

Most common principal diagnoses assigned to Australian emergency department presentations involving alcohol use: a multi-centre study

Peter Miller,¹ Thea Vakidis,¹ Nicholas Taylor,^{1,2} Tim Baker,^{3,4} Julian Stella,⁵ Diana Egerton-Warburton,⁶ Shannon Hyder,¹ Petra Staiger,¹ Steven J. Bowe,⁷ Jonathan Shepherd,⁸ Rachel Zordan,^{9,10} Andrew Walby,⁹ Martyn Lloyd Jones,^{11,12} David Caldicott,¹³ Daniel Barker,¹⁴ Michael Hall,¹⁵ Christopher M. Doran,¹⁶ Nadine Ezard,^{17,18} Paul Preisz,¹⁹⁻²¹ Alys Havard,^{18,22} Anthony Shakeshaft,¹⁸ Hamed Akhlaghi,^{9,10} Kate Kloot,²³ Nicole Lowry,⁵ Suzanne Bumpstead²⁴

Alcohol is the most commonly used psychoactive substance consumed in Australia and almost 80% of people aged 14 years and over have reported alcohol consumption in the past 12 months.¹ Harmful use of alcohol is one of the leading causes of disease burden among people in Australia, particularly adolescents,¹ and is a major contributory factor to injury-related deaths (i.e. suicide, transport accidents and falls).¹ Emergency departments (EDs) are one of the key points of contact between people experiencing alcohol-related harms and the health sector.²⁻⁵

To determine public health issues associated with alcohol consumption, the World Health Organization (WHO) has encouraged the routine collection of ED data for use in preventing alcohol-related injuries or deaths.⁶ The best-known model for such data collection comes from Cardiff, Wales,

Abstract

Objectives: Alcohol is the most widely consumed psychoactive substance in Australia and the consequences of alcohol consumption have enormous personal and social impacts. This study aimed to describe the principal diagnoses of emergency department (ED) presentations involving alcohol use in the previous 12 hours at eight hospitals in Victoria and the Australian Capital Territory, Australia.

Methods: Twelve months' data (1 July 2018 – 30 June 2019) were collected from eight EDs, including demographics, ICD-10 codes, hospital location and self-reported drinking in the preceding 12 hours. The ten most common ICD-10 discharge codes were analysed based on age, sex and hospital geographic area.

Results: ICD codes pertaining to mental and behavioural disorders due to alcohol use accounted for the highest proportion in most EDs. Suicide ideation/attempt was in the five highest ICD codes for all but one hospital. It was the second most common alcohol-related presentation for both males and females.

Conclusions: Alcohol plays a major role in a range of presentations, especially in relation to mental health and suicide.

Implications for public health: The collection of alcohol involvement in ED presentations represents a major step forward in informing the community about the burden of alcohol on their health resources.

Key words: alcohol, emergency department, frequency, injury, hospital

1. School of Psychology, Deakin University, Victoria
2. National Drug Research Institute, Curtin University, Victoria
3. Centre for Rural Emergency Medicine, Faculty of Health, Deakin University, Victoria
4. South West Healthcare, Victoria
5. Barwon Health, Victoria
6. School of Clinical Sciences at Monash Health, Monash University, Victoria
7. Biostatistics Unit, Deakin University, Victoria
8. Crime and Security Research Institute, Cardiff University, Wales, UK
9. St Vincent's Hospital Melbourne, Victoria
10. Melbourne Medical School, University of Melbourne, Victoria
11. VMO Department of Addiction Medicine, St Vincent's Hospital Melbourne, Victoria
12. Alfred Addiction and Mental Health, the Alfred Hospital, Victoria
13. Calvary Health Care, Australian Capital Territory
14. School of Medicine and Public Health, University of Newcastle, New South Wales
15. ACT Health, Australian Capital Territory
16. Cluster for Resilience and Well-being, Appleton Institute, Central Queensland University, Queensland
17. St Vincent's Hospital Sydney, National Centre for Clinical Research on Emerging Drugs, New South Wales
18. National Drug and Alcohol Research Centre, UNSW Sydney, New South Wales
19. St Vincent's Hospital Darlinghurst, New South Wales
20. Faculty of Medicine & Health, UNSW Sydney, New South Wales
21. School of Medicine, University Notre Dame, New South Wales
22. Centre for Big Data Research in Health, UNSW Sydney, New South Wales
23. School of Medicine, Deakin University, Victoria
24. Monash Medical Centre Clayton, Monash Health, Victoria

Correspondence to: Nicholas Taylor, National Drug Research Institute, Curtin University, 85 Commercial Rd, Melbourne VIC 3004; e-mail: nic.taylor@curtin.edu.au

Submitted: December 2021; Revision requested: April 2022; Accepted: July 2022

The authors have stated they have no conflicts of interest.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

Aust NZ J Public Health. 2022; Online; doi: 10.1111/1753-6405.13303

in the UK.⁷ ED data are most appropriate because persons with or without injuries are well represented in EDs, particularly in acute intoxication and injury cases.^{8,9} When programs are implemented for the prevention of alcohol-related harm, the collection of ED data is well-suited to identify the nature and extent of harm in relation to alcohol involvement so that program effectiveness can be assessed, and priorities for policy development identified.¹⁰ These ED data represent a unique insight because the information they provide is not available anywhere in the justice system, especially considering that only a minority of alcohol-related assaults that lead to emergency hospital treatment are represented in police records. At present, it is not compulsory for Australian EDs to collect alcohol-related data or to attempt to quantify alcohol consumption in ED attendances, so the true prevalence rates of alcohol-related injuries are unknown and most likely underestimated.² While there are a number of Australian studies that have used ED data to investigate the association between alcohol consumption and injury presentations,^{2,11-14} and some that have identified alcohol aetiological fractions for injuries,¹⁵ only one has looked at alcohol involvement across all types of ED attendances over time.¹¹ This study found that presentations with mental and behavioural diagnoses were more likely to be alcohol-related than other ICD codes; however, the study was based only in rural areas, and the data are old, having been collected between 2006 and 2008.¹¹

This study aims to identify the most common ICD10 codes associated with self-reported alcohol consumption in the 12 hours before

presentation in eight EDs in Victoria and the Australian Capital Territory (ACT) in Australia.

Methods

This study used data from a five-year study of the National Health and Medical Research Council (NHMRC) Driving Change project (<http://lastdrinks.info/>).¹⁶ Data were extracted from a total of eight EDs, six in Victoria and two in the ACT, and are not publicly available. Data collected included age, sex, clinical manifestations, hospital geographical location, principal diagnosis and ICD-10-AM code, with four additional questions covering drinking in the 12 hours prior to attendance, typical alcohol consumption level in a drinking session, location where most alcohol was purchased and the location of the last drink.¹⁶ Alcohol-related data were collected specifically as a part of the project. Data for the study were extracted from July 2018 to June 2019 (which was the first full 12 months available where all sites collected data).

The four key questions addressing alcohol consumption were asked by a combination of triage nurses, administrative staff and medical staff. Questions were mandatory within the electronic record systems of each emergency department. Staff had training on the reasons behind the questions and the range of responses available. Exclusion criteria included anyone under the age of 18. Clinicians were able to identify when patients were non-responsive or not willing to answer questions, or when questions were not asked for ethical reasons, such as when the clinician perceived a cultural or interpersonal issue or provided other clinical judgement that made the questions inappropriate. The identified

data were sent to the research team from each hospital via a secure server.

People attending the ED were only asked about consumption in the past 12 hours. This timeframe was a balance between ensuring the relevance of alcohol involvement versus missing out on many cases where alcohol was consumed in the days prior, but the injury sustained did not become severe enough to attend hospital until some time later. A chi-square analysis will be used to determine whether presentations were evenly distributed across age and gender groups.

To classify hospitals' geographical location, the Rural and Metropolitan Areas (RRMA) system was used, which incorporates population numbers and an index of remoteness.¹⁷ Six hospitals were classified as M1 (capital cities; Melbourne and Canberra), one hospital classified as M2 (other metropolitan centres; Geelong) and one hospital as R1 (small rural centres; Warrnambool, Victoria). To account for potential variation in diagnosis practices between hospitals, ICD codes were also grouped based on the Independent Hospital Pricing Authority (IHPA) ED principal diagnosis short list (eleventh edition).¹⁸

Ethics approval was obtained from Deakin University (HEAG-H 188_2018) and all hospitals involved in the study.

Results

A total of 346,057 ED attendances were recorded in the eight EDs over the one-year study period, of which 17,586 (5.08%) who replied 'Yes' to alcohol consumption in the preceding 12 hours were selected for analysis; 755 cases had no recorded ICD code (4.29%). The ten most common ICD codes associated with people who had consumed alcohol in the previous 12 hours, comprising just over one-quarter of alcohol-related cases reported, are listed in Table 1. Patients who did not wait for treatment came in at the tenth most common 'diagnosis' ($n=238$; 1.52%). Supplementary Table S1 shows the top 100 most common ICD codes involving prior alcohol use.

IHPA groupings can be found in Table 2.

The most common ICD codes for presentations reporting alcohol consumption in the past 12 hours for each of the eight hospitals are shown in Figure 1. In M1 (capital city) hospitals, mental and behavioural disorders associated with recent alcohol use

Table 1: Most common principal diagnoses involving prior alcohol use.

ICD Code	Description	n	% Overall percentage	Min % (lowest hospital)	Max % (highest hospital)
F10.0	Mental and behavioural disorders due to use of alcohol, acute intoxication	1,256	7.14%	0.00%	14.69%
R45.81	Suicidal ideation	595	3.38%	0.37%	6.67%
R10.4	Abdominal / flank pain /cramps / intestinal colic	474	2.70%	0.69%	4.18%
T51.9	Toxic effect of alcohol	409	2.33%	0.00%	3.63%
F10.2	Alcohol dependence	360	2.05%	0.00%	4.73%
R55	Collapse / faint / vasovagal attack / micturition syncope	358	2.04%	1.35%	2.91%
F32.90	Depression	307	1.75%	0.00%	6.03%
R29.6	Tendency to fall	268	1.52%	0.00%	9.00%
F10.3	Mental & behavioural disorder due to alcohol use with withdrawal state	266	1.51%	0.12%	16.06%
S01.9	Unspecified open wound of unspecified part of head	222	1.26%	0.06%	2.51%

accounted for the highest proportion, from 3.36% in M1 ACT, 8.23% in M1 (suburban) and 14.69% in M1 (CBD) Victoria. In contrast, at the other metropolitan hospitals (M2) in Victoria, the highest proportion of alcohol-related injury (4.50%) was for the toxic effects of alcohol. At the rural Victorian hospital, open wound of wrist and hand was the most common alcohol-related presentation (4.47%). Apart from mental and behavioural disorders (acute intoxication), one of the most common causes of alcohol-related presentations in all hospitals was suicide attempt/ideation. The proportion of injuries to the head, face or neck was 1.21% M1 ACT, 1.21% M1 (suburban), 7.22% R1 and 5.93% M1 (CBD), Victoria. Collapse/faint, abdominal pain and unspecified fall were also among the most common ICD codes in most EDs.

When comparing gender, the prevalence of acute intoxication was higher in men (4.37%) than in women (2.77%), as was alcohol dependence (1.45% in men, 0.60% in women). However, mental and behavioural disorders due to alcohol use, regardless of withdrawal state, dependence syndrome and the toxic effect of alcohol (poisoning or overdose), were similar between males and females (see Table 3). Suicidal ideation was the second most common ICD code for both males (1.98%) and females (1.40%). Similarly, the rates and ranking of syncope and collapse and tendency to fall were similar for both genders.

Table 4 shows presentations for males and females after ICD codes were grouped into blocks, according to the IHPA ED principal diagnosis short list.

Table 5 describes the numbers and percentages of presentations per ICD code for different age groups. Acute intoxication was most common in younger age groups, whereas suicidal ideation was the second or third most common alcohol-related presentation in those aged 18–54 years. Depression was a consistent ICD code recorded in patients aged 25–54 years. In all age groups except 75 years and older, ICD code Z531 (Did not wait for treatment) was consistent, accounting for 0.96 to 1.86% of alcohol-related presentations. Alcohol-related syncope (collapse/faint) gradually increased from 45 years, along with a tendency to fall for patients over 55 years.

Table 6 shows the most common diagnoses across age groups after ICD codes were grouped into blocks, according to the IHPA ED principal diagnosis short list.

Table 2: Most common principal diagnoses blocks involving prior alcohol use.

Block	Description	n.	%	Min %	Max %
F10-F19	Mental and behavioural disorders due to psychoactive substance use	2,441	13.88%	2.69%	26.82%
S00-S09	Injuries to the head	1,258	7.15%	3.61%	11.71%
R00-R09	Symptoms and signs involving the circulatory and respiratory systems	919	5.23%	2.35%	6.97%
R40-R46	Symptoms and signs involving cognition, perception, emotional state and behaviour	894	5.08%	0.50%	7.75%
R50-R69	General symptoms and signs	758	4.31%	2.12%	7.33%
S60-S69	Injuries to the wrist and hand	691	3.93%	1.91%	8.93%
R10-R19	Symptoms and signs involving the digestive system and abdomen	665	3.78%	1.70%	5.69%
T51-T65	Toxic effects of substances chiefly nonmedicinal as to source	521	2.96%	0.52%	5.14%
S80-S88	Injuries to the knee and lower leg	405	2.30%	0.84%	3.26%
S90-S99	Injuries to the ankle and foot	405	2.30%	1.28%	4.73%

Figure 1: Most common alcohol involved presentations per location.

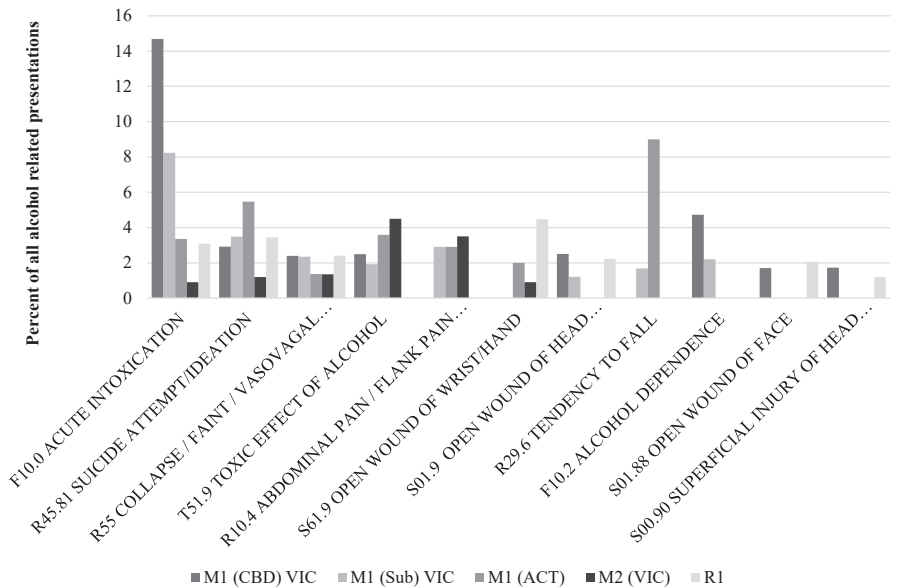


Table 3: Top 10 most common alcohol-related principal diagnoses based on sex.

ICD Code	Description	Female n.	%	Male n.	%
F10.0	Mental and behavioural disorders due to use of alcohol, acute intoxication	487	2.77%	769	4.37%
R45.81	Suicidal ideation	247	1.40%	348	1.98%
R10.4	Abdominal / flank pain /cramps / intestinal colic	219	1.25%	255	1.45%
T51.9	Toxic effect of alcohol	176	1.00%	233	1.32%
F10.2	Alcohol dependence	105	0.60%	255	1.45%
R55	Collapse / faint / vasovagal attack / micturition syncope	152	0.86%	206	1.17%
F32.90	Depression	133	0.76%	174	0.99%
R29.6	Tendency to fall	110	0.63%	158	0.90%
F10.3	Mental & behavioural disorder due to alcohol use with withdrawal state	106	0.60%	160	0.91%
S01.9	Unspecified open wound of unspecified part of head	50	0.28%	172	0.98%

A chi-square analysis was used to determine whether presentations were evenly distributed across age and gender groups, analysis showed there were significant deviations across different groups ($\chi^2=86.94$, $df=6$, $p<0.001$). As shown in Table 7, female ED presentations were significantly higher than expected in the 18–24 age group, while males were significantly higher than the expected value in the 35–44, and 55–64 age groups.

Discussion

This cross-sectional, multi-centre study is the first of its kind in Australia to systematically document alcohol consumption in the 12 hours prior among those attending an ED,¹⁶ and the first study to document the ICD-10 coding of harms exhibited by people attending EDs who had consumed alcohol in the previous 12 hours. The findings demonstrate the value of a mandatory collection of data regarding alcohol consumption in the EDs by highlighting the impact on EDs associated with specific diagnoses, allowing for a better understanding of what is preventable and what might be better dealt with in community settings. The findings also

underline the broad range of health outcomes and the significant burden on Australian EDs associated with the consumption of alcohol.

Main associated presentations

Mental and behavioural disorders associated with the use of alcohol comprised the highest proportion of alcohol-related ED presentations, particularly among capital city (M1) and other metropolitan centre (M2) hospitals. This is consistent with prior empirical studies that have shown the high

prevalence of comorbid alcohol consumption and mental health issues, particularly with mood, anxiety and externalizing behaviours.^{19,20} This is important in the context of the health and social harms associated with risky alcohol use such as the development of alcohol use disorders or alcohol dependence later in life,¹⁹ experience of unintentional injuries²¹ and involvement with justice systems.^{22,23} Prior research has demonstrated this comes at a significant cost to Australian society; somewhere between \$14 billion²⁴ and \$36 billion per year.²⁵

Table 4: Top 10 most common alcohol-related principal diagnoses blocks based on sex.

Block	Description	Female n.	%	Male n.	%
F10-F19	Mental and behavioural disorders due to psychoactive substance use	899	5.11%	1,542	8.77%
S00-S09	Injuries to the head	329	1.87%	929	5.28%
R00-R09	Symptoms and signs involving the circulatory and respiratory systems	292	1.66%	627	3.57%
R40-R46	Symptoms and signs involving cognition, perception, emotional state and behaviour	356	2.02%	538	3.06%
R50-R69	General symptoms and signs	297	1.69%	461	2.62%
S60-S69	Injuries to the wrist and hand	211	1.20%	480	2.73%
R10-R19	Symptoms and signs involving the digestive system and abdomen	320	1.82%	345	1.96%
T51-T65	Toxic effects of substances chiefly nonmedicinal as to source	222	1.26%	298	1.69%
S80-S88	Injuries to the knee and lower leg	154	0.88%	251	1.43%
S90-S99	Injuries to the ankle and foot	170	0.97%	235	1.34%

Table 5: Most common principal diagnoses involving prior alcohol use by age group.

ICD Code	Description	Age group													
		18-24=3,268		25-34=3,699		35-44=3,281		45-54=3,124		55-64=2,091		65-74=1,245		>75=878	
		N	%*	N	%*	N	%*	N	%*	N	%*	N	%*	N	%*
F10.0	Mental and behavioural disorders due to use of alcohol, acute intoxication	300	9%	300	8%	243	7%	258	8%	139	7%	54	4%	22	3%
F10.2	Alcohol dependence					101	3%	109	3%	58	3%	22	2%		
F10.3	Mental & behavioural disorder due to alcohol use with withdrawal state	54	2%	54	1%	58	2%	58	2%	26	1%				
F32.90	Depression	50	2%	50	1%	67	2%	92	3%	23	1%				
J22	Infection, lower respiratory tract / chest infection, acute											11	1%	18	2%
N39.0	Urinary tract infection (UTI)													10	1%
R04.0	Epistaxis (nosebleeds)											16	1%	10	1%
R06.0	Respiratory distress - shortness of breath													15	2%
R10.4	Abdominal / flank pain / cramps / intestinal colic	72	2%	72	2%	97	3%	80	3%	70	3%	38	3%	20	2%
R11	Hyperemesis / nausea and/or vomiting			40	1%										
R29.6	Tendency to fall, not elsewhere classified							38	1%	48	2%	41	3%	56	6%
R42	Dizziness/vertigo													12	1%
R45.81	Suicidal ideation	144	4%	148	4%	131	4%	124	4%	38	2%				
R55	Syncope and collapse					39	1%	62	2%	61	3%	60	5%	57	6%
S01.88	Open wound / bite (non-venomous) of face (excludes eye)	43	1%												
S01.9	Open wound of head, unspecified					42	1%			36	2%	13	1%		
S10.9	Superficial injury of neck	52	2%	52	1%										
S61.9	Open wound of wrist and hand, part unspecified	43	1%	50	1%										
S72.08	Fracture of hip													12	1%
T51.9	Toxic effect of alcohol	109	3%	118	3%	91	3%	77	2%	49	2%	16	1%		
Z53.1	Did not wait for treatment	48	1%	50	1%	44	1%	58	2%			12	1%		

Note:
* per age group category

Table 6: Most common principal diagnoses blocks involving prior alcohol use by age group.

ICD Code	Description	Age group													
		18-24=3,268		25-34=3,699		35-44=3,281		45-54=3,124		55-64=2,091		65-74=1,245		>75=878	
		N	%*	N	%*	N	%*	N	%*	N	%*	N	%*	N	%*
F10-F19	Mental and behavioural disorders due to psychoactive substance use	524	16%	500	14%	522	16%	515	16%	252	12%	90	7%	38	4%
F30-F39	Mood [affective] disorders					84	3%	112	4%						
I30-I52	Other forms of heart disease									50	2%	44	4%	24	3%
K55-K64	Other diseases of intestines													26	3%
M40-M54	Dorsopathies											28	2%		
R00-R09	Symptoms and signs involving the circulatory and respiratory systems			122	3%	152	5%	182	6%	192	9%	123	10%	77	9%
R10-R19	Symptoms and signs involving the digestive system and abdomen	126	4%	135	4%	117	4%	120	4%	89	4%	49	4%	29	3%
R25-R29	Symptoms and signs involving the nervous and musculoskeletal systems									53	3%	43	3%	62	7%
R40-R46	Injuries to the shoulder and upper arm	197	6%	197	5%	202	6%	176	6%	73	3%	32	3%		
R50-R69	General symptoms and signs	100	3%	122	3%	108	3%	140	4%	97	5%	102	8%	89	10%
S00-S09	Injuries to the head	323	10%	303	8%	218	7%	141	5%	137	7%	76	6%	60	7%
S40-S49	Injuries to the shoulder and upper arm													19	2%
S60-S69	Injuries to the wrist and hand	188	6%	208	6%	118	4%	78	3%	58	3%	31	2%		
S70-S79	Injuries to the hip and thigh													27	3%
S80-S88	Injuries to the knee and lower leg	102	3%												
S90-S99	Injuries to the ankle and foot	110	3%	114	3%										
T36-T50	Poisoning by drugs, medicaments and biological substances	101	3%	94	3%	82	3%								
T51-T65	Toxic effects of substances chiefly nonmedicinal as to source	131	4%	100	3%	103	3%	100	3%	59	3%				
Z40-Z54	Persons encountering health services for specific procedures and health care							75	2%						

Note:

* per age group category

There are also pragmatic implications of the high proportion of mental and behavioural disorders due to the effects of alcohol diagnoses for ED staff, as staff members (e.g. doctors, nurses, security guards) often require a significant amount of time to care for these patients.

When considering physical injuries, this study showed a high proportion of head injuries associated with recent alcohol use, especially in younger and rural males. Previous research has identified that individuals with high levels of alcohol consumption are at greater risk for traumatic brain injury from head injury compared with the general population and men are more likely to experience wound/laceration of the head than women.²⁶ Several studies have shown that alcohol intoxication has a strong association with the incidence of facial/head injuries,^{5,27,28} which may result from aggression, violence, falls, a tendency to fight and other risky behaviours.²⁸ In an Australian study, interpersonal violence related to alcohol consumption was the most common cause of facial fractures, followed by falls and transport-related injuries, and the male gender accounted for the majority of

these incidents,²⁹ which was consistent with this study.

There was a distinct diagnosis difference between some hospitals, hospitals that reported lower intoxication attendances (F10.0) tended to report higher attendances for toxic effects of alcohol (T51.9).

Gender

The findings also show some small differences for males and females in the types of injuries or illnesses associated with alcohol use for which they present at the ED, although the general trends are fairly similar in terms of the

most common presentations being in relation to acute intoxication, suicidal ideation, alcohol dependence and the toxic effects of alcohol. These findings are somewhat different from previous work in the estimation of the burden of alcohol presentations on ED⁵ that identified that males were more likely to attend the ED, although the focus of the previous study was exclusively on injuries. In general, these injuries also do not appear to be related to aggression and may describe a different type of drinking pattern where it could be people drinking alcohol at home rather than drinking at licenced venues and then experiencing aggression and injury.³⁰⁻³²

Table 7: Gender and age distribution in cases involving alcohol use.

Age group	Gender		Adjusted p value*
	Female (%)	Male (%)	
18-24 n(%)	1,407 (21)	1,859 (17)	<0.001
25-34 n(%)	1,361 (21)	2,337 (21)	0.562
35-44 n(%)	1,135 (17)	2,144 (19)	<0.001
45-54 n(%)	1,190 (18)	1,933 (18)	0.254
55-64 n(%)	681 (10)	1,409 (13)	<0.001
65-74 n(%)	419 (6)	825 (7)	0.008
>75 n(%)	384 (6)	530 (5)	0.129

Note:

*Bonferroni correction applied, $\alpha=0.007$

Age

There were a number of interesting differences in relation to the types of alcohol-associated presentations for different age groups. While attendances for acute alcohol intoxication are the most common reason for attendance in people under the age of 65, this changes to collapse in those over 65. The findings are somewhat different to a recent analysis of Victorian ED data that found that younger people were more likely to experience alcohol-related unintentional falls, which had almost doubled between 2003 and 2015.³³ The difference likely arises because Wood and colleagues were reliant on alcohol use being documented in the patient's medical record, whereas our study reports recent alcohol use. Previous research has demonstrated that clinical assessment of intoxication at levels below heavy intoxication (<0.015g/10ml) is no better than chance.³⁴ It may also be that clinical staff unconsciously accept that older people are more likely to fall over and do not look for or ask about alcohol/other drug consumption.

We also found that in people under the age of 45 suicidal ideation was the second most common reason for ED attendance after drinking, compared to alcohol dependence in those over 45, similar to prior research.³⁵ This finding reaffirms the association between alcohol and suicide-related behaviours and the very substantial burden in general on mental health.³⁶ The finding supports previous research highlighting that alcohol intoxication is a risk factor for suicide, and it can complicate risk assessment by impairing patients' judgement and thinking.³⁷ It also highlights the more apparent role of alcohol use in younger people engaging in impulsive suicide attempts.^{38,39}

The sample was predominantly male across all age groups; this male dominant skew was significantly more pronounced in the 35–44 and 55–64 age groups. Female patients were proportionally significantly higher in the 18–24 age range, compared to the rest of the sample.

Implications

This paper has highlighted the substantial burden of alcohol on EDs, especially beyond the most commonly discussed presentations related to intoxication and injury. Future interventions and studies collecting on alcohol-related ED attendances could focus

on these groups of cases, rather than needing to collect data on all attendees, although data from states such as the Northern Territory and Western Australia are required to be able to identify different trends that they might face, due to the substantial demographic differences and conditions within these states, especially in remote communities. The findings also point to the value of such a monitoring system as a trial for other substances. Cases varied depending on gender, age and ED locations, and further research is required into the underlying causes behind these differences.

Limitations

This study has a number of limitations. By only examining the principal diagnosis, it is possible that some diagnoses have been under-represented, as they were not the diagnosis of concern during the presentation. It is not compulsory for EDs to collect a principal diagnosis, more than 4% of presentations were missing an ICD code from the principal diagnosis field, which may have resulted in the under-reporting of presentations. The current study also did not capture presentations from individuals under 18 years of age; as such, the study's findings cannot be generalised to this group. While ED staff endeavoured to ask the last drinks questions of every person attending the department, somewhere between 10% and 30% of people attending ED were unable or unwilling to respond. Further, these data were self-reported. Any self-reported data are vulnerable to some biases. For example, respondents may engage in a social desirability bias (i.e. modifying their response to fit what they see as a more socially acceptable response). Responses can also be affected by recall biases (i.e. remembering incorrectly). However, recent peer-reviewed studies conducted in EDs have found that self-report of alcohol use in the ED is remarkably accurate, averaging 92% accuracy when the self-report was validated with a breathalyser.⁴

Another potential limitation is that while some of the patients reported alcohol use in the previous 12 hours, some of these patients were not under the influence of alcohol. While these data might be over-inclusive of some cases, the 12-hour window was designed to capture patients who were intoxicated to some degree and then became injured and ill, but who presented to an ED at a later

stage, and patients who drank earlier and no longer had alcohol in their blood and then sustained an injury or illness and presented immediately.

On the other hand, the last drinks questions do not capture harm caused to others due to the patient's alcohol use, or harm caused to the patient due to another person's alcohol use. Previous research has suggested that this may further increase estimations of alcohol-related presentations by as much as 30%.² Therefore, the current study very substantially under-represents the role of alcohol, as a previous snapshot of data collected in Australian EDs suggests that the harm of alcohol to others (children, intimate partners, family members, friends, acquaintances and strangers) accounts for an additional percentage of 14–22% of alcohol's total burden of harm.⁴⁰

Conclusions

Alcohol use is associated with a wide range of cases presenting to Australian EDs and is most common in mental health presentation and injuries. The burden varies across different locations, as well as across different demographics, but it is likely that the role of alcohol use remains under-estimated in presentations related to suicide, other mental health conditions and falls. Intoxicated patients create a substantial extra burden on staff and represent a modifiable risk factor for many presentations.

The current study highlights the utility of collecting alcohol involvement information at triage, and the size of the dataset allows some conclusions to be made around filters that can be set up so that not all people attending the ED need to be asked about alcohol consumption, instead, IT systems can be amended to initiate alcohol screening questions for attendances related to: mental and behavioural disorders (including acute intoxication and suicidal ideation), abdominal issues, injuries and falls/collapses/fainting. The routine collection of alcohol involvement for such cases, including location of event and last consumption, will represent a major step forward for informing the community about the burden of alcohol on their health resources, as well as providing governments with a clearer picture of the sources of alcohol-related harm in the community.

Acknowledgements

The study was supported by an NHMRC Partnership Project Grant, NHMRC-ID: APP1113693. The funding organisation had no influence on the study design, data collection and data analysis, or the decision of publishing outcomes in the journal.

References

1. Australian Institute of Health And Welfare. *National Drug Strategy Household Survey 2016*. Canberra (AUST): AIHW; 2017, p. 34-6.
2. Egerton-Warburton D, Gosbell A, Wadsworth A, Fatovich DM, Richardson DB. Survey of alcohol-related presentations to Australasian emergency departments. *Med J Aust*. 2014;201:584-7.
3. Egerton-Warburton D, Gosbell A, Wadsworth A, Richardson D, Fatovich DM. A point-prevalence survey of alcohol-related presentations to Australasian emergency department. *Aust N Z J Public Health*. 2018;42:218.
4. Cherpitel CJ. Alcohol-related injury and the emergency department: Research and policy questions for the next decade. *Addiction*. 2006;101:1225-7.
5. Young DJ, Stockwell T, Cherpitel CJ, Ye Y, Macdonald S, Borges G, et al. Emergency room injury presentations as an indicator of alcohol-related problems in the community: A multilevel analysis of an international study. *J Stud Alcohol*. 2004;65:605-13.
6. Butchart A, Brown D, Khanh-huynh A, Corso P, Florquin N, Muggah R. *Manual for Estimating the Economic Costs of Injuries Due to Interpersonal and Self-directed Violence*. Geneva (CHE): World Health Organisation, and Department of Health and Human Services, Centres for Disease Control and Prevention; 2008.
7. Shepherd J. Preventing alcohol-related violence: A public health approach. *Crim Behav Ment Health*. 2007;17:250-64.
8. Droste N, Miller P, Baker T. Review article: Emergency department data sharing to reduce alcohol-related violence: A systematic review of the feasibility and effectiveness of community-level interventions. *Emerg Med Australas*. 2014;26:326-35.
9. Miller P, Droste N, Baker T, Gervis C. Last drinks: A study of rural emergency department data collection to identify and target community alcohol-related violence. *Emerg Med Australas*. 2015;27:225-31.
10. World Health Organization. *WHO Collaborative Study on Alcohol and Injuries: Final Report*. Geneva (CHE): WHO; 2007.
11. Havard A, Shakeshaft AP, Conigrave KM, Sanson-Fisher R. The prevalence and characteristics of alcohol-related presentations to emergency departments in rural Australia. *Emerg Med J*. 2011;28:290-5.
12. Hobday M, Chikritzhs T, Liang W, Meuleners L. The effect of alcohol outlets, sales and trading hours on alcohol-related injuries presenting at emergency departments in Perth, Australia, from 2002 to 2010. *Addiction*. 2015;110:1901-9.
13. O'Donnell M, Sims S, Maclean MJ, Gonzalez-Izquierdo A, Gilbert R, Stanley FJ. Trends in alcohol-related injury admissions in adolescents in Western Australia and England: Population-based cohort study. *BMJ Open*. 2017;7:e014913.
14. Watt K, Purdie DM, Roche AM, McClure RJ. The relationship between acute alcohol consumption and consequent injury type. *Alcohol Alcohol*. 2005;40:263-8.
15. Chikritzhs T, Evans M, Gardner C, Pascal R, Stockwell T, Zeisser C. *Australian Alcohol Aetiological Fractions for Injuries Treated in Emergency Departments*. Perth (AUST): Curtin University National Drug Research Institute; 2011.
16. Miller PG, Droste N, Egerton-Warburton D, Caldicott D, Fulde G, Ezard N, et al. Driving change: A partnership study protocol using shared emergency department data to reduce alcohol-related harm. *Emerg Med Australas*. 2019;31:942-7.
17. Australian Institute of Health and Welfare. *Rural, Regional and Remote Health: A Guide to Remoteness Classification*. Catalogue No.: PHE.53. Canberra (AUST): AIHW; 2004.
18. Independent Hospital Pricing Authority. *ICD-10-AM/ACHI/ACS*. 11th ed. Sydney (AUST): IHPA; 2019.
19. Behrendt S, Beesdo-Baum K, Zimmermann P, Hofer M, Perkonig A, Buhnering G, et al. The role of mental disorders in the risk and speed of transition to alcohol use disorders among community youth. *Psychol Med*. 2011;41:1073-85.
20. Salom CL, Betts KS, Williams GM, Najman JM, Scott JG, Alati R. Do young people with comorbid mental and alcohol disorders experience worse behavioural problems? *Psychiatry Res*. 2014;219:372-9.
21. Rehm J, Taylor B, Room R. Global burden of disease from alcohol, illicit drugs and tobacco. *Drug Alcohol Rev*. 2006;25:503-13.
22. Boden JM, Fergusson DM, Horwood LJ. Alcohol misuse and violent behavior: Findings from a 30-year longitudinal study. *Drug Alcohol Depend*. 2012;122:135-41.
23. O'Driscoll C, Larney S, Indig D, Basson J. The impact of personality disorders, substance use and other mental illness on re-offending. *J Forens Psychiatry Psychol*. 2012;23:382-91.
24. Manning M, Smith C, Mazerolle P. The Societal Costs of Alcohol Misuse in Australia. In: *Trends & Issues in Crime and Criminal Justice*. No.: 454. Canberra (AUST): Australian Institute of Criminology; 2013.
25. Laslett A.-M, Catalano P, Chikritzhs T, Dale C, Doran C, Ferris J, et al. *The Range and Magnitude of Alcohol's Harm to Others*. Melbourne (AUST): Alcohol Education & Rehabilitation Foundation, AER Centre for Alcohol Policy Research, Turning Point Alcohol and Drug Centre, Eastern Health; 2010.
26. Puljula J, Savola O, Tuomivaara V, Pribula J, Hillbom M. Weekday distribution of head traumas in patients admitted to the emergency department of a city hospital: Effects of age, gender and drinking pattern. *Alcohol Alcohol*. 2007;42:474-9.
27. Alvi A, Doherty T, Lewen G. Facial fractures and concomitant injuries in trauma patients. *Laryngoscope*. 2003;113:102-6.
28. Gawęda A, Konopelko J, Pisarski M, Kuźniarz K. Maxillofacial trauma in relation to patients' sobriety – a one-year epidemiological analysis. *J Pre Clin Clin Res*. 2014;8(1):17-22.
29. Lee KH, Qiu M. Characteristics of alcohol-related facial fractures. *J Oral Maxillofac Surg*. 2017;75:786,e781-6,e787.
30. Miller P, Curtis A, Palmer D, Busija L, Tindall J, Droste N, et al. Changes in injury-related hospital emergency department presentations associated with the imposition of regulatory versus voluntary licensing conditions on licensed venues in two cities. *Drug Alcohol Rev*. 2014;33:314-22.
31. Miller P, Sønderlund A, Coomber K, Palmer D, Gillham K, Tindall J, et al. Do community interventions targeting licensed venues reduce alcohol-related emergency department presentations? *Drug Alcohol Rev*. 2011;30:546-53.
32. Miller P, Coomber K, Sønderlund A, McKenzie S. The long-term effect of lockouts on alcohol-related emergency department attendances within Ballarat, Australia. *Drug Alcohol Rev*. 2012;31:370-6.
33. Woods C, Jones R, Usher K. The impact of unintentional alcohol-related falls on emergency departments. *Australas Emerg Care*. 2019;22:22-7.
34. Brick J, Erickson CK. Intoxication is not always visible: An unrecognized prevention challenge. *Alcohol Clin Exp Res*. 2009;33:1489-507.
35. Lejoyeux M, Huet F, Claudon M, Fichelle A, Casalino E, Lequen V. Characteristics of suicide attempts preceded by alcohol consumption. *Arch Suicide Res*. 2008;12:30-8.
36. Wyder M, De Leo D. Behind impulsive suicide attempts: Indications from a community study. *J Affect Disord*. 2007;104:167-73.
37. Borschmann R, Stark P, Prakash C, Sawyer SM. Risk profile of young people admitted to hospital for suicidal behaviour in Melbourne, Australia. *J Paediatr Child Health*. 2018;54:1213-20.
38. Wyder M, Draper B, Snowdon J. A pilot study of suicide victims' last contact with a health professional: Characteristics of suicides over the age of 60. *Aust N Z J Psychiatry*. 2007;41:A100-1.
39. Wyller TB, Holmen J, Laake P, Laake K. Correlates of subjective well-being in stroke patients. *Stroke*. 1998;29:363-7.
40. Egerton-Warburton D, Gosbell A, Moore K, Wadsworth A, Richardson D, Fatovich DM. Alcohol-related harm in emergency departments: A prospective, multi-centre study. *Addiction*. 2018;113:623-32.

Supporting Information

Additional supporting information may be found in the online version of this article:

Supplementary Table 1: Top 100 most common ICD codes involving prior alcohol use.