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FALLS IN HOSPITAL, 2011/12 TO 2020/21: AN OVERVIEW OF FALL-RELATED INJURIES THAT OCCURRED DURING HOSPITAL ADMISSION IN VICTORIA

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OVERVIEW

This edition of *Hazard* focused on falls that occur during hospital admission in Victoria. Falls that occur in hospital and result in patient harm are relatively common, with a rate of 3.6 falls per 1000 separations in 2017/18, Australia, reported by the AIHW [1]: more than 40,000 hospital falls.

The aim of this edition of *Hazard* is to provide an in-depth epidemiological overview of recorded falls during hospital admission in Victoria, including frequencies, rates and trends. Time trends in the ten-year period from 2011/12 to 2020/21 are presented, as well as an analysis of the types of falls and the injuries resulting from falls that occur during hospital admission in the three-year period from 2018/19 to 2020/21. All hospital falls are included: some of these did not result in recorded injuries.

The data source for this report was the Victorian Admitted Episodes Dataset (VAED), which was sourced from the Victorian Department of Health. The VAED was used to identify and select hospital admissions with a fall during hospital stay, as well as providing the 'exposure data': all hospital admissions in Victoria for the duration of the study period.

CONTENTS

EXECUTIVE SUMMARY

Falls occurring while a patient is admitted to hospital is an unwanted adverse event that can result in serious injuries such as fractures, head trauma and other complications. Patient falls occur commonly in Victorian health care services and are the most frequently reported incident in the Victorian Health Services Information Management System (VHIMS) [2]. Inpatient falls can result in an increased length of stay with associated increases in treatment costs and use of health care resources. Fall risk increases with age and Australia's aging population may see these numbers increase in the coming years [3]. Local and up-to-date statistics on in-hospital falls are a requirement for the ongoing development of prevention practices and to track their impact. As the current published Victorian in-hospital falls statistics date back to the ten-year period from 1998 to 2008 [4], an updated overview of Victorian in-hospital falls rates and trends was considered timely.

The aim of Edition 92 of *Hazard* is to provide an epidemiological overview and patient profile of falls that occur during hospital admission in Victoria, as recorded in the Victorian Admitted Episodes Dataset (VAED). Time trends over the ten-year period from 2011/12 to 2020/21 are presented, as well as an in-depth analysis of falls during hospital admission in the three-year period from 2018/19 to 2020/21. Estimation of the burden of in-hospital falls, by modelling the effect of falls on length of hospital stay and cost while accounting for the impact of primary and associated conditions, is beyond the scope of this edition of *Hazard*.

IN-HOSPITAL FALLS: HOSPITAL ADMISSION PATTERNS (3 YEARS)

- Hospital admissions were extracted from the VAED for the 3-year period from 1 July 2018 to 30 June 2021: 8,664,516 in total, accounting for 22,571,661 hospital bed days.
- During these admissions, a total of 24,477 falls in hospital were recorded; an average of 8159 per year.
- Over 60% of patients with falls in hospital were aged 75 years and above and more than half (54%) were male.
- Rate of falls per 1000 admissions ranged from 2.53/1000 admissions in 2018/19 to 3.21/1000 admissions in 2020/21. The rate of falls per 1000 bed days ranged from 0.95/1000 bed days (2018/19) to 1.28/1000 bed days (2020/21).
- Three-quarters of hospital falls were recorded in metropolitan hospitals; however, in terms of rates, regional Victorian hospitals had higher rates per 1000 admissions and per 1000 bed days.
- Most common principal diagnoses for initial admissions with a subsequent in-hospital fall were:
  1. Delirium
  2. Heart failure
  3. Cerebral infarction
  4. Femur fracture
  5. Pneumonia
- Pre-existing comorbidities recorded in patients with falls in hospital were most commonly:
  1. Diabetes with chronic complications
  2. Delirium
  3. Diabetes without complications
  4. Malignancy
  5. Dementia

- Comorbidities with the highest rates of hospital falls per 1000 admissions were dementia, delirium, Parkinson's disease, hemiplegia/paraplegia and ataxia; notably these are all neurological or neuropsychiatric conditions.
- While the majority of *all hospital admissions* were elective admissions (58%), the majority of admissions with *an in-hospital fall* were emergency admissions (53%).
- Some care types, such as *Geriatric evaluation and management program*, were associated with in-hospital falls rates that were above 18-fold of the average rate.
- Among admissions with an in-hospital fall, 11% separated or transferred to an aged care residential facility; this proportion was 1.4% in all hospital admissions.
- Of those with an in-hospital fall, 6% died in hospital, whereas 0.7% of all hospital admissions resulted in death in hospital.
- Same level falls (all types), which include falls due to slipping, tripping and stumbling, accounted for 44% of in-hospital falls among inpatients, followed by 'unspecified falls' (32%) and falls involving beds (17%).
- The most common diagnosis code assigned to in-hospital falls was *examination and observation for other reasons* (36%); within this category, the most commonly used specific code was for *examination and observation following other accident*. The most common injuries recorded for in-hospital falls were open head wound (7%), superficial head injury (7%) and forearm open wound (5%).
- More severe injuries included intracranial injury (1.6%) and femur fracture (1.5%); this translates to an average of 249 hospital falls specifically resulting in femur fracture or intracranial injury per year in Victoria.

IN-HOSPITAL FALLS: HOSPITAL ADMISSION TRENDS (10 YEARS)

- In the ten-year period from 2011/12 to 2020/21, there were 64,821 falls during hospital admission recorded in the VAED.
- Frequencies, rates per 1000 admissions and per 1000 bed days were higher in males than females, and increased steeply with increasing age.
- Modelling of hospital falls time trends saw an average increase of 4.4% per year in the hospital falls rate per 1000 admissions; the rate per 1000 bed days increased by an average of 6.3% per year.
- Modelled increases in hospital falls rates were statistically significant in all adult age groups.
- In-hospital falls were separated into two categories for further analysis: those with a recorded injury following a fall in hospital vs those with 'other/no injury' following a fall in hospital (representing 38% of cases).
- Further modelling of these two groups showed that in the 'other/no injury' group, the rate per 1000 admissions rose steeply by 18.5% per year on average (95% CI: 17.7%–19.4%, $p<0.0001$). Similarly, the rate per 1000 bed days for hospital falls 'without injury' rose steeply by 20.7% per year on average (95% CI: 19.8%–21.5%, $p<0.0001$).
- There was only a mild, not statistically significant increase in rates of hospital falls 'with injury' per 1000 admissions over the ten-year period. There was a mild increase in the rate per 1000 bed days of recorded hospital falls *with injury*: 1.4% per year (95% CI: 1.0% to 1.9%, $p<0.0001$).
- These trends could reflect improved reporting and recording of hospital falls, in particular non-injurious falls, between 2011/12 and 2020/21.

INTRODUCTION

Falls that occur during hospital admission are relatively common with more than 40,000 health service area falls recorded in hospital separations data for Australia, 2017/18, reported by the AIHW [1]. This equates to 3.6 falls per 1000 hospital separations: the majority of these were falls that occurred during admission (within the same facility). Reported hospital fall rates differ by setting, patient case-mix and recording practices. In New South Wales in 2010–2014, 3.2 falls per 1000 bed days were reported in a study using the Incident Information Management System linked with the health information exchange data [5]. Victorian rates of in-hospital falls increased from 0.41 to 0.88 per 1000 bed days during the ten-year period from 1998/99 to 2007/08, based on an analysis of the Victorian Admitted Episodes Dataset [4], noting the different types of data sources for the Victorian vs. the New South Wales falls rates. In a systematic review by Oliver et al. (2004), a range of in-patient fall risk factors emerged; these were: gait instability; lower limb weakness; urinary incontinence; history of falls; agitation, confusion or judgement impairment; and certain categories of prescription drugs such as sedative hypnotics [6]. Not all recorded in-hospital falls result in injury and when injury does occur, the severity can range from mild to life-threatening. Risk factors for major injuries, defined as fractures or head injuries requiring surgery or intensive observation, include dementia, osteoporosis, stroke, depression, chronic obstructive pulmonary disease and Parkinson disease, as reported in a Danish study of hospital patients aged 65 years and above [7].

In-hospital falls increase length of stay and cost of care. The cost of in-hospital falls can be calculated by comparing the hospital costs in a falls group with a non-falls group and taking patient case-mix and clinical complexity into account. Comorbidities as well as in-hospital complications are risk factors for falls but these can also increase hospital treatment costs, independent of a fall. In a multi-site study in six hospitals in New South Wales and Victoria, patients with in-hospital falls were reported to spend eight days longer in hospital when compared with those without falls, and they incurred greater hospital costs by $6669, on average [8]. This was the result of modelling which accounted for patient demographics, comorbidity, previous falls and other factors. Those with in-hospital fall(s) *but without resulting injury* also spent longer in hospital and incurred greater hospital costs than those without a fall, in the fully adjusted modelling: this could be due to an effect of in-hospital falls on care pathways and discharge planning [8].

The risk of in-hospital falls can be reduced; approaches to prevention and management of in-hospital falls are generally based around risk assessment, prevention plan development and delivery, and monitoring. An overview of in-hospital falls prevention generally and programs in Australia and Victoria specifically is provided in the Discussion section of this edition of *Hazard*. Because in-hospital falls differ by setting (such as the type of hospital), patient case mix and recording practices, local timely statistics are necessary for ongoing development of prevention practices and to track their impact. Currently, published Victorian in-hospital falls statistics date back to the ten-year period from 1998 to 2008 [4], during which an increasing trend was observed: it was therefore considered timely to present current Victorian in-hospital falls rates, trends and patterns. The currently available consolidated hospital data includes the onset of the COVID-19 pandemic which had a profound effect on health services, further supporting the need for an updated profile of in-patient falls as a key component of patient safety.

AIMS AND DATA SOURCES

AIM

The aim of Edition 92 of *Hazard* is to provide an epidemiological overview of falls that occur during hospital admission in Victoria, as recorded in the Victorian Admitted Episodes Dataset. Time trends over the ten-year period from 2011/12 to 2020/21 are presented, as well as an in-depth analysis of falls during hospital admission in the three-year period from 2018/19 to 2020/21. Estimation of the burden of in-hospital falls, by modelling the effect of falls on length of hospital stay and cost while accounting for principal and associated conditions, is beyond the scope of this edition of *Hazard*. The presented in-hospital falls rates, risk factors and trends for Victoria, Australia are intended not only for patient safety regulator and policy makers, but more generally for patient safety stakeholders and researchers, as some of the presented patterns and associations can be extrapolated beyond the Victorian setting.

DATA SOURCES

This edition of *Hazard* is based on the Victorian Admitted Episodes Dataset (VAED) sourced from the Victorian Department of Health.

METHODS

OVERVIEW OF METHODS USED TO DETERMINE FALLS IN HOSPITAL

For the correct interpretation of the presented hospital admission statistics, an understanding of the case selection used to address the aims of this edition of *Hazard* is essential.

CASE SELECTION FOR HOSPITAL ADMISSIONS WITH FALLS

Hospital admission records with an in-hospital fall were selected from the Victorian Admitted Episodes Dataset (VAED). The VAED records all admissions in public and private hospitals in the state of Victoria. Case selection was limited to the 10-year period from 1 July 2011 to 30 June 2021. Hospital falls records were selected as admissions with an International Classification of Disease – 10th Revision – Australian Modification (ICD-10-AM) code for falls that are potentially relevant to falls in hospital: W01, W03-W08, W10, W13, W17–19 [4]. These codes could occur anywhere in the 40 diagnosis codes fields. Only falls with corresponding prefix 'C' indicating that the falls arose during admission were included. Selected cases were limited to admissions by Victorian residents. All ages were included. Only admissions by male and female patients were included, as indeterminate and other sex were uncommon and reporting of small cell counts could potentially compromise patient data confidentiality. Case selection of falls during hospital admission was not limited to incident episodes: hospital falls could occur in any type of admission, including statistical admissions[1], maternity admissions, emergency admissions and elective admissions. This approach does not result in double-counting, as a complicating condition is, by definition, not present at the time when the episode of care commenced.

CASE SELECTION FOR ALL HOSPITAL ADMISSIONS (EXPOSURE)

For calculation of hospital falls per 1000 admissions and hospital falls per 1000 bed days, hospital admission exposure (or denominator) data were extracted. These were selected from the VAED as admissions by males and females who were Victorian residents. Selection was limited to the 10-year period from 1 July 2011 to 30 June 2021. To match the data selection for falls during hospital admission, 'exposure' admission data selection included all admission types: selection was not limited to incident episodes.

1. A **statistical admission** is the administrative process by which a hospital records the commencement of a new episode of care, with a new care type, for a patient within one hospital stay. Source: https://www.health.vic.gov.au/publications/victorian-admitted-episodes-dataset-vaed-manual-2023-2024

RESULTS

EPIDEMIOLOGICAL PROFILE – THREE YEARS (2018/19 TO 2020/21)

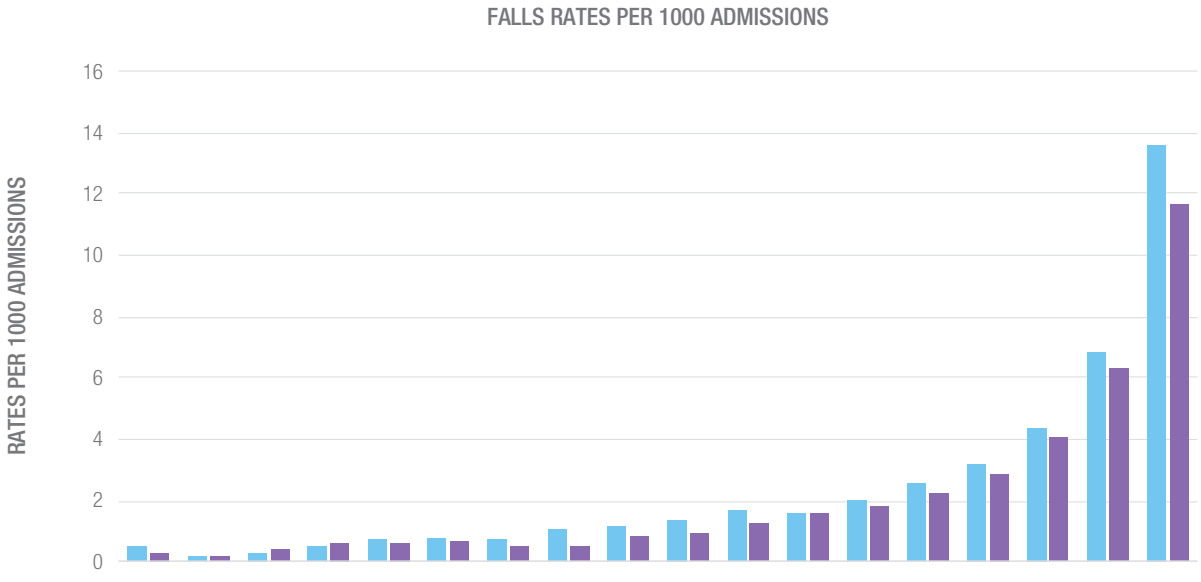
IN-HOSPITAL FALL PATIENT PROFILE

In the three-year period from 2018/19 to 2020/21, there were 8,664,516 hospital admissions in Victoria, Australia: together these admissions amounted to 22,571,661 hospital bed days. During these admissions, in total 24,477 falls in hospital were recorded in the VAED: an average of 8159 per year. Of those patients with a hospital fall, over 60% were aged 75 years and above and more than half (54%) were male. The number of recorded falls during hospital admission are presented in Table 1. The presented rates of falls per 1000 admissions show that falls are more common among older patients and among male patients. These patterns are also observed after accounting for length of stay, as indicated in the reported rates of falls per 1000 bed days. Rates by age group and sex are presented in more detail in Figure 1 and Figure 2: higher rates for males are observed at ages 25 years and above (with exception of the 55–59 year age group which has equal rates for males and females).

TABLE 1
FALLS DURING HOSPITAL ADMISSION, BY FINANCIAL YEAR, AGE GROUP AND SEX: FREQUENCIES AND RATES IN VICTORIA, 2018/19 TO 2020/21

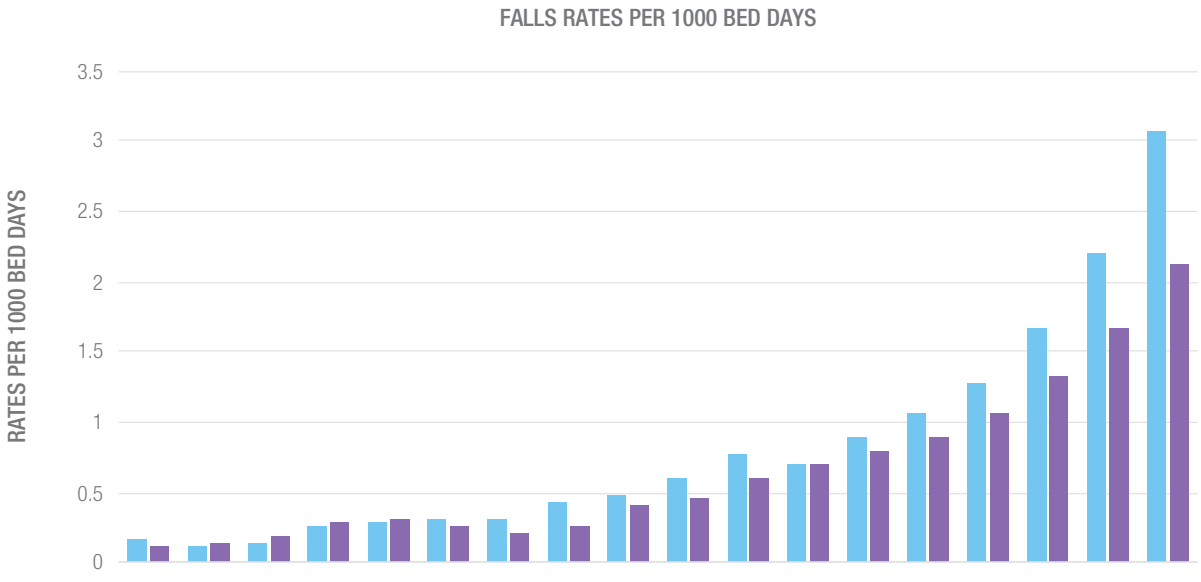
	Admissions with fall		Admissions total		Falls per 1000 admissions	Falls per 1000 bed days
	N	%	N	%	Rate	Rate
Financial year						
2018/19	7,491	30.6	2,955,152	34.1	2.53	0.95
2019/20	7,756	31.7	2,834,134	32.7	2.74	1.03
2020/21	9,230	37.7	2,875,230	33.2	3.21	1.28
Age group						
0–14 years	219	0.9	605,318	7.0	0.36	0.14
15–24 years	279	1.1	441,648	5.1	0.63	0.29
25–34 years	461	1.9	819,925	9.5	0.56	0.25
35–44 years	668	2.7	843,862	9.7	0.79	0.37
45–54 years	1,294	5.3	992,319	11.5	1.30	0.61
55–64 years	2,287	9.3	1,305,426	15.1	1.75	0.78
65–74 years	4,438	18.1	1,646,986	19.0	2.69	1.09
75–84 years	7,444	30.4	1,421,254	16.4	5.24	1.71
85+ year	7,387	30.2	587,778	6.8	12.57	2.52
Sex						
Male	13,185	53.9	4,130,069	47.7	3.19	1.25
Female	11,292	46.1	4,534,447	52.3	2.49	0.94
Total	**24,477**	**100.0**	**8,664,516**	**100.0**	**2.82**	**1.08**

FIGURE 1
FALLS DURING HOSPITAL ADMISSION:
FALLS RATES PER 1000 ADMISSIONS, BY AGE GROUP AND SEX. VICTORIA, 2018/19 TO 2020/21



Years	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
Male	0.49	0.15	0.25	0.53	0.69	0.71	0.68	0.99	1.10	1.32	1.69	1.56	2.02	2.49	3.14	4.31	6.77	13.56
Female	0.33	0.21	0.36	0.61	0.66	0.54	0.48	0.53	0.80	0.94	1.27	1.54	1.83	2.17	2.83	4.06	6.28	11.65

FIGURE 2
FALLS DURING HOSPITAL ADMISSION: FALLS RATES PER 1000 BED DAYS, BY AGE GROUP AND SEX. VICTORIA, 2018/19 TO 2020/21



Years	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
Male	0.17	0.10	0.14	0.26	0.30	0.31	0.30	0.43	0.49	0.60	0.76	0.70	0.89	1.05	1.29	1.66	2.20	3.07
Female	0.11	0.13	0.18	0.27	0.31	0.25	0.22	0.25	0.40	0.46	0.61	0.70	0.80	0.89	1.06	1.33	1.67	2.12

The numbers and rates of falls in hospitals in Victoria in 2018/19 to 2020/21 by region and hospital type are presented in Table 2. The highest numbers of hospital falls were recorded in North-Western Victoria and Southern Victoria (metropolitan areas), and the lowest numbers were recorded in Hume and Gippsland (regional/rural areas). In terms of falls per 1000 patients and falls per 1000 bed days, however, the highest rates were observed in the Grampians and Barwon South Western regions (regional/rural) and the lowest rates were observed in Hume (regional/rural) and North-Western Victoria (metropolitan).

Three-quarters of hospital falls were recorded in metropolitan hospitals and one-quarter in regional hospitals. In terms of rates, however, regional Victorian hospitals had higher rates per 1000 admissions and per 1000 bed days. Public hospitals accounted for the majority of hospital falls (79%); also, in terms of rates, falls per 1000 patients and falls per 1000 bed days were greater in public than in private hospitals (Table 2). It should be noted, however, that these are crude rates that do not account for patient case-mix. The level of case complexity as well as the clinical specialties and commonly carried out procedures will differ between hospitals.

This analysis is based on all types of hospital admissions in Victoria, 2018/19 to 2020/21, with a recorded in-hospital fall. The principal diagnoses in these admissions are therefore diverse. An overview of the 30 most commonly recorded principal diagnoses is presented in Table 3. Together, admissions with these 30 diagnoses make up 44% of all admissions with an in-hospital fall, which illustrates the diversity. The most common principal diagnosis in admissions with an in-hospital fall was delirium, followed by heart failure and cerebral infarction. Fourth-listed was femur fracture and fifth-listed was pneumonia.

TABLE 2
FALL DURING HOSPITAL ADMISSION, BY PATIENT RESIDENTIAL REGION, HOSPITAL LOCATION AND HOSPITAL TYPE: FREQUENCIES AND RATES IN VICTORIA, 2018/19 TO 2020/21

	Admissions with fall		Admissions total		Falls per 1000 admissions	Falls per 1000 bed days
	N	%	N	%	Rates	Rates
Region of residence*						
Barwon South Western	2,164	8.8	611,960	7.1	3.5	1.4
Grampians	1,427	5.8	378,878	4.4	3.8	1.4
Loddon Mallee	1,406	5.7	507,364	5.9	2.8	1.0
Hume	1,039	4.2	396,410	4.6	2.6	0.9
Gippsland	1,191	4.9	448,185	5.2	2.7	1.0
Eastern (metropolitan)	4,436	18.1	1,501,627	17.3	3.0	1.1
Southern (metropolitan)	6,106	25.0	2,178,163	25.1	2.8	1.1
North-Western (metropolitan)	6,708	27.4	2,641,925	30.5	2.5	1.0
Hospital location						
Metropolitan	18,440	75.3	6,759,632	78.0	2.7	1.0
Regional	6,037	24.7	1,904,884	22.0	3.2	1.2
Hospital type						
Private	5,087	20.8	3,157,586	36.4	1.6	0.7
Public	19,390	79.2	5,506,930	63.6	3.5	1.3
Total	**24,477**	**100.0**	**8,664,516**	**100.0**	**2.82**	**1.08**

*Region of residence of the patient. In the denominator data for region of residence, <5 cases were not able to be mapped to a region (these are excluded from the analysis).

TABLE 3
FALL DURING HOSPITAL ADMISSION IN VICTORIA, 2018/19 TO 2020/21: 30 MOST COMMON PRINCIPAL DIAGNOSES IN ADMISSIONS WITH A RECORDED FALL. THE PRINCIPAL DIAGNOSIS IS THE MAIN REASON FOR THE ADMISSION.

	N*	%
Principal diagnosis of hospital-falls patients		
Delirium, not induced by alcohol and other psychoactive substances	1008	4.1
Heart failure	917	3.8
Cerebral infarction	877	3.6
Fracture of femur	783	3.2
Pneumonia, organism unspecified	533	2.2
Other symptoms and signs involving the nervous and musculoskeletal systems	501	2.1
Other and unspecified sepsis	469	1.9
Other chronic obstructive pulmonary disease	400	1.6
Type 2 diabetes mellitus	387	1.6
Malaise and fatigue	342	1.4
Intracranial injury	323	1.3
Gonarthrosis [arthrosis of knee]	296	1.2
Other disorders of urinary system	290	1.2
Secondary malignant neoplasm of other and unspecified sites	285	1.2
Fracture of rib(s), sternum and thoracic spine	275	1.1
Acute myocardial infarction	253	1.0
Malignant neoplasm of bronchus and lung	251	1.0
Fracture of lumbar spine and pelvis	248	1.0
Depressive episode	244	1.0
Dorsalgia [thoracic pain syndrome]	221	0.9
Dementia in Alzheimer's disease	212	0.9
Intracerebral haemorrhage	212	0.9
Cellulitis	209	0.9
Other disorders of muscle	209	0.9
Bipolar affective disorder	183	0.8
Fracture of lower leg, including ankle	177	0.7
Pneumonitis due to solids and liquids	177	0.7
Hypotension	170	0.7
Fracture of shoulder and upper arm	163	0.7
Paralytic ileus and intestinal obstruction without hernia	163	0.7

*No total is presented as these are the top-30 principal diagnoses only: the totals do not add up to 100%.

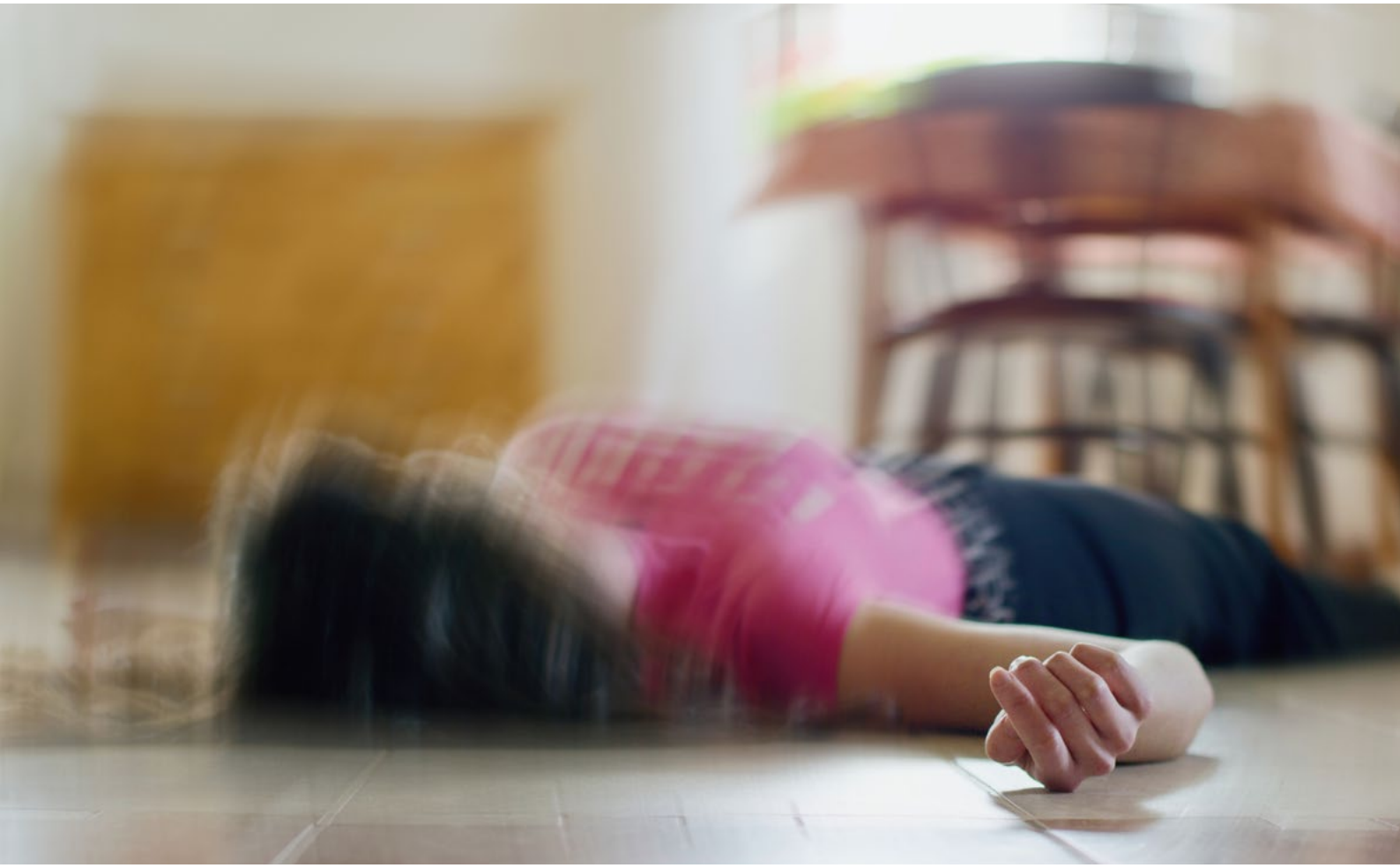
Comorbidities recorded in patients with falls in hospital are summarised in Table 4. The list of comorbidities are based on those summarised by Fernando et al. [9]; additionally, conditions noted by Brand et al. [4] as potentially relevant to falls in hospital and fracture risk are also included. Seizures and syncope have also been added to the list of comorbidities as these result in temporary loss of consciousness and could result in a fall. Conditions that are listed in the diagnoses codes but have a prefix of "C", indicating that they arose during hospital admission, are not included as comorbidities. The conditions with the highest prevalence in admitted patients with a hospital fall are diabetes with chronic complications; delirium; diabetes without complications; malignancy and dementia. The conditions with the highest rates of hospital falls per 1000 admissions, were: dementia; delirium; Parkinson's disease; hemiplegia/paraplegia; and ataxia; notably, these top-five are all neurological or neuropsychiatric conditions. The top-five list of comorbidities with the highest rates of falls per 1000 bed days was similar: dementia, delirium, Parkinson's disease, ataxia and seizures/convulsions.

TABLE 4
FALL DURING HOSPITAL ADMISSION, BY PATIENT COMORBIDITY: FREQUENCIES AND RATES IN VICTORIA, 2018/19 TO 2020/21

	Admissions with fall		Admissions total		Falls per 1000 admissions	Falls per 1000 bed days
	N	%	N	%	Rates	Rates
Comorbidities – AICI (Australian Injury Comorbidity Index) [9]						
HIV/AIDS	23	0.1	2,222	0.0	10.4	1.6
Alcohol dependence	1,079	4.4	110,426	1.3	9.8	1.8
Drug dependence	398	1.6	60,320	0.7	6.6	0.9
Any malignancy	3,347	13.7	930,193	10.7	3.6	1.3
Blood loss anaemia	186	0.8	15,507	0.2	12.0	1.8
Cardiac arrhythmias	2,580	10.5	233,227	2.7	11.1	1.9
Cerebrovascular disease	1,925	7.9	73,612	0.8	26.2	2.8
Chronic pulmonary disease	1,762	7.2	136,966	1.6	12.9	2.0
Coagulopathy	644	2.6	44,378	0.5	14.5	2.0
Congestive heart failure	2,626	10.7	124,277	1.4	21.1	2.4
Deficiency anaemias	838	3.4	124,065	1.4	6.8	1.8
Dementia	2,860	11.7	52,037	0.6	55.0	4.3
Depression	1,341	5.5	155,799	1.8	8.6	1.2
Diabetes with chronic complications	4,567	18.7	349,663	4.0	13.1	2.2
Diabetes without complications	4,089	16.7	503,054	5.8	8.1	1.9
Fluid and electrolyte disorders	3,867	15.8	218,142	2.5	17.7	2.3
Hemiplegia/paraplegia	987	4.0	24,321	0.3	40.6	2.9
Hypertension – complicated	139	0.6	5,574	0.1	24.9	2.7
Hypertension – uncomplicated	2,102	8.6	106,031	1.2	19.8	2.3
Hypothyroidism	198	0.8	7,685	0.1	25.8	2.2
Metastatic solid tumour	1,917	7.8	430,639	5.0	4.5	1.5
Mild liver disease	961	3.9	79,725	0.9	12.1	2.0
Moderate or severe liver disease	347	1.4	18,450	0.2	18.8	2.9
Myocardial infarction	591	2.4	55,028	0.6	10.7	1.8
Obesity	127	0.5	31,922	0.4	4.0	0.8
Other neurological disorders	2,077	8.5	126,489	1.5	16.4	2.8
Peptic ulcer disease	135	0.6	17,584	0.2	7.7	1.6
Peripheral vascular disease	598	2.4	45,804	0.5	13.1	1.6
Pulmonary circulation disorders	396	1.6	28,060	0.3	14.1	1.7
Psychoses	625	2.6	58,054	0.7	10.8	0.8
Renal disease including renal failure	2,659	10.9	1,271,610	14.7	2.1	1.2
Rheumatic disease including some other connective tissue disorders	248	1.0	35,500	0.4	7.0	1.5
Valvular disease	366	1.5	31,755	0.4	11.5	1.5
Weight loss	3,613	14.8	126,270	1.5	28.6	2.5
One or more AICI-mortality index flags*	12,921	52.8	2,752,489	31.8	4.7	1.6

	Admissions with fall		Admissions total		Falls per 1000 admissions	Falls per 1000 bed days
	N	%	N	%	Rates	Rates
Other conditions relevant to falls (Brand et al.)						
Ataxia	198	0.8	5,082	0.1	39.0	3.5
Deafness	105	0.4	6,279	0.1	16.7	2.3
Delirium	4382	17.9	82,900	1.0	52.9	4.3
Neuromyalgia [nerve related muscle pain]	≤5	≤0.02	1,485	0.0	3.4	0.9
Osteoporosis	689	2.8	26,134	0.3	26.4	2.4
Parkinson's disease	648	2.7	14,477	0.2	44.8	3.6
Vision impairment	269	1.1	11,727	0.1	22.9	2.9
Syncope	324	1.3	48,125	0.6	6.7	2.1
Seizures/convulsions	605	2.5	40,928	0.5	14.8	3.0

AICI= Australian Injury Comorbidity Index [9].
*Relevant conditions: Any malignancy; Cardiac arrhythmias; Chronic pulmonary disease; Coagulopathy; Congestive heart failure; Dementia; Metastatic solid tumour; Mild liver disease; Myocardial infarction; Peptic Ulcer Disease; Renal disease including renal failure



HOSPITAL FALL ADMISSION PROFILE

Hospital admissions can generally be categorised into clinical specialties. Hospital falls in terms of frequencies and rates per clinical specialty are presented in Table 5. A total of 230 admissions were not mapped to a clinical specialty: less than one percent of the data. Of the clinical specialties, neurology, psychiatry, orthopaedics, general medicine and respiratory specialty had the highest number of admissions with a fall during hospital stay. In terms of rates, neurology, psychiatry, vascular, nephrology and cardio-thoracic specialties had the highest rates of falls per 1000 admissions. Falls rates per 1000 bed days were highest in neurology, nephrology, endocrinology, respiratory, and general medicine specialties. Relatively low rates of falls per 1000 admissions as well as per 1000 bed days were observed in renal dialysis, obstetrics and antenatal, and ophthalmology specialty.

TABLE 5
FALL DURING HOSPITAL ADMISSION, BY CLINICAL SPECIALTY: FREQUENCIES AND RATES IN VICTORIA, 2018/19 TO 2020/21

	Admissions with fall		Admissions total		Falls per 1000 admissions	Falls per 1000 bed days
	N	%	N	%	Rates	Rates
Clinical specialty						
Neurosurgery	487	2.0	82,068	0.9	5.93	1.35
Vascular	321	1.3	41,358	0.5	7.76	1.47
Orthopaedics	2,867	11.8	483,102	5.6	5.93	1.33
Neurology	3,153	13.0	315,245	3.6	10.00	2.39
Ophthalmology	46	0.2	271,565	3.1	0.17	0.16
ENT	260	1.1	212,743	2.5	1.22	0.80
Cardio-thoracic	183	0.8	24,282	0.3	7.54	0.73
Cardiology	1,705	7.0	430,788	5.0	3.96	1.43
Dental	*	*	110,252	1.3	*	*
Rheumatology	779	3.2	123,462	1.4	6.31	1.23
Plastics	363	1.5	231,850	2.7	1.57	0.70
General medicine	2,687	11.1	563,771	6.5	4.77	1.48
Psychiatry	3,001	12.4	323,462	3.7	9.28	1.26
General surgery	810	3.3	422,801	4.9	1.92	0.64
Nephrology	333	1.4	43,945	0.5	7.58	1.88
Renal dialysis	*	*	1,143,630	13.2	*	*
Urology	747	3.1	346,199	4.0	2.16	1.05
Gynaecology	98	0.4	266,384	3.1	0.37	0.26
Obstetrics & ante-natal	67	0.3	382,992	4.4	0.17	0.07
Neonatology	54	0.2	222,087	2.6	0.24	0.06
Haematology	552	2.3	285,729	3.3	1.93	0.95
Respiratory	2,332	9.6	356,120	4.1	6.55	1.61
Oncology/radiology	1,301	5.4	682,892	7.9	1.91	1.13
Endocrinology	574	2.4	110,106	1.3	5.21	1.63
Gastroenterology	1,500	6.2	1,176,802	13.6	1.27	0.81
Total[†]	**24,247**	**100.0**	**8,653,635**	**100.0**	**2.83**	**1.08**

*Small cells have been suppressed to maintain data confidentiality.
[†]There were 7698 admissions (0.1%) that did not have an assigned clinical specialty

The numbers and rates of falls during hospital admission, shown by admission and separation type, are provided in Table 6. Although the majority of *all hospital admissions* were elective admissions (58%), the majority of *admissions with an in-hospital fall* were emergency admissions (53%). Statistical admissions (the commencement of a new episode of care within the same hospital stay) accounted for less than one percent of all admissions, but these admissions accounted for 9% of admissions with an in-hospital fall. This is reflected in the rates per 1000 admissions: 29 for statistical admission, 6 for emergency admissions and <2 for elective admissions. Maternity or birth episodes had low rates of falls, both in terms of rates per 1000 admissions and rates per 1000 bed days.

Hospital separation occurs at the conclusion of the hospital admission and therefore, in-hospital fall may affect hospital separation type. Separation type should therefore not be considered as a factor potentially associated with the occurrence of a fall, but rather an admission outcome that is potentially affected by a fall occurrence during admission. The vast majority of all admissions had a separation to private residence/accommodation (93%); however, among the admissions with an in-hospital fall, only 44% had a separation to private residence. Of the admissions with a fall during hospital stay, 11% separated or transferred to an aged care residential facility: in all hospital admissions, this proportion was 1.4%. Please note that these proportions do not take the admission source into account (which could be residential aged care, home or other). Of those with an in-hospital fall, 6% died in hospital, whereas 0.7% of all hospital admissions resulted in death in hospital. The rates of falls per 1000 admissions as well as per 1000 bed days were highest in those with a statistical separation (the commencement of a new episode of care within the same hospital stay) and those who subsequently died in hospital.

TABLE 6
FALL DURING HOSPITAL ADMISSION, BY ADMISSION AND SEPARATION TYPE: FREQUENCIES AND RATES IN VICTORIA, 2018/19 TO 2020/21

	Admissions with fall		Admissions total		Falls per 1000 admissions	Falls per 1000 bed days
	N	%	N	%	Rates	Rates
Admission type						
Emergency (through ED in this hospital and other emergency admissions)	13,023	53.2	2,215,940	25.6	5.9	1.6
Elective admission (other, planned, interim care)	9,224	37.7	5,893,419	58.0	1.6	0.8
Statistical admission	2,121	8.7	73,445	0.8	28.9	2.0
Maternity or birth episode	109	0.44	481,307	5.6	0.2	0.1
Other admission type*	0	0	405	0.005	0.0	0.0
Type of separation						
Separation to private residence/ accommodation	10,789	44.1	8,028,805	92.7	1.3	0.6
Separation and transfer to aged care residential facility	2,731	11.2	121,120	1.4	22.5	2.9
Separation and transfer – other†	6,938	28.4	335,340	3.9	20.7	2.8
Statistical separation	2,255	9.2	75,631	0.9	29.8	3.1
Left against medical advice	242	1.0	46,716	0.5	5.2	1.9
Other separation‡	0	0	405	0.005	0.0	0.0
Death	1,522	6.2	56,499	0.7	26.9	2.9
Total	**24,477**	**100.0**	**8,664,516**	**100.0**	**2.8**	**1.1**

*Posthumous Organ Procurement.
†Separation and transfer to mental health residential facility; separation and transfer to Transition Care bed-based program; separation and transfer to acute hospital/extended care.
‡Posthumous Organ Procurement.

Table 7 summarises the numbers and rates of falls during hospital admission, shown by care type. Overall, the most common admissions by care type were these classified as *Other care (acute) including qualified newborn*; however, these constituted 93% of total admissions but only 69% of admissions with an in-hospital fall. The highest rates of in-hospital falls were observed in admissions with care types recorded as: *Acute, aged persons mental health*; *Geriatric evaluation and management plan*; *NHT (nursing home type)/non-acute*; and *Designated rehabilitation program/unit*. In-hospital falls in these admission care types were particularly high, ranging from 9- to 26- fold the average rate across all care types. The highest absolute number of falls, however, was observed in admissions with care type recorded as Other care (Acute) including qualified newborn: although in hospital falls rates in this group were relatively low, these admissions made up the majority of admissions overall.

TABLE 7
FALL DURING HOSPITAL ADMISSION, BY CARE TYPE:
FREQUENCIES AND RATES IN VICTORIA, 2018/19 TO 2020/21

	Admissions with fall		Admissions total		Falls per 1000 admissions	Falls per 1000 bed days
	N	%	N	%	Rates	Rates
Care type						
NHT/non acute	21	0.1	537	0.01	39.1	1.6
Designated paediatric rehabilitation program/unit	6	0.02	644	0.01	9.3	0.5
Designated rehabilitation program/unit	2,856	11.7	114,548	1.3	24.9	1.6
Palliative care program	568	2.3	25,619	0.3	22.2	2.2
Mental health service						
Mental Health Secure Extended Care Unit (SECU)	13	0.1	608	0.01	21.4	0.2
Acute, Child and Adolescent Mental Health (CAMHS)	16	0.1	6,739	0.1	2.4	0.4
Acute, Aged Persons Mental Health (APMH)	515	2.1	7,082	0.1	72.7	2.6
Acute, specialist mental health	27	0.1	14,887	0.2	1.8	0.3
Acute, adult mental health	711	2.9	187,552	2.2	3.8	0.5
Geriatric evaluation and management program	2,872	11.7	56,916	0.7	50.5	2.5
Maintenance care	32	0.1	1,976	0.02	16.2	1.7
Alcohol and drug program	6	0.02	9,392	0.1	0.6	0.2
Other care (acute) including qualified newborn	16,810	68.7	8,082,169	93.3	2.1	1.0
Unqualified newborn	24	0.1	155,442	1.8	0.2	0.1
Posthumous organ procurement	0	0.0	405	0.005	0.0	0.005
Total	**24,477**	**100.0**	**8,664,516**	**100.0**	**2.8**	**1.08**

NHT=Nursing Home Type

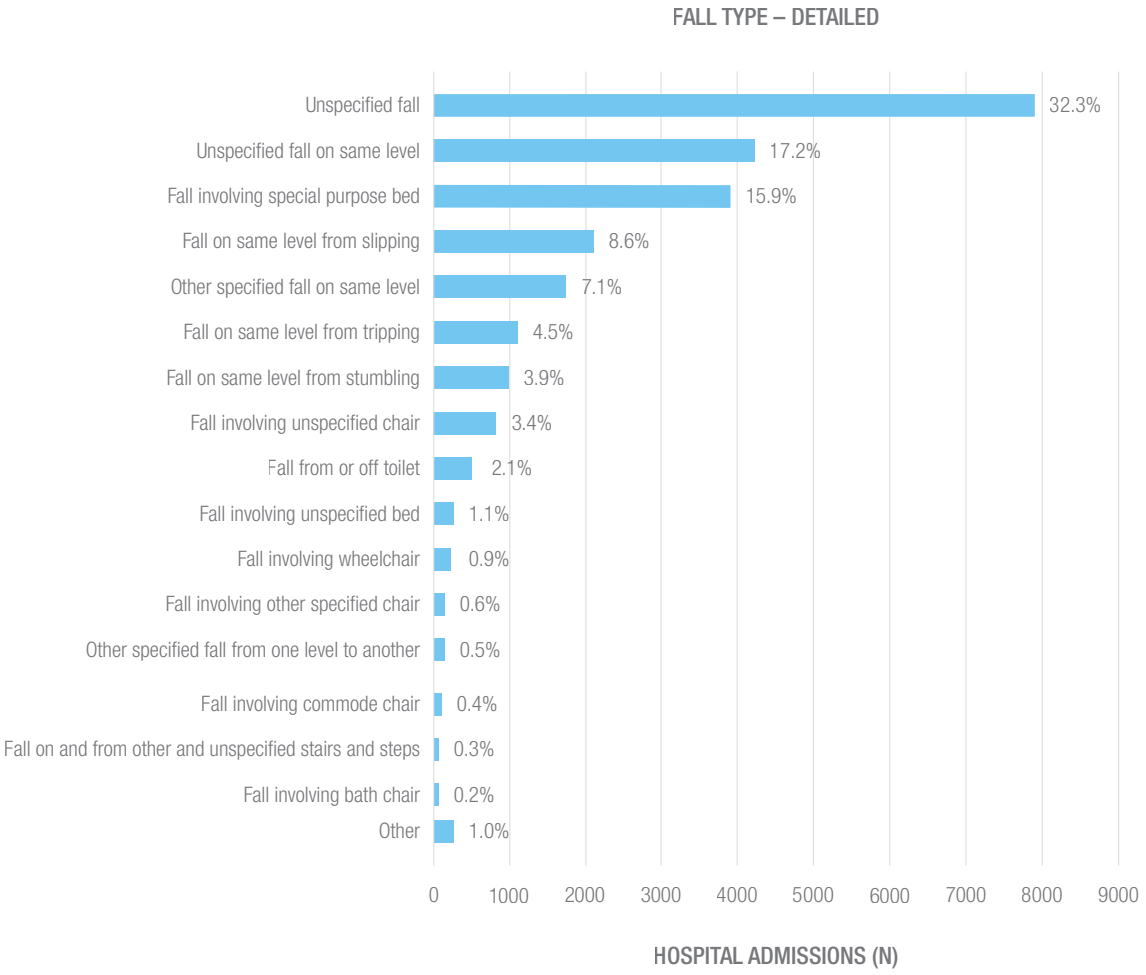
HOSPITAL FALL INJURY PROFILE

The types of injuries sustained in in-hospital falls recorded in hospital admissions in Victoria, 2018/19 to 2020/20 are summarised in Table 8. The most commonly recorded fall types were unspecified fall (32%), followed by other fall on same level (27%) and fall involving a bed (17%). Also, commonly recorded was a fall on the same level from slipping, tripping and stumbling (17%). Falls involving other people, such as fall while being carried or supported by another person, or fall on same level due to collision with or being pushed by another person, were relatively rare (0.1% of cases, each). Falls with a level difference (fall from, out of or through building or structure; other fall from one level to another), were also relatively rare (0.1% and 0.6%, respectively).

TABLE 8
FALL DURING HOSPITAL ADMISSION IN VICTORIA, 2018/19 TO 2020/21:
FALL TYPES (BROAD CATEGORIES)

	ICD-10-AM	N	%
Fall type – broad categories			
Fall on same level from slipping, tripping and stumbling	W01	4,167	17.0
Other fall on same level due to collision with, or pushing by, another person	W03	15	0.1
Fall while being carried or supported by other persons	W04	30	0.1
Fall involving wheelchair	W05	214	0.9
Fall involving bed	W06	4,215	17.2
Fall involving chair	W07	1,144	4.7
Fall involving other furniture	W08	21	0.1
Fall on and from stairs and steps	W10	72	0.3
Fall from, out of or through building or structure	W13	14	0.1
Other fall from one level to another	W17	149	0.6
Other fall on same level	W18	6,539	26.7
Unspecified fall	W19	7,897	32.3
Total	**–**	**24,477**	**100.0**

FIGURE 3
FALL DURING HOSPITAL ADMISSION IN VICTORIA, 2018/19 TO 2020/21:
FALL TYPES (DETAILED)



More detail on in-hospital fall types for admissions in Victoria, 2018/19 to 2020/21 is provided in Figure 3. Although almost one-third of falls were unspecified (32%), detail is provided for the remaining cases. Notably, falls involving a special purpose bed were relatively common (17%) (in the ICD-10-AM, these include falls involving a hospital bed). Other specific causes involving fixtures or products were fall from or off toilet (2.1%), fall involving wheelchair (0.9%); fall involving commode chair (0.4%) and fall involving bath chair (0.2%): these fall types were relatively uncommon.

The diagnoses assigned to the in-hospital falls are summarised in Table 9, which lists the top twenty most commonly encountered diagnoses. Diagnoses are grouped at a three-place ICD-10-AM level. Together, the listed diagnoses make up 87% of all diagnoses. The most commonly listed diagnosis code associated with an in-hospital fall was 'examination and observation for other reasons' (n=8908; 36%). Within this diagnosis group (ICD-10-AM code Z04), there were 8728 cases coded as Z043: *Examination and observation following other accident*; 160 cases coded as Z048: *Examination and observation for other specified reasons*; 9 cases coded as Z045: *Examination and observation following other inflicted injury*; and less than five (each) of Z041*: Examination and observation following transport accident*; Z042: *Examination and observation following work accident*; and Z049: *Examination and observation for unspecified reason*. While overall, 36% of cases were coded to 'examination and observation for other reasons', i.e. a non-injury code, this proportion was 38% for males and 34% for females.

The most commonly recorded injuries associated with an in-hospital fall were open head wound (7%), superficial head injury (7%), and open wound of forearm (5%). However, relatively severe injuries such as intracranial injury and femur fracture were also recorded (1.6% and 1.5%, respectively): this equates to an average of 249 in-hospital falls resulting specifically in femur fracture or intracranial injury per year in Victoria.

TABLE 9
FALL DURING HOSPITAL ADMISSION IN VICTORIA, 2018/19 TO 2020/21:
TWENTY MOST COMMON DIAGNOSES ASSIGNED TO THE IN-HOSPITAL FALL

	ICD-10-AM	N	%
Diagnosis assigned to the in-hospital fall			
Examination and observation for other reasons*	Z04	8,908	36.4
Open wound of head	S01	1,624	6.6
Superficial injury of head	S00	1,609	6.6
Open wound of forearm	S51	1,318	5.4
Other and unspecified injuries of head	S09	1,276	5.2
Other and unspecified injuries of hip and thigh	S79	745	3.0
Other and unspecified injuries of abdomen, lower back and pelvis	S39	716	2.9
Superficial injury of lower leg	S80	694	2.8
Other and unspecified injuries of lower leg	S89	559	2.3
Other and unspecified injuries of shoulder and upper arm	S49	526	2.2
Open wound of lower leg	S81	476	1.9
Superficial injury of forearm	S50	456	1.9
Intracranial injury	S06	386	1.6
Fracture of femur	S72	360	1.5
Open wound of wrist and hand	S61	345	1.4
Superficial injury of abdomen, lower back and pelvis	S30	316	1.3
Other and unspecified injuries of thorax	S29	279	1.1
Superficial injury of hip and thigh	S70	260	1.1
Other and unspecified injuries of neck	S19	247	1.0
Fracture of lumbar spine and pelvis	S32	219	0.9
All other	†	3,158	12.9
Total	**–**	**24,477**	**100.0**

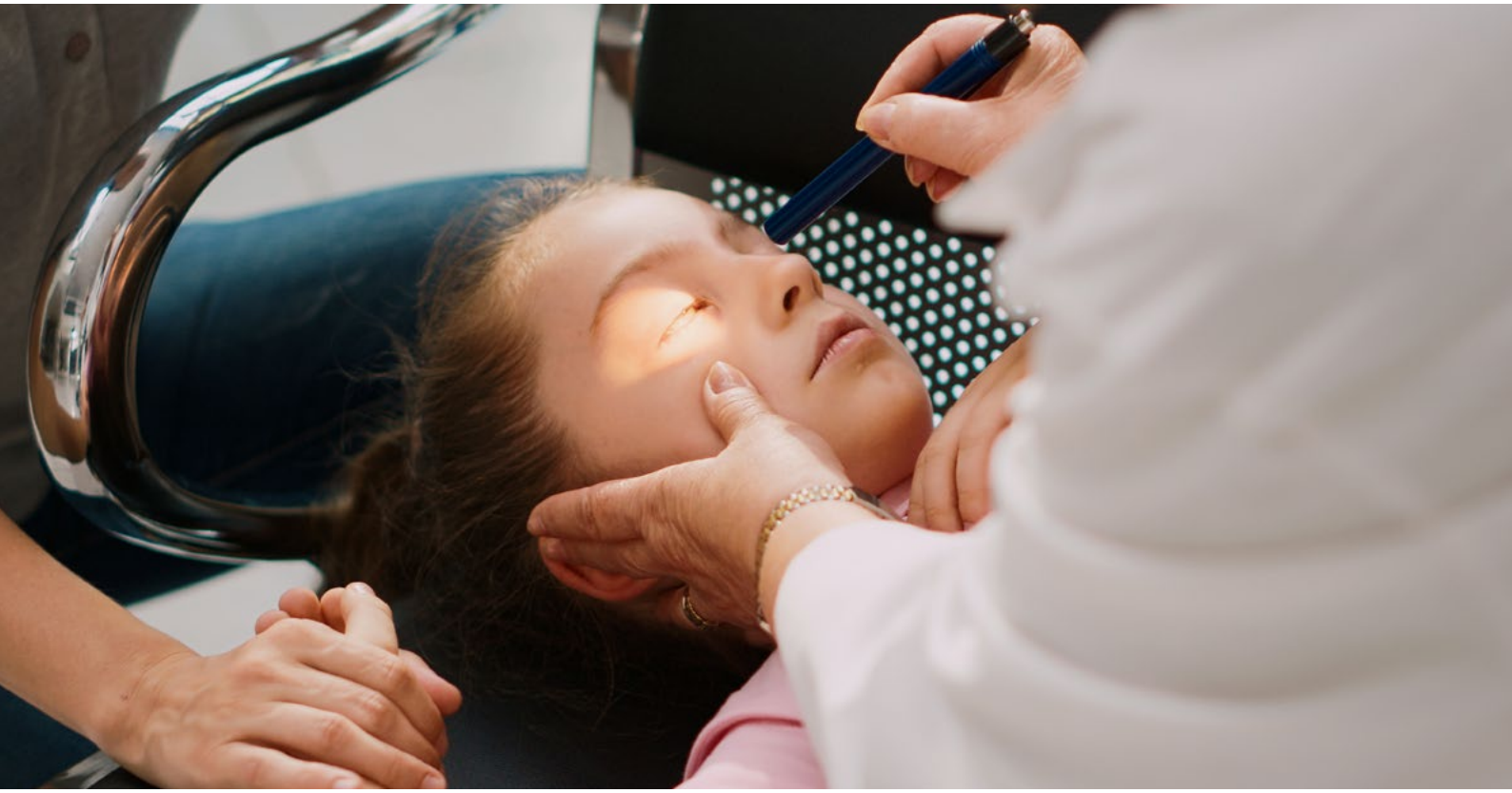
*98% of these were coded to Z048: *Examination and observation for other specified reasons*
†There are 175 unique three-place ICD-10-AM codes that together make up 12.9% of hospital fall-related diagnoses.

The grouped diagnoses resulting from in-hospital falls are summarised in Table 10. More than one-third of cases did not have an injury diagnosis assigned to the fall in hospital (38%); details are provided in the table footnote. The next biggest category was a mixed group of other or unspecified injury types: 20%. Open wounds and superficial injuries were relatively common (17% and 16%, respectively). Fractures resulted from 5.6% of recorded falls in hospital.

TABLE 10
FALL DURING HOSPITAL ADMISSION IN VICTORIA, 2018/19 TO 2020/21:
DIAGNOSIS GROUP ASSIGNED TO THE IN-HOSPITAL FALL

	N	%
Type of injury		
Superficial injury	3,885	15.9
Open wound	4,100	16.8
Fracture	1,373	5.6
Dislocation, sprain and strain of joints and ligaments	184	0.8
Injury of nerves and spinal cord	6	0.0
Injury of blood vessels	79	0.3
Injury of muscle and tendon	472	1.9
Crushing injury	20	0.1
Other and unspecified injuries	4,988	20.4
Other/no injury*	9,370	38.3
Total	**24,477**	**100.0**

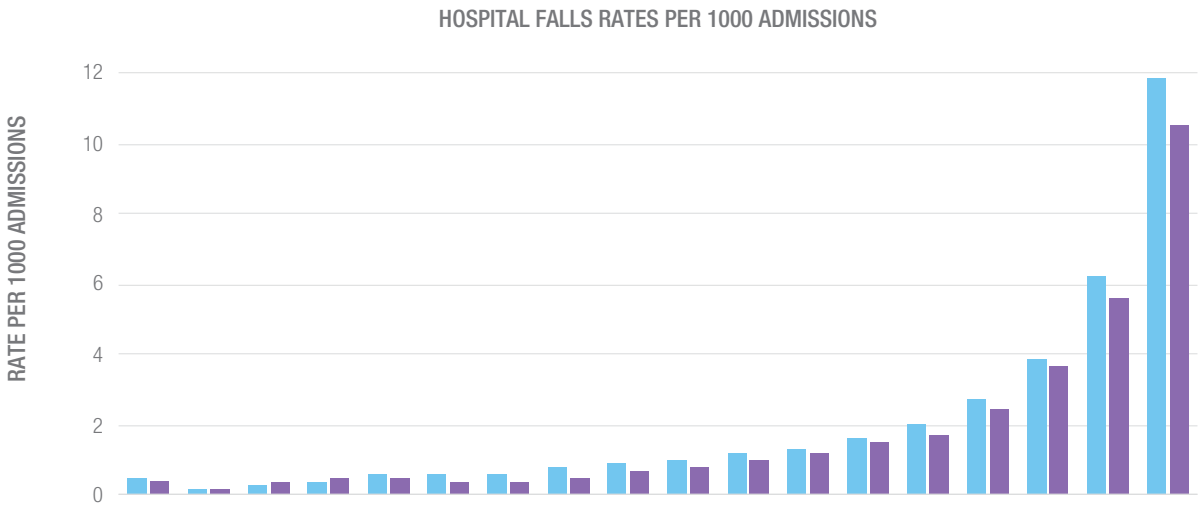
*Of the falls related 'injury' codes that could not be mapped to injury types listed above, 8908/9370 (95%) were Z04 codes (Examination and observation for other reasons); 75 (0.8%) were Z03 codes (Medical observation and evaluation for suspected diseases and conditions, ruled out); and the remainder of codes each accounted for 0.5% or less of the hospital falls with other or no injury diagnosis codes.



TIME TRENDS – TEN YEARS (2011/12 TO 2020/21)

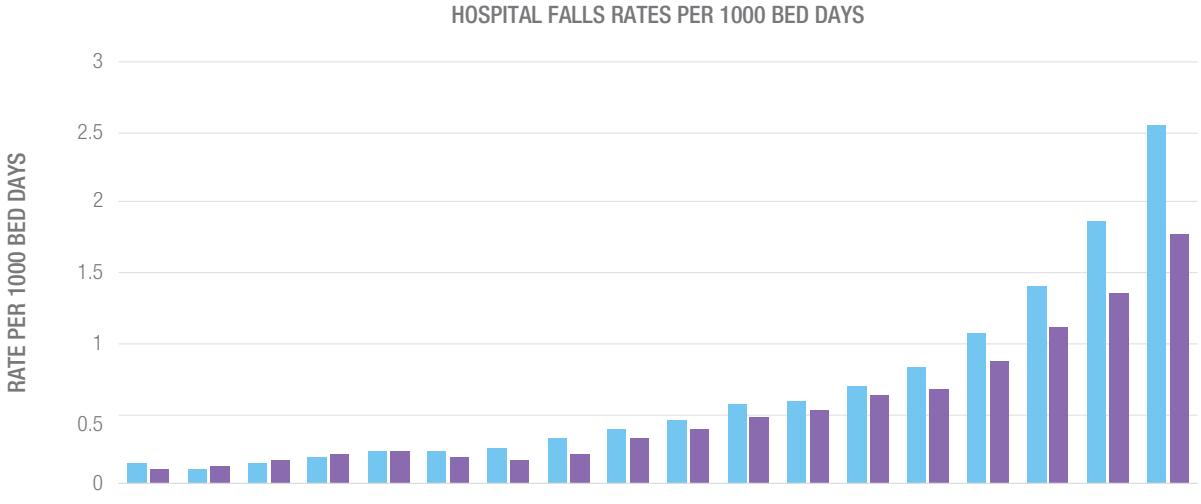
In the ten-year period from 2011/12 to 2020/21, there were 64,821 falls during hospital admission recorded in the Victorian Admitted Episodes Dataset. An overview of frequencies and rates for males and females, by age group, is provided in Table 11. In the ten-year period, frequencies, rates per 1000 admissions and rates per 1000 bed days were higher in males than females, and increased steeply with increasing age. This is shown in more detail in Figure 4 and Figure 5. These figures also show that the male-female difference in the older age groups is more pronounced in rates per 1000 bed days than in rates per admissions.

FIGURE 4
FALL DURING HOSPITAL ADMISSION OVER A 10-YEAR PERIOD (2011/12 TO 2020/21) IN VICTORIA: RATES PER 1000 ADMISSIONS, BY AGE GROUP AND SEX



Years	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
Male	0.45	0.17	0.27	0.42	0.55	0.55	0.60	0.78	0.89	1.02	1.26	1.33	1.62	2.01	2.73	3.88	6.23	11.93
Female	0.34	0.19	0.37	0.47	0.51	0.42	0.39	0.49	0.65	0.84	1.01	1.17	1.49	1.74	2.46	3.65	5.65	10.59

FIGURE 5
FALL DURING HOSPITAL ADMISSION OVER A 10-YEAR PERIOD (2011/12 TO 2020/21) IN VICTORIA: RATES PER 1000 BED DAYS, BY AGE GROUP AND SEX



Years	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
Male	0.15	0.12	0.15	0.20	0.23	0.23	0.25	0.32	0.39	0.45	0.56	0.58	0.69	0.83	1.08	1.39	1.87	2.53
Female	0.11	0.12	0.18	0.21	0.24	0.19	0.17	0.22	0.31	0.40	0.47	0.53	0.63	0.68	0.88	1.12	1.35	1.78

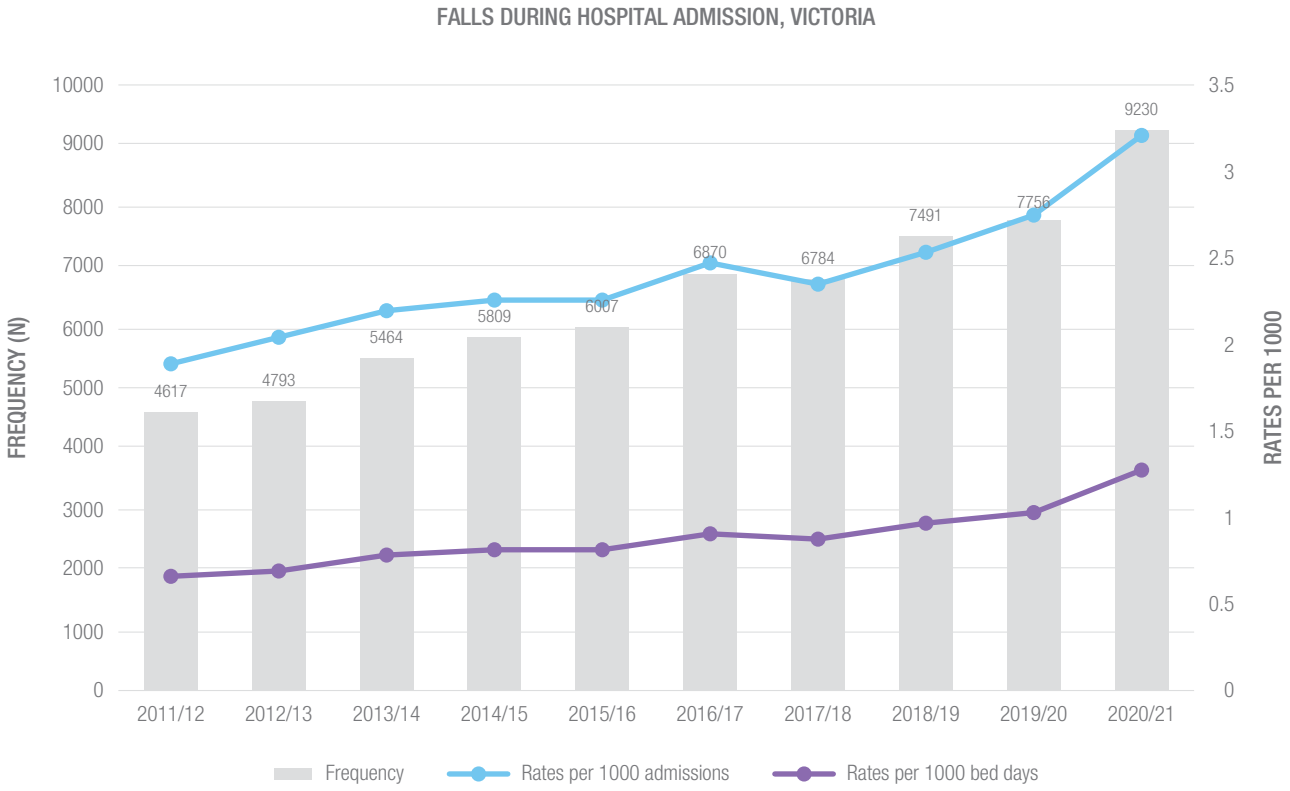
TABLE 11
FALL DURING HOSPITAL ADMISSION OVER A 10-YEAR PERIOD (2011/12 TO 2020/21) IN VICTORIA: FREQUENCIES AND RATES, AND ANNUAL CHANGE IN RATES, BY AGE GROUP AND SEX

	Frequency		Rate per 1000 admissions			Rate per 1000 bed days		
			Average rate (per 1000 admissions)	Annual change in rate (%) per admissions*		Average rate (per 1000 bed = days)	Annual change in rate (%) per bed days*	
				%	[95% CI]		%	95% CI
Male								
0–14 years	408	0.6%	0.4	0.5	–3.1, 4.1	0.1	1.5	–2.0, 5.2
15–24 years	279	0.4%	0.5	6.1	1.8, 10.5	0.2	6.9	2.8, 11.1
25–34 years	412	0.6%	0.6	7.4	2.5, 12.5	0.2	9.6	4.6, 14.9
35–44 years	813	1.3%	0.8	6.3	3.4, 9.2	0.4	7.2	4.5, 10.1
45–54 years	1,651	2.5%	1.2	8.5	6.2, 10.8	0.5	9.2	6.7, 11.8
55–64 years	3,150	4.9%	1.5	6.5	5.3, 7.7	0.6	7.3	6.0, 8.6
65–74 years	6,476	10.0%	2.4	5.4	4.0, 6.8	1.0	6.6	5.1, 8.2
75–84 years	11,339	17.5%	4.9	2.9	1.7, 4.0	1.6	5.2	4.0, 6.4
85 and above	9,926	15.3%	11.9	4.2	2.8, 5.7	2.5	6.2	4.7, 7.7
Total (male)	**34,454**	**53.2%**	**2.7**	**4.4**	**3.9, 5.0**	**1.0**	**6.2**	**5.6, 6.7**
Female								
0–14 years	278	0.4%	0.3	3.4	–1.7, 8.7	0.1	4.6	–0.6, 10.0
15–24 years	445	0.7%	0.5	8.3	5.8, 10.9	0.2	8.5	6.0, 11.0
25–34 years	727	1.1%	0.4	7.7	5.0, 10.6	0.2	9.0	6.3, 11.8
35–44 years	973	1.5%	0.6	5.5	2.7, 8.4	0.3	6.6	3.7, 9.6
45–54 years	1,569	2.4%	0.9	6.2	4.5, 7.9	0.4	6.8	5.0, 8.7
55–64 years	2,664	4.1%	1.3	8.4	7.1, 9.8	0.6	9.2	7.9, 10.6
65–74 years	4,781	7.4%	2.1	5.3	3.6, 7.1	0.8	6.7	4.8, 8.6
75–84 years	8,899	13.7%	4.5	3.1	1.7, 4.5	1.2	5.9	4.5, 7.2
85 and above	10,031	15.5%	10.6	3.1	1.0, 5.3	1.8	5.7	3.4, 7.9
Total (female)	**30,367**	**46.8%**	**2.1**	**4.3**	**3.7, 5.0**	**0.8**	**6.4**	**5.8, 7.0**
Grand total	**64,821**	**100.0%**	**2.4**	**4.4**	**4.0, 4.8**	**0.9**	**6.3**	**5.9, 6.7**

*annual changes in rates are estimates based on Poisson regression modelling, taking age group and sex into account.

The change in frequency and rate of hospital falls over the ten-year period from 2011/12 to 2020/21 is shown in Figure 6. The frequency, change in rate per 1000 admissions and change in rate per 1000 bed days all increased over the ten-year period. Hospital falls time trends were modelled to estimate an average percentage increase per year, accounting for changes in exposure (hospital admissions overall; bed days overall), and patient age group and sex. The results are presented in Table 11. The hospital falls rate per 1000 admissions increased by an average of 4.4% per year during the ten-year period, and the rate per 1000 bed days increased by an average of 6.3% per year. The rate of increase was similar for males and females: 4.4% and 4.3%, respectively, for rates per 1000 admissions, and 6.2% and 6.4%, respectively, for rates per 1000 bed days. The modelled increases in hospital falls rates were statistically significant in all *adult* age groups; the increase was not statistically significant in males or females aged 0–14 years. Although the average modelled rates of change differed by age group, there was no consistent pattern of change with increasing age. Notably, the average increase in rate of hospital falls per admissions was >5% annually for the age bands between 15 and 74 years (but not for the ages 75 years and above): although hospital falls rates were highest in older persons, the *increase in falls rates over time* was not as steep in this age group as in some of the younger age groups.

FIGURE 6
TIME TRENDS IN FALLS DURING HOSPITAL ADMISSION OVER A 10-YEAR PERIOD (2011/12 TO 2020/21) IN VICTORIA: ANNUAL FREQUENCIES AND RATES



The observed increases in falls rates over the ten-year period from 2011/12 to 2020/21 in Victoria could be influenced by various factors other than patient safety: these include changes in patient case-mix over time as well as changes in reporting and recording of patient falls. The latter was explored by separating in-hospital falls into those with a recorded injury in one of the injury type categories presented in Table 10, vs. the 'other/no injury' category presented in Table 10. In the data presented in Table 10, the latter category made up of 38% of cases; the vast majority (95%) of which were coded to 'Examination and observation for other reasons'. These trends are presented in Figure 7 (rates per 1000 admissions) and Figure 8 (rates per 1000 bed days). The rate per 1000 admissions of recorded hospital falls *without injury* rose steeply by 18.5% per year on average (95% confidence interval: 17.7% to 19.4), based on modelling accounting for age group and sex. The rate per 1000 admissions of recorded hospital falls *with injury*, however, did not change statistically significantly.

The rate per 1000 bed days of recorded hospital falls *without injury* also rose steeply and statistically significantly by 20.7% per year on average (95% confidence interval: 19.8% to 21.5%). The rate per 1000 bed days of recorded hospital falls *with injury* also rose but the increase was mild: 1.4% per year on average (95% confidence interval: 1.0% to 1.9%).

These findings suggest that while there may be a mild increase in rates of hospital falls with injury over the ten-year period, there is a pronounced increase in rates of hospital falls without injury. This could potentially be indicative of improved reporting and recording of hospital falls (including those that did not result in injury) between 2011/12 and 2020/21.

FIGURE 7
TIME TRENDS IN INJURIOUS AND NON-INJURIOUS FALLS DURING HOSPITAL ADMISSION OVER A 10-YEAR PERIOD (2011/12 TO 2020/21) IN VICTORIA: RATES PER 1000 ADMISSIONS

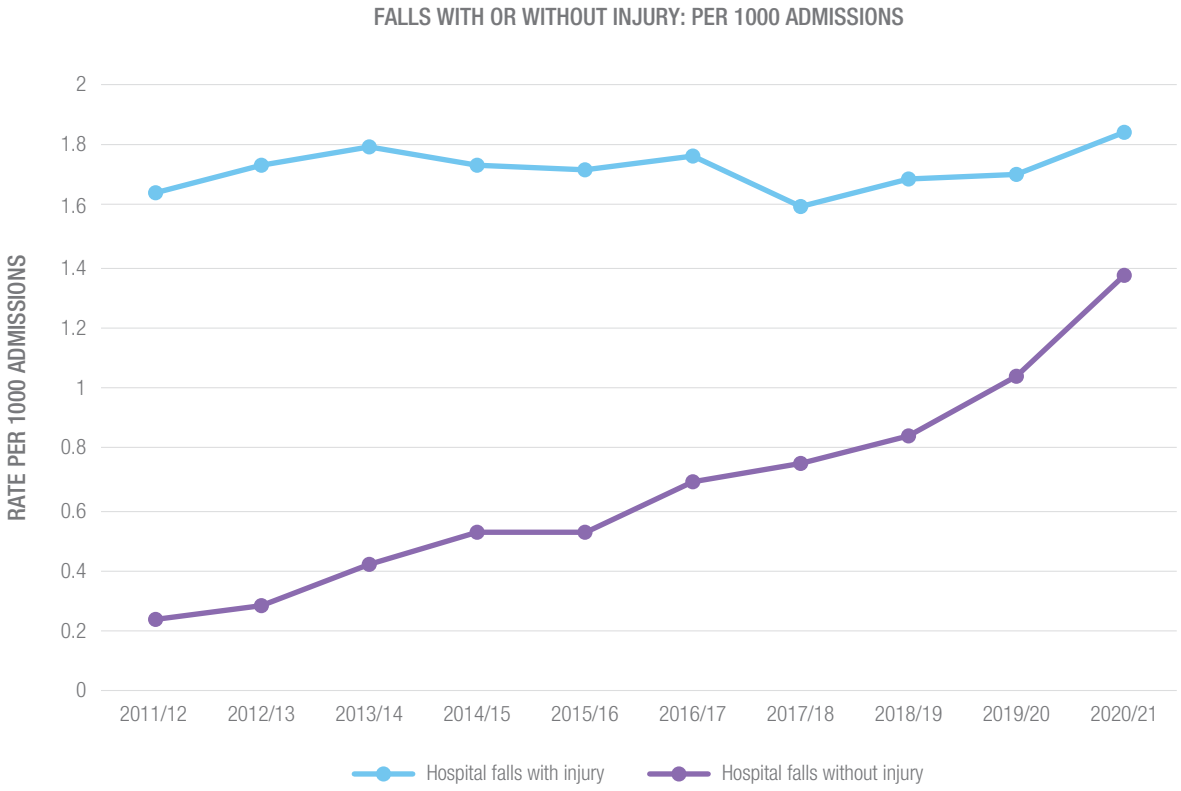
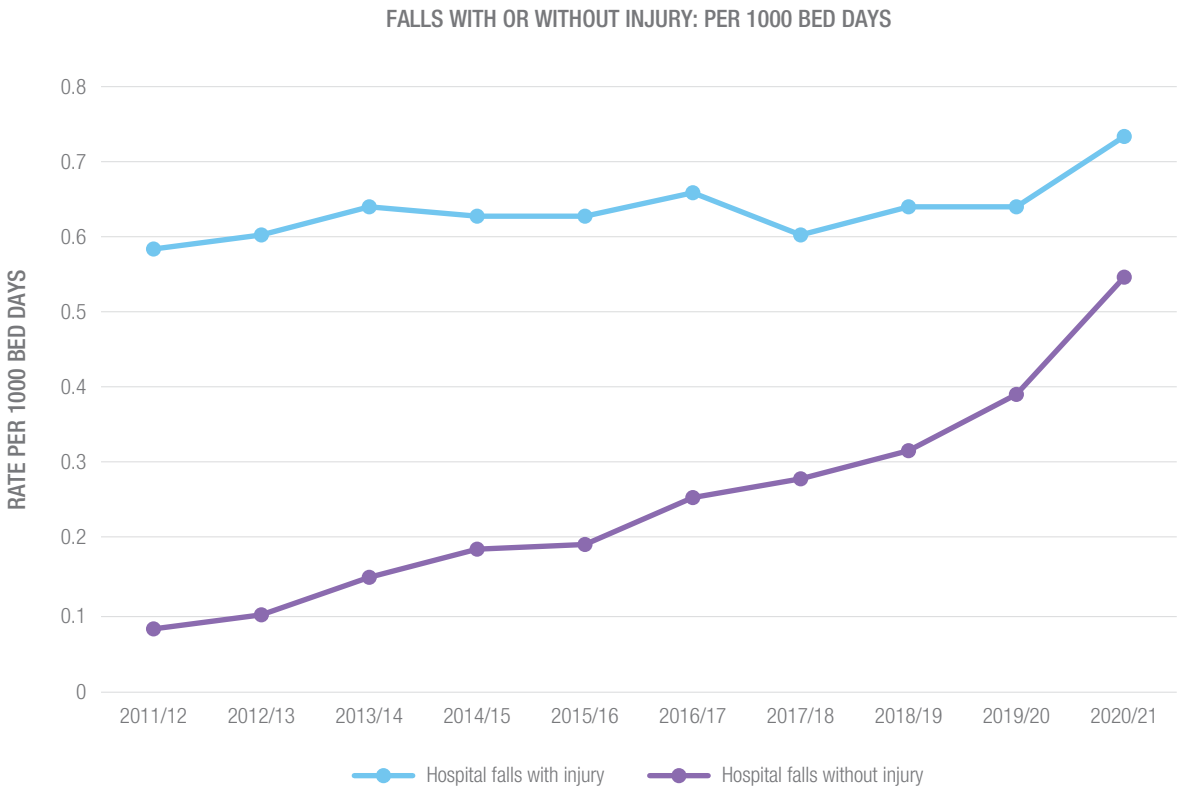


FIGURE 8
TIME TRENDS IN INJURIOUS AND NON-INJURIOUS FALLS DURING HOSPITAL ADMISSION OVER A 10-YEAR PERIOD (2011/12 TO 2020/21) IN VICTORIA: RATES PER 1000 BED DAYS



DISCUSSION

OVERVIEW

This edition of *Hazard* provides a detailed overview of in-hospital falls by patients over the three-year period July 2018 to June 2021. During this time there were 8,664,516 admissions recorded in the VAED with 24,477 recorded falls in hospital: 8159 in-hospital falls per year. Just over 60% of patients experiencing in-hospital falls were aged 75 years and above and more than half (54%) were male. The rate of falls per 1000 admissions ranged from 2.53 (2018/19) to 3.21 (2020/21) per 1000 admissions. Similarly, falls rate per length of stay ranged from 0.95 per 1000 bed days in 2018/19 to 1.28/1000 bed days in 2020/21. While three quarters of hospital falls were recorded in metropolitan hospitals, regional Victorian hospitals recorded higher corresponding fall rates per 1000 admissions and per 1000 bed days. Statistical admissions, the commencement of a new episode of care within the same hospital stay, were associated with relatively high rates of falls during hospital stay: this is not entirely surprising as changes in care type can be an indication of patient frailty and additional or altered care requirement. Patients' comorbidities associated with the highest rates of hospital falls per 1000 admissions were neurological or neuropsychiatric conditions such as dementia, delirium, Parkinson's disease, hemiplegia/paraplegia and ataxia. Among admissions with an in-hospital fall, 11% separated or transferred to a residential aged care facility, compared to only 1.4% for all admissions overall. Same level falls (all types) accounted for 44% of in-hospital falls, followed by 'unspecified falls' (32%) and falls involving beds (17%). More severe injuries included intracranial injury (1.6%) and femur fracture (1.5%) occurring in approximately 249 hospital falls per year in Victoria.

In the ten-year period from 2011/12 to 2020/21, there were 64,821 in-hospital falls recorded during hospital admission in Victoria. Rates per 1000 admissions and per 1000 bed days were higher in males than females, and increased steeply with increasing age. Modelling of hospital falls time trends showed an average increase of 4.4% per year in the hospital falls rate per 1000 admissions; the rate per 1000 bed days increased by an average of 6.3% per year. All adult age groups recorded increases in hospital falls rates that were statistically significant, with average rate increases greatest between the ages of 15 and 74 years. Approximately 38% of patients experiencing an in-hospital fall did not sustain an injury. The rate of non-injurious falls per 1000 admissions rose steeply by 18.5% per year on average (95% CI: 17.7%–19.4%, $p<0.0001$), while there was only a mild increase (not statistically significant) in rates of hospital falls 'with injury' over the ten-year period. This observation could be reflective of improved reporting and recording of hospital falls, in particular non-injurious falls, between 2011/12 and 2020/21.

This report is limited to the analysis of in-hospital falls recorded in the Victorian Admitted Episodes Dataset. Only admitted patient falls are captured: falls in hospital by staff, visitors or non-admitted patients are not included. For more in-depth analysis of in-hospital falls, the Victorian Health Incident Management System Minimum Dataset can provide further information[2].

The COVID-19 pandemic occurred during the study period, which includes 2019/20 and 2020/21. The COVID-19 pandemic had a pronounced impact on hospital admissions, staffing and staffing workload, and visitor traffic (visitors were restricted during the various lockdown periods in Victoria). Quantifying and qualifying the specific impact of COVID-19 on in-hospital falls requires a dedicated analysis that is beyond the scope of *Hazard* 92.

2. https://www.health.vic.gov.au/publications/victorian-health-incident-management-system-minimum-dataset

HOSPITAL FALLS PREVENTION: GENERAL OVERVIEW

Victorian hospitals are a fundamental part of the Australian healthcare system which is made up of both government and private organisations. Funding of public hospital services is jointly shared by the Australian Government and state and territory governments; however, administration responsibilities lie with the states and territories [10]. In addition, the federal government utilises the Medicare scheme to pay for the cost of healthcare using an activity-based system [11]. This federated approach includes a complex interplay of legislative, regulatory and management frameworks to ensure provision of quality and safe healthcare. Preventive services and programs are often a shared responsibility [12].

Preventing falls in the hospital setting is complex and requires a multi-faceted approach. Patients may present with multiple co-morbidities that can influence their fall-risk level. The health care system itself is also complex as it is made up of many layers of care, each of which can potentially influence the quality and level of care being delivered to patients, particularly in terms of patient safety.

The delivery of health care services should always have the patient's needs, wellbeing and safety as first priority. However, balancing health care needs with patient safety measures can be challenging. Examples can include instances where patients are encouraged to move and/or walk around the ward to benefit recovery and rehabilitation but with a (short-term) increased risk of falls.

The reporting of fall incidents, hazards and near misses by health care staff is an important component of the fall prevention process. Health care providers are obligated to work with patients and carers to prevent falls, minimise harm from falls and adhere to post-fall management requirements and standards. A global overview of falls prevention in hospitals is presented below, noting that many of the hospital patient safety issues related to falls prevention are common to residential aged care.

GLOBAL LEVEL

Falls prevention research in hospitals has mainly focussed on older persons as they represent a high-risk fall group [13]. The following is an excerpt from a recent WHO report [14] which listed the following factors associated with a higher fall risk in hospital:

- impact of and recovery from surgery or a specific diagnosis on mobility [15, 16]
- delirium [17, 18]
- the use of particular medications, introduction of new medications and/or other changes to existing medications [15, 16, 19]
- the unfamiliar and unknown environment, leading to challenges in navigation and mobility [15]
- environmental hazards such as inappropriate bed height, poor lighting, uneven flooring, trip hazards, unsuitable chair heights, cluttered surroundings [6, 16, 20–24]
- extended periods of bed rest and immobility during hospital stay, leading to reduced mobility and function [25]. For example, in 2015 it was estimated that in one of France's largest hospitals, 20% of all patients older than 70 years were significantly less able to perform the basic tasks necessary for daily living at the time of discharge than they were when they entered the hospital [26]
- lack of one-to-one patient education on reducing fall risk [27]
- inadequate training or supervision of staff, a lack of protocols or failure to implement protocols [28]
- lack of effective communication between clinical staff and patients, which can undermine opportunities for patients to request mobility assistance and report pain or medication side effects, all of which are related to fall risk [29].

In addition to the above, general factors that affect falls risk in patients of all ages include acute illness, being in pain, inappropriate footwear or clothing, sleeping difficulty, toileting difficulties and dizziness [14].

The World Health Organisation's (WHO) [14] technical report, *Step safely: strategies for preventing and managing falls across the life-course*, recommends that comprehensive falls prevention planning requires a *systems approach* which considers the interaction between several influencing factors such as:

- the patient's biology (frailty, muscle and bone strength, balance, vision and cognitive function)
- the patient's behaviour
- the patient's physical environment
- the patient's cultural and socioeconomic environment

Rather than just focus on the individual, the systems approach creates environments, policies and awareness to prevent falls altogether or where that's not possible, reduce the severity of their outcome. WHO[14] defines three levels of falls prevention: (1) Primary prevention (interventions to prevent falls from happening), (2) Secondary prevention (interventions that reduce the severity of an injury when a fall occurs), and (3) Tertiary prevention (which aims to decrease the frequency and severity of a disability after a fall). In summary, WHO [14] recommends five key interventions to prevent falls in hospital among older patients and these include:

1. Multicomponent interventions
    a. Include standardised service-wide or ward-wide targeted approaches that involve several components such as staff education, patient education, toileting schedules, medication review, environmental modification, patient signage warning of fall risk, patient footwear policies for walking, and exercise.
    b. Nursing staff need to be sufficiently resourced to perform 'regular proactive patient care rounds' such as asking their patients if they're in pain, need assistance with toileting or have easy access to water and other items. All are practices that reduce the need for the patient to constantly call for help and subsequently reduce falls [30].
    c. Targeted and ongoing education of all ward staff, including cleaning and catering staff, to ensure patient safety by removing clutter, allowing easy access to handrails, making sure brakes are applied to hospital equipment with wheels, using night lights and keeping floors and walking surfaces clean and dry [30].
2. Multifactorial interventions
    a. Involve multiple interventions modified to suit an individual patient's needs via fall-risk assessments. These assessments then inform the suite of interventions necessary to address a particular patient's level of fall risk. A fall risk assessment alone is not sufficient to prevent falls: it needs to be accompanied by proven fall prevention measures that are actively adhered to [31, 32].
    b. The WHO report [14] concludes that it is difficult to measure the effectiveness of multifactorial interventions as they can cover a very broad range of intervention types and combinations. However, multifactorial interventions that include individualised patient education, hospital staff training to support the targeted program and patient-to-staff feedback mechanisms were found to be relatively effective in reducing falls among older patients in clinical care [33].
3. Exercise
    a. Exercise is an important fall prevention measure in the home setting but less so in the hospital setting [13, 34]. However, some studies have found that exercise can contribute to falls reduction among patients who have extended stays in hospital [35, 36]. A study by Brown et al. [37] measured the amount of time inpatients spent in three levels of mobility (lying, sitting, and standing/walking) and found that on average, 83% of time in hospital was spent lying in bed and only 3% standing or walking. It is important that older patients in hospital are encouraged to increase their mobility, if it is safe to do so, to improve functional strength and capacity.
    b. The ***"#endPJparalysis"*** movement which started in the UK in 2018 and has been adapted in Victoria (Australia), aims to motivate inpatients to dress in their everyday clothes while in hospital and "have an active recovery to prevent functional decline" [38]. The initiative was implemented in over 33 participating health services in Victoria with some sites reporting an observable *decrease in falls* among their patients taking part [38].
4. Education
    a. Educating patients in hospital about falls prevention can lead to a reduction in falls [33, 39]. This information can be provided in several ways including one-on-one advice, group sessions which can include family members, printed materials/leaflets, visual media or web-based information sources [14]. Education about falls is more effective as a component of a multifactorial intervention, and better suited in rehabilitation wards rather than acute care [13, 33].
    b. Education materials should also be made available in languages other than English, and modified for visual impairment (large fonts, high contrast) and patients with cognitive impairment (simplified language and images) [14].
5. Appropriate footwear
    a. It is highly recommended that older patients in hospital wear appropriate footwear (solid, enclosed shoes) while walking around as opposed to slippers or just socks which are more likely to result in slips/trips [23].

FALLS PREVENTION STANDARDS AND FRAMEWORKS IN HEALTH CARE SETTINGS: AUSTRALIA & VICTORIA

NATIONAL LEVEL

The Australian Commission on Safety and Quality in Health Care's (ACSQHC) key purpose is to lead and coordinate key improvements in safety and quality in health care across Australia. The ACSQHC works in conjunction with patients, carers, clinicians, the Australian state and territory health systems, private sector, managers and health care organisations to deliver better health outcomes and experiences for all patients and consumers [40]. This is primarily achieved through the implementation of the National Safety and Quality Health Service (NSQHS) Standards developed by the ASCQHC in collaboration with the Australian Government, states and territories, the private sector, clinical experts, patients and carers. The main aims of these standards are to protect the public from harm and to improve the quality of health service provision [41]. Accreditation to the standards is mandatory for all hospitals, day procedure services and public dental services throughout Australia. The NSQHS Standards are made up of eight standards which represent specific areas of patient care:

1. Clinical Governance Standard
2. Partnering with Consumers Standard
3. Preventing and Controlling Healthcare-Associated Infection Standard
4. Medication Safety Standard
5. Comprehensive Care Standard
6. Communicating Safety Standard
7. Blood Management Standard
8. Recognising and Responding to Acute Deterioration Standard.

Standard 1 (Clinical Governance Standard) ensures that there are systems in place for patients to receive health care and health services that are safe, effective, integrated, high quality and continuously improving [41]. Part of this standard includes the requirement for health service organisations to implement 'open disclosure' which is described as an open discussion with a patient and carer about an adverse event or incident(s) that resulted in harm to the patient while receiving health care [42]. The elements of 'open disclosure' include an apology or expression of regret, a factual explanation of what happened, an opportunity for the patient to relate their experience, potential consequences of the incident(s), and an explanation of the steps being taken to manage the event and prevent it from recurring [43]. The systematic practice of 'open disclosure' is seen as beneficial to both patients and clinicians involved in adverse events. Health service organisations should provide the necessary training and support for health care staff to be able to recognise and report adverse events with the knowledge that they are contributing to the ongoing improvement in the quality and safety of health care services [43].

While fall-related adverse events are not specifically outlined in Standard 1, falls prevention measures should be taken into consideration within each of this standard's components. Specifically relevant components and associated action items outlined by the ACSQHC [42] include:

- **Governance, leadership and culture –** requires that leaders at all levels in the organisation set up and use clinical governance systems to improve the safety and quality of health care for patients; applies to organisational and clinical leadership
- **Patient safety and quality improvement systems –** these systems are to be integrated with governance processes to enable organisations to actively manage and improve the safety and quality of health care for patients:
  - achieved through policies, procedures and protocols
  - measurement & quality improvement systems
  - risk management systems
  - incident management systems and open disclosure
  - feedback and complaints management systems
  - consideration of diversity and high-risk groups with respect to the planning and delivery of care
  - comprehensive, accurate, integrated & accessible health care records available to clinicians at the point of care
- **Clinical performance and effectiveness:** require that the organisation's workforce has the right qualifications, skills and supervision to provide safe, high-quality health care to patients
- **Safe environment for the delivery of care:** requires that the environment promotes safe and high-quality health care for patients.

Standard 5 (Comprehensive Care Standard) includes specific provisions for fall prevention, harm minimisation and post-fall management and outlines three specific action items within the "Minimising patient harm" sub-category [41]. These include:

- **Action 5.24** – The health service organisation providing services to patients at risk of falls has systems that are consistent with best-practice guidelines for (a) falls prevention, (b) minimising harm from falls, (c) post-fall management.
- **Action 5.25** – The health service organisation providing services to patients at risk of falls ensures that equipment, devices and tools are available to promote safe mobility and manage the risks of falls.
- **Action 5.26** – Clinicians providing care to patients at risk of falls provide patients, carers and families with information about reducing falls risks and falls prevention strategies.

In addition to the NSQHC Standards, the ACSQHC identifies falls prevention as a national safety and quality priority area and has developed falls prevention and harm from falls guidelines specifically for Australian hospital settings caring for older persons (*Preventing Falls and Harm From Falls in Older People: Best Practice Guidelines for Australian Hospitals*)[3] [3]. These include emergency departments, acute and subacute care settings, as well as specialised units. The guidelines are comprehensive and address four main aspects of injury prevention among older people. Part A provides detailed background information as well as a description on falls and fall injuries in Australia. Part B describes standard falls prevention strategies including falls risk screening and falls risk assessment while also taking other important factors into consideration such as cognitive impairment, rural and remote settings, indigenous and culturally and linguistically diverse groups. Part C addresses management strategies for common falls risk factors such as:

- Balance and mobility limitations
- Cognitive impairment
- Continence/incontinence
- Feet and footwear
- Syncope
- Dizziness and vertigo
- Medications
- Vision
- Environmental factors
- Individual surveillance and observation
- Restraints.

Part D looks at minimising injuries from falls by way of hip protectors, vitamin D and calcium supplementation, and osteoporosis management, while Part E provides guidance on responding to falls and aspects of post-fall management [3]. Key messages throughout are that falls are preventable and that fall and injury prevention measures need to be addressed by both frontline workers and by multidisciplinary teams. Involving older patients and their carer(s) in falls prevention plans is an important component in the falls prevention process.

STATE LEVEL: VICTORIA

Safer Care Victoria (SCV): Initiatives and guidelines

Safer Care Victoria (SCV) was established in 2017 following recommendations made from the 2016 review of the Department of Health's governance of quality and safety in Victorian hospitals [44]. SCV is an administrative office of the Department of Health under Section 11 of the Public Administration Act 2004. The organisation works with health services in Victoria to monitor and continuously improve the quality and safety of care that they provide to their patients [45]. They do this by reviewing adverse events, responding to safety risks and issues, and preventing harm by analysing data and identifying areas for improvement [46].

SCV has developed a guide (*Victorian Sentinel Events Guide*) for Victorian public and private health services to assist in the management and mandatory reporting of 'sentinel' adverse events [47]. Sentinel events are defined as adverse events that are "wholly preventable and result in serious harm to, or death of, a patient" and include falls as a sub-category of sentinel events [48].

3. N.B. The ACSQHC is currently working on updating these guidelines. Revised guidelines are expected to be released in 2023/24.

Patient falls commonly occur within Victorian health services and are the most frequently reported incident in the Victorian Health Services Information Management System (VHIMS). SCV and Victorian health services use the VHIMS to report adverse and sentinel events that occur in hospitals. Between the period beginning July 2019 to June 2020, 186 sentinel events were reported to SCV, of which 13% (n=25) were patient falls. Most of these patients were aged 65 years and above (92%) with their falls commonly occurring on a ward (excl. patient's room) or in the patient's room. All had significant co-morbidities which affected treatment and further intervention following their fall [2]. Root Cause Analysis (RCA) reports were conducted for each event which identified 82 findings (root causes) with frequent themes such as documentation and assessment tools (e.g. incomplete falls assessment), patient factors (e.g. comorbidities), workforce factors (e.g. inadequate skill mix) and teamwork factors (e.g. lack of clear handover between teams). This was followed-up with 94 recommendations based on RCA reviews.

More recently, SCV has developed the *Falls Review Tool* to address some of the shortcomings of the RCA approach in analysing fall incidents which only focuses on linear causes stemming from a singular event [49, 50]. The tool uses a human factors (systems thinking) approach based on other adverse event review methodologies such as AcciMap, Bowtie and London Protocol. The *Falls Review Tool* [49] includes several core principles identified as central to the review process:

- Falling is not inevitable
- Not all falls are preventable
- There is dignity in taking risks
- Multidisciplinary approach
- A patient's risk of falling is personal and dynamic
- Advanced care planning
- Focus on systems
- Just culture
  - Definition and resources available here: https://www.safercare.vic.gov.au/support-training/adverse-event-review-and-response/just-culture-training-and-resources
- Duty of candour
  - Definition and resources available here: https://www.safercare.vic.gov.au/support-training/adverse-event-review-and-response/duty-of-candour

The tool can be accessed here: SCV Falls Review Tool: A user guide for reviewing adverse patient safety events relating to falls. Link to Tool, Guide and Review Template: https://www.safercare.vic.gov.au/improvement/projects/older-people-and-palliative-care/falls-review-tool-pilot-project.

Other relevant SCV resources and initiatives related to in-hospital falls include:

- *SCV Policy: Adverse patient safety events*. Link to policy: (https://www.safercare.vic.gov.au/publications/policy-adverse-patient-safety-events)
- *SCV Victorian sentinel event guide*. Link to guide: https://www.safercare.vic.gov.au/publications/sentinel-events-guide
- 100,000 Lives is a five-year program to reduce harm and improve outcomes through small and large-scale improvement projects. Fall prevention-related projects include the *Delirium Collaborative* which involved screening older patients for hospital-acquired delirium within 24 hours of admission. Delirium causes disorientation among patients and can increase the risk of falling in unfamiliar environments such as hospitals. See link for further details: https://www.safercare.vic.gov.au/100000lives/projects/delirium.
- Another associated project, *Creating Age-Friendly Health Systems in Victoria*, uses the US-based '4Ms' framework (what matters, medication, mind and mobility). The framework assists health care workers to improve older person's healthcare experience and outcomes that matter to them while they're in their care. See link for further details: https://www.safercare.vic.gov.au/100000lives/projects/creating-age-friendly-health-systems-in-victoria
- SCV has also developed the *Victorian Clinical Governance Framework* which can be accessed via this link: https://www.safercare.vic.gov.au/publications/clinical-governance-framework.

KEY MESSAGES AND OBJECTIVES FOR FALLS PREVENTION IN HOSPITALS

1. Falls prevention in health care is subject to complex organisational, clinical and systems-related factors that need to be taken into consideration.

2. Falls and injury prevention in the health care setting requires a multi-faceted approach by all levels of the hospital workforce, including frontline workers and multidisciplinary clinical teams.

3. As in-hospital falls differ by setting, patient case-mix and recording practices, local timely falls statistics are necessary for ongoing development of prevention practices and to track their impact. Utilising in-hospital falls data in the VAED serves this purpose and provides the potential for additional patient follow-up through data linkage of health service utilisation records over time and across the continuum of care. Data analysis could be further enhanced with potential linkage to the Victorian Health Services Information Management System (VIHMS).

4. As patients continue to fall while in hospital, adequate mechanisms need to be in place to address falls prevention; and for when falls do occur, reduce the severity of their outcome. In addition, thorough incident reporting systems and post-fall management continues to be an important process in relation to patient safety.

5. Health care providers need to continue to meet mandatory requirements and obligations of the National Safety and Quality Health Service (NSQHS) Standards set out by the ASCQHC.

6. Continued compliance with ACSQHC NSQHS Actions:

    a. **5.24** – The health service organisation providing services to patients at risk of falls has systems that are consistent with best-practice guidelines for (a) falls prevention, (b) minimising harm from falls, (c) post-fall management.

    b. **5.25** – The health service organisation providing services to patients at risk of falls ensures that equipment, devices and tools are available to promote safe mobility and manage the risks of falls.

    c. **5.26** – Clinicians providing care to patients at risk of falls provide patients, carers and families with information about reducing falls risks and falls prevention strategies.

7. Consistent and comprehensive education and awareness around falls prevention for patients, their families and carers and healthcare staff are important and effective prevention measures.

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APPENDIX A: DEFINITIONS, DATA SOURCES AND CASE SELECTION

The scope of this edition of *Hazard* is limited to falls during hospital admissions in Victoria. Patients of all ages are included.

VISU DEFINITIONS

Injury – commonly defined as: 'any unintentional or intentional damage to the body … caused by exposure to physical agents such as mechanical energy, heat, electricity, chemicals, ionizing radiation interacting with the body in amounts or at rates that exceed the threshold of human tolerance' [51, 52].

The human intent of injury is determined by the treating clinician's assessment of the most likely human intent in the occurrence of the injury or poisoning event. This decision is made on the basis of the information available at the time the ED presentations/hospital admission is recorded [53]. The following intent definitions have been derived from the ICD-10-AM Manual, 11th edition (July 2019) [54].

Unintentional injury – injuries that are unintended, often described as 'accidents'; the term 'accidents' is usually avoided as it implies that injuries are random events due to chance.

Intentional injury (self-harm) – purposely self-inflicted poisoning or injury, suicide (attempted)

Intentional injury (assault) – injuries inflicted by another person with intent to injure or kill, by any means; homicide

Undetermined intent injury – injuries that are not specified as unintentional, self-inflicted with intent to self-harm, or assault. This category is applied when the intent is unspecified, unstated or cannot be determined.

Legal intervention injury – injuries inflicted by the police or other law enforcing agents, including in the course of arresting or attempting to arrest, on lawbreakers, suppressing disturbances, maintaining order, and other legal action.

Community injury – an injury that occurs in the community and has a first diagnosis code in the ICD-10-AM code range of S00-T75 or T79 (excludes medical injuries).

Incident admission/ED presentation – (VAED) an episode of care that was not a statistical separation from another unit within the same hospital or transfer from another hospital, and not a repeat admission for the same injury; (VEMD) excludes ED return visits and prearranged visits.

DATA SOURCE

HOSPITAL ADMISSIONS

Hospital admissions data were extracted from the Victorian Admitted Episodes Dataset (VAED), which records all admissions to public and private hospitals in the state of Victoria, including rehabilitation centres, extended care facilities and day procedure centres. The VAED includes demographic, clinical and administrative details for every admitted episode of care. VAED data is used to provide equitable funding to public hospitals under the Casemix system, support health service planning, policy formulation and epidemiological research, and meet national data reporting requirements [55]. The coding in the VAED conforms to the definitions in the National Health Data Dictionary (NHDD) [56].

The clinical details include forty diagnosis codes that include injury and external cause information coded according to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM). Hospital admissions between 01 July 2011 and 30 June 2021 were selected.

CASE SELECTION

Case selection of hospital admissions was not limited to incident admissions: repeat admissions and transfers within and between hospitals were not excluded. Case selection was restricted Victorian residents and patients with sex 'male' and 'female'.

Hospital falls records were selected as admissions with one of the ICD-10-AM codes for falls that are potentially relevant to falls in hospital: W01, W03-W08, W10, W13, W17–19 [4]. Falls codes that were omitted were W02 (fall involving ice-skates, skis, roller skates etc.), W11 (fall on and from ladder), W12 (fall on and from scaffolding), W14 (fall from tree), W14 (fall from cliff) and W16 (diving or jumping into water causing injury other than drowning or submersion). The included falls codes could occur anywhere in the 40 diagnosis codes fields. Only falls with corresponding prefix 'C' indicating that the falls arose during admission were included.

The condition resulting from the fall was identified as the ICD-10-AM diagnosis code directly preceding the hospital fall code. Not all of these were injury codes, as demonstrated in the Results section. To account for multiple consecutive cause diagnosis codes, the following selection method was used: if the ICD-10-AM diagnosis code directly preceding the hospital fall was in the 'V' or 'W' range, the next preceding diagnosis code was selected. This process is shown in the data selection schematic below.

Hospital fall	Condition	Diagnosis associated with hospital fall
tdiag(k) in (W01, W03-W08, W10, W13, W17–19) & tpref(k)='C'	If tdiag(k-1) is in 'V' or 'W', skip to next line.	tdiag(k-1)
tdiag(k) in (W01, W03-W08, W10, W13, W17–19) & tpref(k)='C'	If tdiag(k-2) is in 'V' or 'W', skip to next line.	tdiag(k-2)
tdiag(k) in (W01, W03-W08, W10, W13, W17–19) & tpref(k)='C'	If tdiag(k-3) not in 'V' or 'W'	tdiag(k-3)

APPENDIX B: STATISTICAL ANALYSIS

Falls rates were calculated as hospital falls per 1000 admissions and hospital falls per 1000 bed days. The denominator (or exposure data) was the total number of admissions by male and female Victorian residents during the same time period. These rates were stratified by financial year, age group, sex, region of residence, hospital location, hospital type, patient comorbidities, clinical specialty, admission type and separation type.

Trend analysis: changes in the rates of admissions over time were modelled using Poisson models, as trends in the annual number of events, with the log of all admissions (exposure data) as offset. All models contained financial year (time indicator) and were adjusted for age group and sex, where possible (i.e. unless the analysis was limited to a single age group or sex). The percentage change per year was calculated as: $[e^{\alpha} - 1] \times 100$, where α is the model-estimated rate of increase or decrease. The analyses were conducted using the PROC GENMOD procedure in SAS V9.4.

HAZARD EDITION INDEX

VISU GENERAL INFORMATION AND RESOURCES

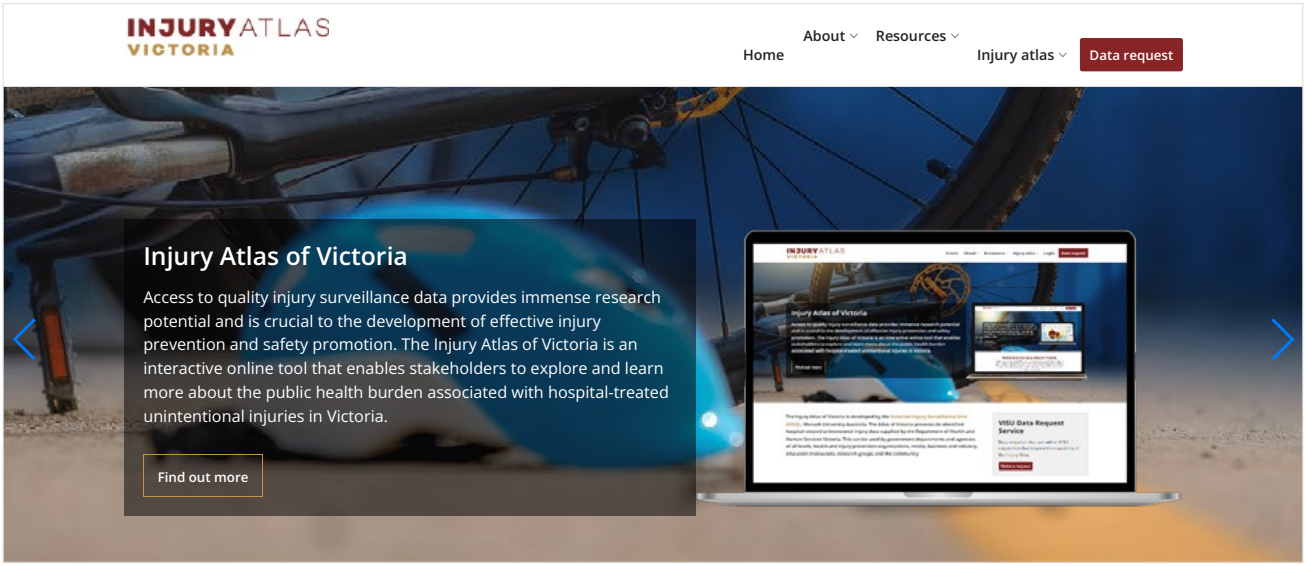
VAED INCLUDES ALL VICTORIAN PUBLIC AND PRIVATE HOSPITALS

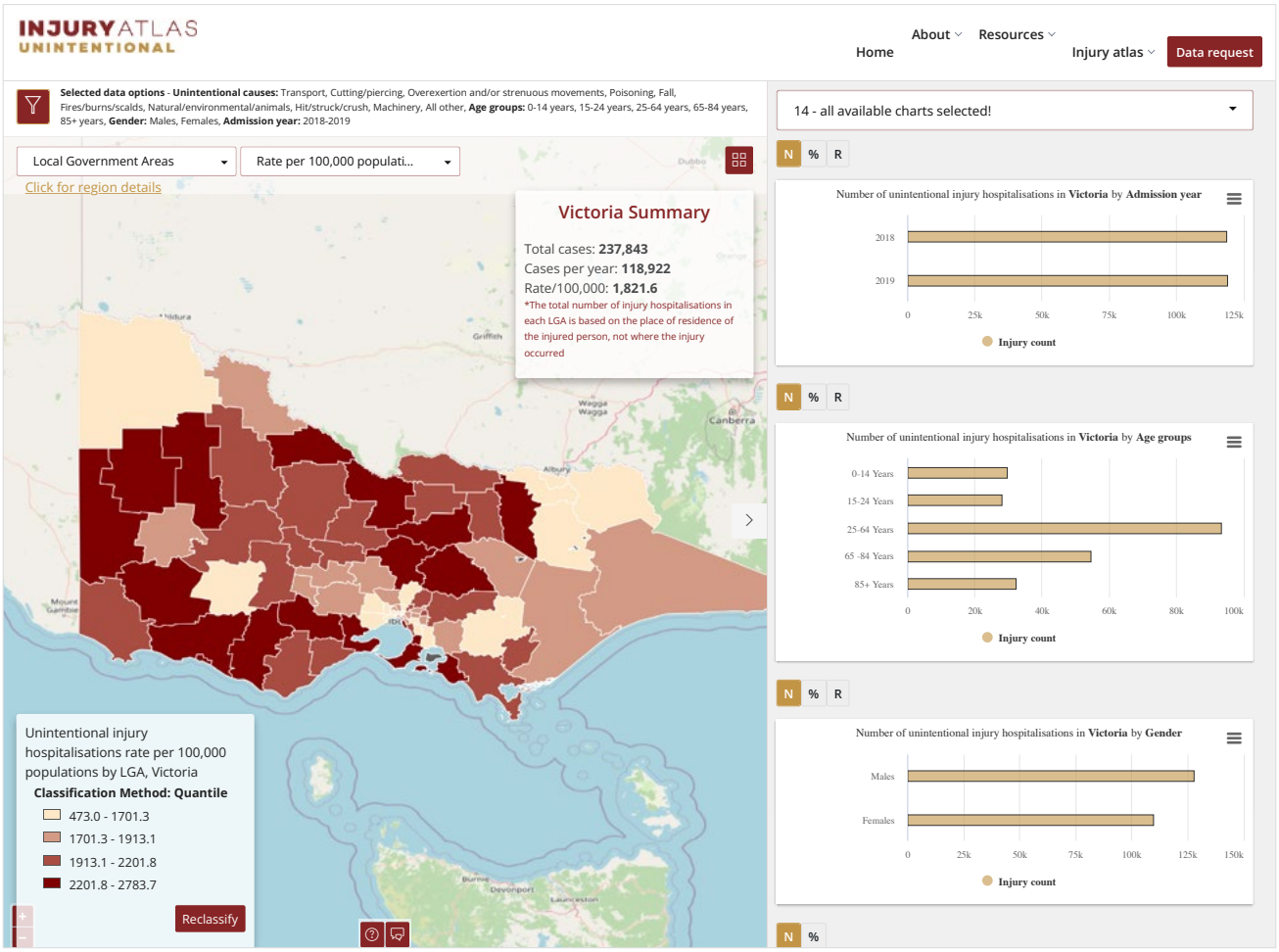
VEMD participating hospitals (Revised December 2022)	
From October 1995 Austin Hospital Ballarat Base Hospital Bendigo Hospital Box Hill Hospital Echuca Regional Health Footscray Hospital Geelong Hospital, The Goulburn Valley Health (Shepparton) Maroondah Hospital Mildura Base Hospital Northeast Health Wangaratta Northern Hospital, The (Epping) Royal Children's Hospital, The (Melbourne) St Vincent's Hospital Melbourne Warrnambool Base Hospital Williamstown Hospital Wimmera Base Hospital (Horsham) **From December 1995** Frankston Hospital Royal Victorian Eye & Ear Hospital, The **From January 1996** Latrobe Regional Hospital **From July 1996** Alfred Hospital, The Monash Medical Centre (Clayton)	**From September 1996** Angliss Hospital **From January 1997** Royal Melbourne Hospital **From January 1999** Dandenong Hospital Sunshine Hospital Werribee Mercy Hospital **From December 2000** Rosebud Hospital **From January 2004** Bairnsdale Regional Health Service Central Gippsland Health Service (Sale Hospital) Hamilton Base Hospital Royal Women's Hospital, The Sandringham Hospital Swan Hill District Health West Gippsland Healthcare Group (Warragul) Wodonga Hospital **From January 2005** Mercy Hospital for Women (Heidelberg) **From April 2005** Casey Hospital **From July 2011** Bass Coast Regional Health

INJURY ATLAS OF VICTORIA

The *Injury Atlas of Victoria* is a new web-based tool that allows the exploration of hospital-treated unintentional injury, transport injury, sports injury and fall injury in Victoria and further enhances the services that VISU provides. It was developed by VISU at Monash University and presents de-identified hospital-treated unintentional injury data supplied by the Victorian Department of Health. This can be used by government departments and agencies of all levels, health and injury prevention organisations, media, business and industry, education institutions, research groups and the community.

The Injury Atlas of Victoria web-based application can be accessed at this address: **https://vicinjuryatlas.org.au/**





How to Access VISU Data

VISU collects and analyses information on injury problems to underpin the development of prevention strategies and their implementation. VISU analyses are publicly available for teaching, research and prevention purposes. Requests for information can be lodged via the data request form on the VISU website or by contacting the VISU office by phone.

Contact VISU at

MUARC – Monash University Accident Research Centre
Building 70, 21 Alliance Lane
Monash University
Clayton Campus
Victoria, 3800
Phone: (03) 9905 1805
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All issues of *Hazard* and other information and publications of the Monash University Accident Research Centre can be found on our internet home page:

www.monash.edu/muarc/visu

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