	3	66.7
S49	Other and unspecified injuries of shoulder and upper arm	365	30	—	2,960	13.3
S50	Superficial injury of forearm	335	33	—	7,844	4.7
S51	Open wound of forearm	2,268	271	—	13,912	18.3
S52	Fracture of forearm	11,616	1,200	—	51,557	24.9
S53	Dislocation, sprain, and strain of joints and ligaments of elbow	611	53	—	19,324	3.4
S54	Injury of nerves at forearm level	23	3	—	161	16.1
S55	Injury of blood vessels at forearm level	19	3	—	54	40.7
S56	Injury of muscle and tendon at forearm level	86	7	—	1,318	7.1
S57	Crushing injury of forearm	41	4	—	384	11.7
S58	Traumatic amputation of forearm	7	—	—	8	87.5

(continued)

Table E1 (continued): Hospital admissions, by principal diagnosis for ICD-10-AM coded cases, 2013–14

Principal diagnosis	Description	Admitted, this hospital	Admitted, other hospital	Died in ED	Total	Admitted (%)
S59	Other and unspecified injuries of forearm	214	30	—	2,943	8.3
S60	Superficial injury of wrist and hand	643	223	—	22,341	3.9
S61	Open wound of wrist and hand	7,674	1,200	—	65,992	13.4
S62	Fracture at wrist and hand level	6,417	853	1	61,898	11.7
S63	Dislocation, sprain, and strain of joints and ligaments at wrist and hand level	667	100	—	45,301	1.7
S64	Injury of nerves at wrist and hand level	91	13	—	345	30.1
S65	Injury of blood vessels at wrist and hand level	41	4	—	174	25.9
S66	Injury of muscle and tendon at wrist and hand level	402	47	—	3,131	14.3
S67	Crushing injury of wrist and hand	1,249	290	—	8,250	18.7
S68	Traumatic amputation of wrist and hand	1,206	202	—	1,989	70.8
S69	Other and unspecified injuries of wrist and hand	519	96	—	7,221	8.5
S70	Superficial injury of hip and thigh	611	26	—	3,418	18.6
S71	Open wound hip and thigh	499	48	—	3,036	18.0
S72	Fracture of femur	13,785	1,251	3	15,745	95.5
S73	Dislocation, sprain, and strain of joint and ligaments of hip	3,483	189	—	9,502	38.6
S74	Injury of nerves at hip and thigh level	12	—	—	61	19.7
S75	Injury of blood vessels at hip and thigh level	10	2	—	29	41.4
S76	Injury of muscle and tendon at hip and thigh level	462	23	—	2,373	20.4
S77	Crushing injury of hip and thigh	57	2	—	155	38.1
S78	Traumatic amputation of hip and thigh	—	—	—	1	—
S79	Other and unspecified injuries of hip and thigh	711	45	—	1,632	46.3
S80	Superficial injury of lower leg	577	33	—	9,275	6.6
S81	Open wound of lower leg	2,628	212	—	19,715	14.4
S82	Fracture of lower leg, including ankle	11,090	967	1	32,474	37.1
S83	Dislocation, sprain, and strain of joints and ligaments of knee	1,600	83	—	30,914	5.4
S84	Injury of nerves at lower leg level	14	—	—	74	18.9
S85	Injury of blood vessels at lower leg level	40	2	—	125	33.6
S86	Injury of muscle and tendon at lower leg level	421	29	—	4,858	9.3
S87	Crushing injury of lower leg	116	16	—	571	23.1
S88	Traumatic amputation of lower leg	5	—	—	8	62.5
S89	Other and unspecified injuries of lower leg	784	62	—	5,566	15.2
S90	Superficial injury of ankle and foot	545	46	—	16,110	3.7
S91	Open wound of ankle and foot	1,743	138	—	17,595	10.7

(continued)

Table E1 (continued): Hospital admissions, by principal diagnosis for ICD-10-AM coded cases, 2013–14

Principal diagnosis	Description	Admitted, this hospital	Admitted, other hospital	Died in ED	Total	Admitted (%)
S92	Fracture of foot, except ankle	2,125	192	—	26,889	8.6
S93	Dislocation, sprain, and strain of joints and ligaments at ankle and foot level	1,327	96	—	68,701	2.1
S94	Injury of nerves at ankle and foot level	119	2	1	279	43.4
S95	Injury of blood vessels at ankle and foot level	15	1	—	66	24.2
S96	Injury of muscle and tendon at ankle and foot level	122	9	—	3,064	4.3
S97	Crushing injury of ankle and foot	231	27	—	2,367	10.9
S98	Traumatic amputation of ankle and foot	80	5	—	108	78.7
S99	Other and unspecified injuries of ankle and foot	316	36	—	4,864	7.2
T00	Superficial injuries involving multiple body regions	2,758	152	—	19,971	14.6
T01	Open wounds involving multiple body regions	619	56	—	2,475	27.3
T02	Fractures involving multiple body regions	641	107	1	1,083	69.1
T03	Dislocations, sprains, and strains involving multiple body regions	384	17	—	1,782	22.5
T04	Crushing injuries involving multiple body regions	76	14	1	193	46.6
T05	Traumatic amputations involving multiple body regions	28	2	—	46	65.2
T06	Other injuries involving multiple body regions, not elsewhere classified	554	61	3	1,500	41.0
T07	Unspecified multiple injuries	3,038	191	14	5,197	62.1
T08	Fracture of spine, level unspecified	114	7	—	159	76.1
T09	Other injuries of spine and trunk, level unspecified	347	17	—	2,575	14.1
T10	Fracture of upper limb, level unspecified	65	13	—	251	31.1
T11	Other injuries of upper limb, level unspecified	99	14	1	3,003	3.8
T12	Fracture of lower limb, level unspecified	186	13	—	556	35.8
T13	Other injuries of lower limb, level unspecified	684	37	—	7,497	9.6
T14	Injury of unspecified body region	4,054	1,045	6	33,979	15.0
T15	Foreign body on external eye	112	93	—	25,108	0.8
T16	Foreign body in ear	169	34	—	7,447	2.7
T17	Foreign body in respiratory tract	803	184	—	6,497	15.2
T18	Foreign body in alimentary tract	2,624	462	—	10,314	29.9
T19	Foreign body in genitourinary tract	149	19	—	981	17.1
T20	Burn of head and neck	527	101	—	2,209	28.4
T21	Burn of trunk	334	61	—	2,276	17.4
T22	Burn of shoulder and upper limb, except wrist and hand	356	69	—	4,138	10.3

(continued)

Table E1 (continued): Hospital admissions, by principal diagnosis for ICD-10-AM coded cases, 2013–14

Principal diagnosis	Description	Admitted, this hospital	Admitted, other hospital	Died in ED	Total	Admitted (%)
T23	Burn of wrist and hand	413	82	—	7,073	7.0
T24	Burn of hip and lower limb, except ankle and foot	517	97	—	4,160	14.8
T25	Burn of ankle and foot	143	17	—	887	18.0
T26	Burn of eye and adnexa	82	24	—	2,331	4.5
T27	Burn of respiratory tract	2	—	—	9	22.2
T28	Burn of internal organs	37	8	—	117	38.5
T29	Burns of multiple body regions	759	146	3	2,147	42.2
T30	Burn, body region unspecified	151	49	—	1,941	10.3
T31	Burns classified according to extent of body surface involved	10	3	—	80	16.3
T33	Superficial frostbite	—	—	—	2	—
T35	Frostbite involving multiple body regions and unspecified frostbite	2	—	—	11	18.2
T36	Poisoning by systemic antibiotics	6	—	—	58	10.3
T37	Poisoning by other systemic anti-infectives and antiparasitics	9	—	—	25	36.0
T38	Poisoning by hormones and their synthetic substitutes and antagonists, not elsewhere classified	213	8	—	320	69.1
T39	Poisoning by nonopioid analgesics, antipyretics and antirheumatics	3,344	157	—	5,618	62.3
T40	Poisoning by narcotics and psychodysleptics [hallucinogens]	1,883	80	—	4,348	45.1
T41	Poisoning by anaesthetics and therapeutic gases	124	14	—	1,086	12.7
T42	Poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs	2,134	111	—	3,846	58.4
T43	Poisoning by psychotropic drugs, not elsewhere classified	3,013	166	4	5,663	56.1
T44	Poisoning by drugs primarily affecting the autonomic nervous system	233	29	1	379	69.1
T45	Poisoning by primarily systemic and haematological agents, not elsewhere classified	438	17	—	961	47.3
T46	Poisoning by agents primarily affecting the cardiovascular system	275	29	—	422	72.0
T47	Poisoning by agents primarily affecting the gastrointestinal system	24	—	—	72	33.3
T48	Poisoning by agents primarily acting on smooth and skeletal muscles and the respiratory system	26	4	—	64	46.9

(continued)

Table E1 (continued): Hospital admissions, by principal diagnosis for ICD-10-AM coded cases, 2013–14

Principal diagnosis	Description	Admitted, this hospital	Admitted, other hospital	Died in ED	Total	Admitted (%)
T49	Poisoning by topical agents primarily affecting skin and mucous membrane and by ophthalmological, otorhinolaryngological and dental drugs	5	—	—	26	19.2
T50	Poisoning by diuretics and other and unspecified drugs, medicaments and biological substances	4,786	329	1	9,501	53.8
T51	Toxic effect of alcohol	763	18	—	2,408	32.4
T52	Toxic effect of organic solvents	62	5	—	275	24.4
T53	Toxic effect of halogen derivatives of aliphatic and aromatic hydrocarbons	23	1	—	54	44.4
T54	Toxic effect of corrosive substances	73	13	—	203	42.4
T55	Toxic effect of soaps and detergents	11	2	—	54	24.1
T56	Toxic effect of metals	55	1	—	79	70.9
T57	Toxic effect of other inorganic substances	—	—	—	4	—
T58	Toxic effect of carbon monoxide	121	11	—	219	60.3
T59	Toxic effect of other gases, fumes and vapours	156	13	—	850	19.9
T60	Toxic effect of pesticides	51	4	—	147	37.4
T61	Toxic effect of noxious substances eaten as seafood	10	—	—	59	16.9
T62	Toxic effect of other noxious substances eaten as food	172	6	—	941	18.9
T63	Toxic effect of contact with venomous animals	922	44	—	6,843	14.1
T64	Toxic effect of aflatoxin and other mycotoxin food contaminants	2	—	—	2	100.0
T65	Toxic effect of other and unspecified substances	913	58	1	2,403	40.4
T66	Unspecified effects of radiation	11	—	—	23	47.8
T67	Effects of heat and light	446	12	2	1,418	32.3
T68	Hypothermia	418	22	12	557	79.0
T69	Other effects of reduced temperature	2	—	—	19	10.5
T70	Effects of air pressure and water pressure	69	8	—	228	33.8
T71	Asphyxiation	264	23	1	509	56.4
T73	Effects of other deprivation	4	—	—	24	16.7
T74	Maltreatment syndromes	712	27	—	2,984	24.8
T75	Effects of other external causes	545	38	7	3,426	17.0
T79	Certain early complications of trauma, not elsewhere classified	982	62	4	1,824	57.2
Total		**198,989**	**18,851**	**168**	**1,220,172**	**17.9**

Glossary

additional diagnosis: A condition or complaint either coexisting with the principal diagnosis or arising during the episode of admitted patient care, episode of residential care, or attendance at a health-care establishment. Compare with **principal diagnosis**.

admission: The process whereby the hospital accepts responsibility for the patient's care and/or treatment. Admission follows a clinical decision based on specified criteria that a patient requires same-day or overnight care or treatment. An admission may be formal or statistical. For more information, see AIHW METeOR identifier: 327206.

admitted patient: A patient who undergoes a hospital's admission process to receive treatment and/or care. This treatment and/or care is provided over a period of time, and can occur in hospital and/or in the person's home. For more information, see AIHW METeOR identifier: 268957.

area of usual residence: The geographical region in which a person or group of people usually live.

Australian Statistical Geography Standard (ASGS): A common framework of statistical areas used by Australian Bureau of Statistics and other organisations to enable the publication of statistics that are comparable and spatially integrated. The ASGS replaced the Australian Standard Geographical Classification in July 2011.

Index of Relative Socio-Economic Disadvantage: One of the sets of **Socio-Economic Indexes for Areas** for ranking the average socioeconomic conditions of the population in an area. It summarises attributes of the population such as low income, low educational attainment, high unemployment, and jobs in relatively unskilled occupations.

International Statistical Classification of Diseases and Related Health Problems: The World Health Organization's internationally accepted classification of death and disease. The 10th revision (ICD-10) is currently in use. The Australian modification of the ICD-10 (ICD-10-AM) is used for diagnoses and procedures recorded for patients admitted to hospitals.

non-admitted patient: A patient who does not undergo a hospital's formal admission process. For more information, see AIHW METeOR identifier: 268973.

peer group: Groupings of hospitals into broadly similar groups in terms of characteristics.

principal diagnosis: The diagnosis established after study to be chiefly responsible for occasioning an episode of admitted patient care, an episode of residential care, or an attendance at the health-care establishment.

public hospital: A hospital controlled by a state or territory health authority. In Australia public hospitals offer free diagnostic services, treatment, care, and accommodation to all Australians who need them.

remoteness classification: Each state and territory is divided into several regions based on their relative accessibility to goods and services (such as general practitioners, hospitals, and specialist care) as measured by road distance. These regions are based on the Accessibility/Remoteness Index of Australia (ARIA), and defined as remoteness areas by either the **Australian Standard Geographical Classification** (before 2011) or the **Australian Statistical Geographical Standard** (from 2011 onwards) in each Census year.

socioeconomic status: An indication of how well off a person or group is. In this report, socioeconomic status is mostly reported using the **Socio-Economic Indexes for Areas**, typically for 5 groups, from the lowest socioeconomic status (worst off) to the highest socioeconomic status (best off).

Socio-Economic Indexes for Areas: A set of indexes, created from Census data, that aim to represent the **socioeconomic status** of Australian communities, and identify areas of advantage and disadvantage. The index value reflects the overall or average level of disadvantage of the population of an area; it does not show how individuals living in the same area differ from each other in their socioeconomic status. This report uses the **Index of Relative Socio-Economic Disadvantage**.

triage: The process by which a patient is briefly assessed upon arrival in the emergency department to determine the urgency of their problem and priority for care.

triage category: The urgency of the patient's need for medical and nursing care as assessed at triage. For more information, see AIHW METeOR identifier: 471926.

References

ABS (Australian Bureau of Statistics) 2010. Australian Statistical Geography Standard (ASGS): Volume 1—Main Structure and Greater Capital City Statistical Areas, July 2011. ABS cat. no. 1270.0.55.001. Canberra: ABS.

ABS 2012. Australian Statistical Geography Standard (ASGS): Correspondences, July 2011. ABS cat. no. 1270.0.55.006. Canberra: ABS.

ABS 2013. Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia 2011. ABS cat. no. 2033.0. Canberra: ABS.

AIHW (Australian Institute of Health and Welfare) 2014. Australian hospital statistics 2013–14: emergency department care. Health services series no. 58. Cat. no. HSE 153. Canberra: AIHW.

AIHW 2015. Emergency department care 2014–15: Australian hospital statistics. Health services series no. 65. Cat. no. HSE 168. Canberra: AIHW.

AIHW 2017. Emergency department care 2016–17: Australian hospital statistics. Health services series no. 80. Cat. no. HSE 194. Canberra: AIHW.

Ford J 2016. Australian trauma registry consolidated report 1/1/2013–30/6/2015. Melbourne: Monash University.

IHPA (Independent Hospital Pricing Authority) 2017. Emergency department ICD-10-AM (9th edn.) principal diagnosis short list: user guide. Sydney: IHPA. Viewed 18 September 2017.

Stephenson S, Henley G, Harrison J & Langley J 2003. Diagnosis-based injury severity scaling. Injury research and statistics series no. 20. Cat. no. INJCAT 59. Canberra: AIHW.

Vallmuur K & Barker R 2015. Infant product-related injuries: comparing specialised injury surveillance and routine emergency data. Australian and New Zealand Journal of Public Health 40:37–42.

List of tables

Table 3.1: Summary of data items present in the ED data collection 6

Table 3.2: ED presentations, by location of ED and diagnosis coding scheme, 2013–14 7

Table 3.3: ED presentations assigned an ICD-10-AM external cause code in the range V00–Y98 in a diagnosis field, 2013–14 13

Table 3.4: ED presentations, by major diagnostic block and presence of ICD-10-AM injury code, Australia, 2013–14 16

Table 4.1: ICD-10-AM injury diagnosis codes for ED presentations, by injury classification and sex, 2013–14 19

Table 4.2: ED presentations with principal diagnosis of S00–T75 or T79, by age group and sex, 2013–14 20

Table 4.3: ED presentations with principal diagnosis of S00–T75 or T79, by state or territory of usual residence and sex, 2013–14 21

Table 4.4: ED presentations with principal diagnosis of S00–T75 or T79, by remoteness area of usual residence and sex, 2013–14 21

Table 4.5: ED presentations with principal diagnosis of S00–T75 or T79, by socioeconomic status and sex, 2013–14 22

Table 4.6: ED presentations with principal diagnosis of S00–T75 or T79, by nature of injury and sex, 2013–14 22

Table 4.7: ED presentations with principal diagnosis of S00–T75 or T79, by nature of injury and episode end status, 2013–14 23

Table 4.8: ED presentations with principal diagnosis of S00–T75 or T79, by episode end status and sex, 2013–14 23

Table 4.9: ED presentations with principal diagnosis of S00–T75 or T79, by hospital peer group and sex, 2013–14 24

Table 4.10: ED presentations with at least 1 diagnosis other than principal diagnosis of S00–T75 or T79, by age group and sex, 2013–14 24

Table 4.11: ED presentations with at least 1 additional diagnosis of S00–T75 or T79, by principal diagnosis, 2013–14 25

Table 4.12: ED presentations with at least 1 additional diagnosis of S00–T75 or T79, by nature of injury and sex, 2013–14 25

Table 4.13: ED presentations with any diagnosis of T78 or T80–T98, by age group and sex, 2013–14 26

Table 4.14: ED presentations with any diagnosis of T78 or T80–T98, by principal diagnosis, 2013–14 27

Table 4.15: Number of injury cases transferred from another acute care hospital, by state or territory of hospitalisation, 2013–14 31

Table 4.16: Hospital admissions of ED injury cases, by type of hospital, by whether admitted to same or different hospital as ED, 2013–14 32

Table 4.17: ED injury cases admitted to hospital, by type of hospital, triage category, and arrival mode, 2013–14 33

Table 4.18: ED injury cases, by outcome and nature of injury, 2013–14 34

Table 5.1: Admitted injury cases, by nature of injury and activity when injured, selected states and territories (NHMD data), 2013–14 43
Table 5.2: ED cases admitted to hospital, by nature of injury, selected states and territories, 2013–14 43
Table 5.3: Estimates of sport-related ED cases based on ED and NHMD values for admitted injuries, by nature of injury, selected states and territories, 2013–14....44
Table C1: ICD-10-AM coded ED cases with principal diagnosis of S02, by 4-character categories and state and territory of ED, 2013–14 50
Table C2: ICD-10-AM coded ED cases with principal diagnosis of S06, by 4-character categories and state and territory of ED, 2013–14 50
Table C3: ICD-10-AM coded ED cases with principal diagnosis of S72, by 4-character categories and state and territory of ED, 2013–14 51
Table C4: ICD-10-AM coded ED cases with principal diagnosis of T20–T25, by 4-character categories and state and territory of ED, 2013–14 51
Table C5: ED injury cases admitted to level 1 trauma service hospital, by age group and triage category, 2013–14 51
Table C6: ED injury cases presenting to a non-level 1 trauma service hospital and admitted to same or different hospital, by age group and triage category, 2013–14 52
Table C7: ED injury cases admitted to hospital, by type of hospital and nature of injury, 2013–14 52
Table C8: ED injury cases admitted to a level 1 trauma service hospital, by nature of injury, triage category, and mode of arrival, 2013–14 53
Table C9: ED injury cases, by admission or mortality outcome, 2013–14 54
Table D1: Australian hospitals incorporating a level 1 trauma service, 2013–14....55
Table E1: Hospital admissions, by principal diagnosis for ICD-10-AM coded cases, 2013–14....56

List of figures

Figure 3.1: Cases with principal diagnosis of fracture of skull and facial bones (top), by level of specificity and state or territory of ED, 2013–14 10

Figure 3.2: Cases with principal diagnosis of intracranial injury, by level of specificity and state or territory of ED, 2013–14 10

Figure 3.3: Cases with a principal diagnosis of fracture of femur, by level of specificity and state or territory of ED, 2013–14 11

Figure 3.4: Cases with a principal diagnosis of burns of external body surface, by level of specificity and state or territory of ED, 2013–14 12

Figure 4.1: ED presentations with principal diagnosis of S00–T75 or T79, as a percentage of all ED presentations for which all ICD-10-AM coded diagnoses are available, by age group and sex, 2013–14 20

Figure 4.2: Injury-related ED presentations ending in hospital admissions, by state and territory, 2013–14 29

Figure 4.3: Injury-related ED presentations ending in hospital admissions, by age group, 2013–14 30

Figure 4.4: Mean probability of death of ED injury cases admitted to a level 1 trauma service hospital, by age group and triage category, 2013–14 35

Figure 4.5: Mean probability of death of ED injury cases admitted to hospital, by type of hospital and nature of injury, 2013–14 37

Figure 4.6: Mean probability of death of ED injury cases admitted to a level 1 trauma service hospital who arrived by ambulance, by nature of injury and triage category, 2013–14 38

Figure 4.7: Mean probability of death of ED injury cases admitted to a level 1 trauma service hospital who arrived by means other than ambulance, by nature of injury and triage category, 2013–14 39

Figure 4.8: Mean probability of death of ED injury cases, by admission or mortality outcome, 2013–14 40

Related publication

- AIHW (Australian Institute of Health and Welfare) 2014. Australian hospital statistics 2013–14: emergency department care. Health services series no. 58. Cat. no. HSE 153. Canberra: AIHW.

This report examines routinely collected national data on injury cases that attended a public hospital emergency department in Australia in 2013–14 and describes and illustrates possible applications of the data for injury surveillance. Use of different coding systems made identification of injury cases difficult in some instances. The data did not include a field for external cause of injury which markedly reduced the value of the data for injury surveillance. Despite these limitations, and while linked data studies are needed to provide a more complete assessment of emergency department injury data, the results reported here nevertheless suggest that the source has value for injury surveillance.

aihw.gov.au

AIHW

Stronger evidence,
better decisions,
improved health and welfare