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This edition of Hazard provides an overview of child falls in Victoria. The article draws on the extensive previous work undertaken by the Monash University Accident Research Centre and utilises available sources to provide an update of the child fall data.

Child fall injuries: an overview

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Summary

Falls are the leading cause of non-fatal child injury, representing 41% of hospitalisations and 42% of emergency department presentations for child injury in Victoria.

Hospitalisation rates for child falls have increased in the 12 years since June 1987. Fall admissions peaks in the 5-9 age group, where most are falls from playground equipment. Fifteen percent of falls resulting in ED presentations subsequently required hospitalisation.

Twelve percent of ED fall presentations were from a height of 1m or above, one quarter of which required hospitalisation, compared to low falls (ie. less than one metre) of which 14% required hospitalisation.

The most common location for all child fall injuries was the home with reduced frequency as the age of the child increased. Conversely, the frequency of falls at areas for sporting activity increased with the age of the injured child.

The most common injuries sustained as a result of a fall by age group, were intracranial injury (<1 year of age; 17.3%); open wounds to the face (1-4 years; 19%); and forearm/wrist fractures (5-9 and 10-14 years; 14% and 12% respectively).

The nature of factors involved in fall injury varies across age groups. This is influenced by the changing range of environments experienced by children as they grow older as well as developmental, sociological and behavioural factors.

Bikes, monkey bars and in-line/roller skates rank within the top 5 factors contributing to child falls at both the moderate and severe levels of injury, accounting for approximately one in five admissions and presentations. Household furniture items, including nursery furniture, are strongly represented in falls to children aged less than 5 years.

The continuing high incidence and severity of falls requiring medical treatment, associated costs and potential for health gain by their prevention, has seen child falls targeted by the Commonwealth Department of Health and Aged Care as an area of high priority and one requiring immediate attention.

Current knowledge of falls prevention should be implemented and new knowledge should be sought through research.

Introduction

Accidental falls are the leading cause of child injury hospital admission nationally, accounting for more than 23,000 hospital admissions in 1996/97 alone (Dept. Health & Aged Care, 1999). Overall, falls account for 41% of all child injury admissions and 42% of emergency department (ED) presentations for injury (Watson et al., 2000).

It is estimated that child falls were responsible for direct costs of $134 million nationally for the year 1993/94, of which $28 million is the cost of inpatient care (Dept. Health & Aged Care, 1999). Allowing for indirect costs, the estimated total lifetime cost of child falls for 1995/96 was $458 million (Dept. Health & Aged Care, 1999).

The continuing high incidence and severity of falls requiring medical treatment, associated costs and potential for health gain by their prevention, has seen child falls targeted by the *National Injury Prevention Action Plan: Priorities for 2000-2002* (Dept. of Health & Aged Care, 1999) as an area of both high priority and immediate attention. The objective of the plan is to decrease the incidence, severity, mortality and morbidity associated with falls in children between the ages of 0-14 years.

This edition of *Hazard* profiles child falls in Victoria drawing on three databases at three levels of severity: all deaths (Victorian Coroner's Facilitation System), all public hospital admissions (Victorian Admitted Episodes Database – VAED; formally VIMD) and approximately 80% of statewide public hospital emergency department presentations (Victorian Emergency Minimum Dataset – VEMD). Exposure data from the Australian Bureau of Statistics (ABS) Home Safety Survey of 1999 is considered, as is the extensive previous work undertaken by the Monash University Accident Research Centre (MUARC) concerning child falls. For the purposes of this article children are defined as persons aged 0-14 years. Analyses will consider four broad age groups: <1 year; 1-4; 5-9 and 10-14 years of age.

Both fall occurrence and injury are associated with childrens' physical, cognitive and social development, age and changing exposure to particular environments and products throughout different stages of life (Ozanne-Smith & Brumen, 1996).

Deaths

The National Injury Surveillance Unit (NISU) reports 173 child fall deaths nationally and 10 in Victoria for the 20 years 1979 to 1998, representing 2% and 0.7% respectively of all child injury deaths in the same period. The definition of fall used by NISU excludes both *falls in, on, or from objects* and *falls resulting in drowning* (www.nisu.flinders.edu.au).

Fall related deaths were extracted from the Victorian Coroner's Facilitation System (CFS) for the period July 1989 to June 1995[1]. A broader definition of falls, to include falls resulting in transport accidents and drowning, was used. In this six-year period, 58 Victorian deaths were associated with a fall, representing 11% of all child deaths for this period. Three-quarters of fall related deaths were to young children (0-4 years of age). The most common causes of these deaths were drownings (43%) or run-overs (motor vehicle, trailer or tractor; 21%; Table 1).

Hospital Admissions

The Victorian Admitted Episodes Dataset (VAED) records hospital admissions for all Victorian public hospitals[2]. In six years (July 1992 to June 1998) of the VAED there were 26,650 Victorian children hospitalised as the result of a fall (Stathakis, 1999). Falls rank first among causes of child hospitalisation across all child age groups ie. 0-4, 5-9 and 10-14 years.

Child fall hospitalisation rates, for all categories, have increased in the 12 years since June 1987, and the increase for children under 5 years of age, is statistically significant (Figure 1). The introduction of casemix funding in Victoria in 1993 has altered coding and admission policies and these must be considered when examining trends in Victorian admissions data.

Child falls leading to death by cause, Victoria **Table 1**

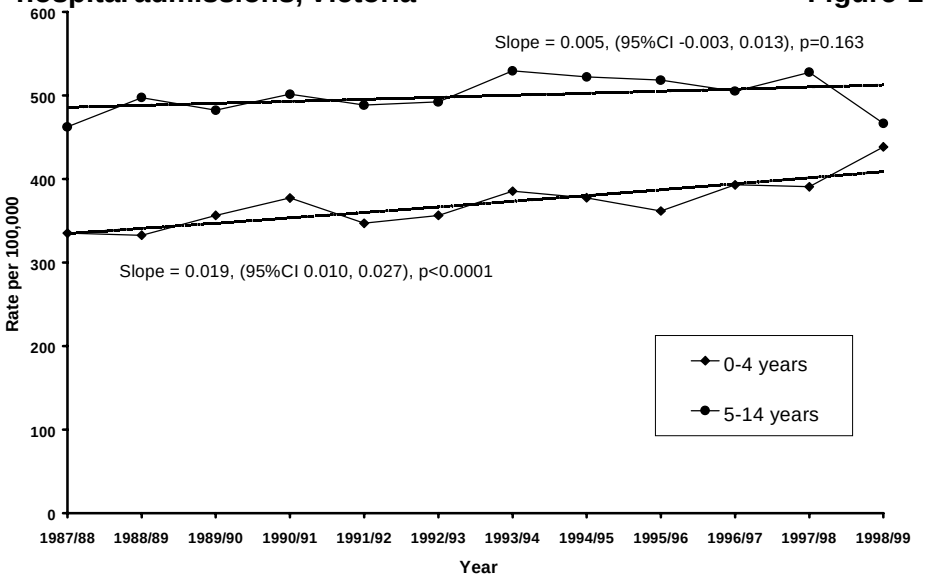
Cause of Death	N	%
Drowning	25	43
- *Swimming pool*	*15*	
- *bore hole/ channel/ dam/ irrigation/ sewage outlet/ storage tank/trough*	*8*	
- *rubbish bin*	*1*	
- *from boat*	*1*	
Run-over	12	21
- *tractor/trailer*	*7*	
- *motor vehicle*	*5*	
Fall from furniture	3	5
Dropped by other person	4	7
Fall from other (incl. horse, cliff, tree, motorcycle, roof, window)	14	24
TOTAL	**58**	**100**

Source: Victorian Coroner's Facilitation System, July 1989 to June 1995

1 Cases were selected by the event leading to injury codes for falls plus a text search of all death narratives for the text terms "fall", "fell", "trip", "slip" and "stumble".

2 Falls were recorded on the ICD external cause of injury or 'E-code' (E880.0 to 888.9) and distinguish between falls on the same level and falls from a height. E-codes are not specific to all fall circumstances but are applicable to falls from stairs, buildings or structures, ladders or scaffolds, playground equipment, chairs or beds; into holes or other openings in surfaces; during sports and falls resulting in fractures. Other falls are recorded in more general categories of falls: different level other; same level trip/slip/stumble (not sport); and other falls on same level.

Fall injuries, children 0-14 years, rates and trends, public hospital admissions, Victoria **Figure 1**



Source: Victorian Admitted Episodes Database, July 1987 to June 1999

The rate of fall admission peaks in the 5-9 age group, where 38% were due to falls from playground equipment (Table 2). Most hospitalised younger children were injured in falls from a different level (more than three quarters of <1 y.o. and approximately two-thirds of 1-9 y.o. In contrast almost half of older children (10-14 years) fell on the same level (45%), one-third during sport. Of falls from a height where the product was specified by the ICD system, 48% of children aged less than 5 years fell from chairs and beds (Table 2).

Changes to the ICD-10-AM coding system

Stathakis (2000) discussed the implications of changes to the International Classification of Diseases coding structure, effective as of July 1998.

Within the context of child falls, a loss of specificity from the previous ICD-9-AM codes means that some product related falls, such as those from trampolines, are no longer identifiable. Other falls such as those from nursery furniture items, along with newly emerging products, such as scooters, were neither identifiable in ICD-9-AM, nor in the new ICD-10-AM system. Of some benefit is the inclusion of a new category for falls from skateboards, rollerskates, ice-skates and skis, however the inability to distinguish between these products means that whilst this code represents an improvement it is not ideal.

Of considerably more benefit, from 2001, will be the ability to identify falls from specific items of playground equipment and during specific sporting activities.

Child falls resulting in hospitalisation*, Victoria, annual average frequency and rates (per 100,000) **Table 2**

Type of Fall	<1 y.o.		1-4 y.o.		5-9 y.o.		10-14 y.o.		Total	
	N (%)	Rate	N (%)	Rate	N (%)	Rate	N (%)	Rate	N (%)	Rate
Falls, different level	**113 (78)**	**181**	**683 (65)**	**267**	**1,271 (66)**	**402**	**482 (36)**	**154**	**2,549 (57)**	**269**
	8	*13*	*43*	*17*	*28*	*9*	*21*	*7*	*100*	*10*
- *Steps/stairs*	*0*	*0*	*9*	*4*	*8*	*2*	*4*	*1*	*21*	*2*
- *Ladders/scaffolds*	*0*	*1*	*33*	*13*	*46*	*15*	*33*	*11*	*112*	*12*
- *Building/structures*	*1*	*1*	*187*	*73*	*733*	*232*	*177*	*57*	*1,098*	*116*
- *Playground equip.*	*45*	*72*	*210*	*82*	*111*	*35*	*35*	*11*	*401*	*42*
- *Chair or bed*	*59*	*94*	*201*	*79*	*345*	*109*	*212*	*68*	*817*	*86*
- *Different level other*										
Falls, same level	**17 (12)**	**28**	**186 (18)**	**72**	**366 (19)**	**115**	**602 (45)**	**193**	**1,171 (26)**	**124**
	10	*16*	*151*	*59*	*244*	*77*	*286*	*92*	*691*	*73*
- *Same level, not sport*	*0*	*1*	*4*	*1*	*42*	*13*	*203*	*65*	*249*	*26*
- *Falls in sport*	*7*	*11*	*31*	*12*	*80*	*25*	*113*	*36*	*231*	*24*
- *Fracture unspecified*										
Other/unspecified falls	**15 (10)**	**23**	**187 (18)**	**73**	**267 (14)**	**84**	**255 (19)**	**82**	**724 (16)**	**76**
TOTAL	**145**	**231**	**1,056**	**413**	**1,904**	**601**	**1,339**	**429**	**4,444**	**469**

** Public hospitals only, July 1992 to June 1998* *Source: Stathakis (1999)*

Emergency Department Presentations

There were at least 69,883 child fall presentations to participant VEMD emergency departments (EDs; see page 19) in the 4 years from January 1996 to December 1999, representing 40% of all child injuries reported in this period.

The VEMD 'Injury Cause' field distinguishes between low falls ie. same level, less than one metre or unspecified height and high falls ie. over 1 metre[3]. Examination of case narratives for horse, bike and motorbike related injuries to children indicated that 55%, 50% and 37% respectively were falls.

Most falls recorded on the VEMD were low falls (84%). Falls from over 1 metre account for 12% of VEMD child falls.

Injury type and severity

Fifteen percent of child falls presenting to VEMD EDs required hospitalisation compared with all child injury hospitalisation rate of 14%. Children in the 5-9 age group had the highest rate of admission (19.6%) compared with a rate of 11% each for the youngest age groups ie. <1 year and 1-4 years and 14% for the 10-14 age group (Table 3).

Fractures represented almost a third of all child falls resulting in ED presentation, sprains and strains 18% and open wounds 17% (Table 4). Infants (<1 year) were much less likely to sustain fractures or strains/sprains than older children but falls in this age group were over-represented for intracranial injury. Open wounds were most prevalent in children 1-4 years of age.

Similarly, patterns for body region injured varied by age group with 44% of injury to young children (<5 years) occurring to the head and face. In contrast, half of the injuries to children aged 5 years or older were to the upper limbs (Figure 2).

Child falls by external injury cause, ED presentations, Victoria **Table 3**

Age in years	External Injury Cause					Total	% of total requiring admission
	Fall up to 1m or height unknown	Fall over 1m	Bicycle related injury (fall)	Motorbike related injury (fall)	Horse related injury (fall)		
	N	N	N	N	N	**N**	N
<1	2,091	311	1	1	1	**2,405**	10.8
1-4	17,921	1,988	196	7	19	**20,131**	11.5
5-9	18,421	3,716	809	102	90	**23,138**	19.6
10-14	20,248	2,071	1,330	292	268	**24,209**	13.8
Total	**58,681**	**8,086**	**2,336**	**402**	**378**	**69,883**	**15**

Source: Victorian Emergency Minimum Dataset, January 1996 to December 1999

Child fall injuries by nature of main injury, ED presentations, Victoria **Table 4**

Nature of Injury	Age in years				
	<1 %	1-4 %	5-9 %	10-14 %	**Total** %
Fracture	7.1	17.8	39.9	36.8	**31.3**
Sprain/strain	3.9	8.6	16.1	27.6	**17.5**
Open wound	9.4	31	14.4	6.9	**16.5**
Superficial injuries	25	12.9	7.8	6.4	**9.4**
Intracranial injury	17.3	7.1	4.3	3.1	**5.1**
Other injury	10.7	8.6	7.3	9.5	**8.5**
Unspecified injury	6	3.4	2.7	3.0	**3.1**
No injury detected	9.1	1.9	0.9	0.7	**1.4**
Missing/ invalid	11.5	8.7	6.6	6.0	**7.2**
Total	**100**	**100**	**100**	**100**	**100**

Source: Victorian Emergency Minimum Dataset, January 1996 to December 1999, n=69,883

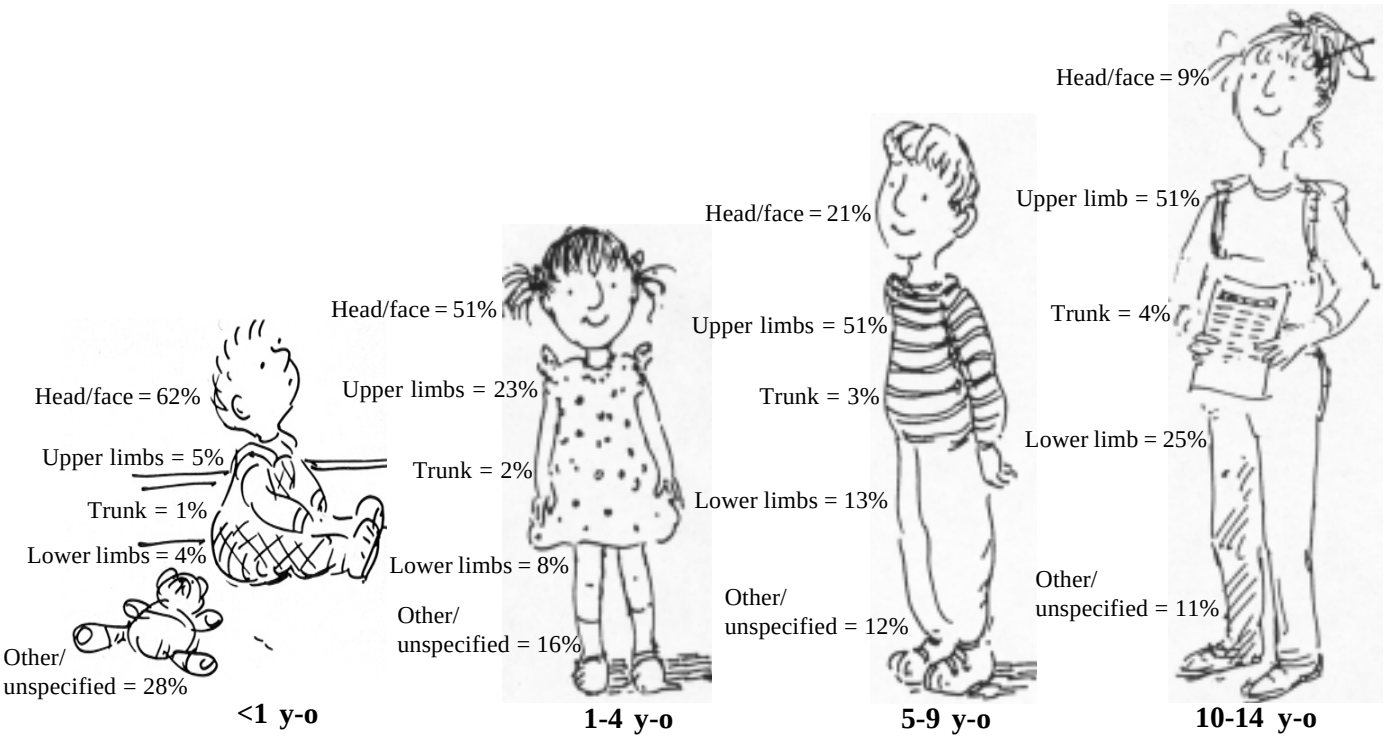
The most common injuries sustained as a result of a fall, by age group, were intracranial injury to infants (<1 year of age; 17.3% of total for age group); open wounds to the face (1-4 age group; 19%); and forearm and wrist fractures (5-9 and 10-14 years; 14 and 12% respectively).

Location

The most common location for all child fall injuries was the home (own or other) with reduced frequency as the age of the child increased (Table 5). Conversely, the frequency of falls at areas for sporting activity increased with the age of the injured child. This pattern is consistent with all child injury and is related to exposure.

3 Falls from bikes, motorbikes and horses are covered by four other 'Injury Cause' codes: horse related; motorcyclist passenger; motorcyclist driver; and pedal cyclist.

Child fall injuries by body region and age group, ED presentations, Victoria — Figure 2



Source: Victorian Emergency Minimum Dataset, January 1996 to December 1999

Child fall injuries by location, ED presentations, Victoria Table 5

Place where injury occurred	Age in years				
	<1 %	1-4 %	5-9 %	10-14 %	**Total** %
Home	84.0	77.3	46.7	30.3	**51.1**
Educational	0.7	4.1	25.4	23.0	**17.6**
Area for sport or recreation	1.7	6.4	13.0	24.6	**14.7**
Road, street or highway	2.5	2.0	5.7	11.2	**6.4**
Area of private enterprise	2.9	2.6	1.3	1.7	**1.9**
Other specified place	4.5	3.8	3.4	3.8	**3.7**
Unspecified place	3.2	3.2	3.8	4.4	**3.8**
Missing/ invalid	0.5	0.7	0.7	1.0	**0.8**
Total	**100**	**100**	**100**	**100**	**100**

Source: Victorian Emergency Minimum Dataset, January 1996 to December 1999, n=69,883

Fall height

Twelve percent of ED fall presentations were from a height of 1m or above and one quarter required admission, compared to low falls (ie. less than one metre) of which 14% required admission.

Fifty-seven percent of VAED reported falls were from a different level. Although there is some question about the reliability of reporting falls from heights, the patterns described by the data are generally as expected with regards to the physical forces acting.

Falls under 1 metre (including unspecified heights)

Falls from low heights, including falls from an unspecified height, accounted for 84% of all VEMD reported falls in children aged 0-14 years (Table 3). VAED admissions data indicated that almost half of older children (10-14 years) fell on the same level (45%), one third of which occurred during sport (Table 2).

Detailed analysis of VEMD data indicated that low falls in younger children were most frequently from furniture items including conventional beds, prams/strollers and tables/benches, for children <1 year of age, and from chairs/stools, tables/benches and conventional beds for children aged 1-4 years. Amongst older children, falls were most frequently associated with recreation. Bicycles ranked highest in low falls for both the 5-9 and the 10-14 year age groups. For 5-9 year olds, bicycles were followed by monkey bars and in-line/roller skates while for the

10-14 year olds, in-line/roller skates and football ranked second and third respectively to bicycles.

ED fall presentations from a low or unspecified height resulted in superficial or open wounds, (excluding the eye) in one third of infants (aged <1) and 44% of the 1-4 age group, mostly to the head and face. Intracranial injuries were prominent among infants (17%) as were fractures in the 1-4 age group (18%).

Fractures were the highest recorded injury to both the 5-9 and 10-14 year age groups resulting in ED presentation. These were most commonly of the forearm/wrist and to a lesser extent the elbow, for 5-9 year olds only. Open wounds of the face and sprains/strains of the ankle, wrist, elbow or forearm were the next most commonly recorded injuries for children aged 5-9 years. After fractures, sprains/strains involving the ankle or wrist were the second most commonly recorded injury for children aged 10-14 years.

VEMD admission rates (including admissions to a ward or within the ED and transfers to other hospitals) were similar for children aged less than 1 (10%), 1-4 years (11%) and 10-14 years (12%), while the admission rate for 5-9 year olds was 18%.

Falls over 1 metre

VAED data showed that younger children are more likely to be hospitalised due to falls from a height. Children aged less than five fell mostly from chairs and beds and those aged 5-9 years from playground equipment (Table 2).

Although less frequent, falls from heights greater than one metre, as reported on the VEMD, are, generally more severe in nature. For children <1 year of age, such falls are commonly from change tables, stair/steps and highchairs and were often associated with infants being left unattended on beds, tables, chairs or bench tops (Watson et al., 2000). Bunk beds, stairs/steps and slides are structures from which children 1-4 years of age fell while children 5-9 years tended to fall from monkey bars, trees and bunk beds. Children aged 10-14 years fall greater heights eg. from trees, horses and monkey bars.

The most common result of a high fall for children aged <1 year was a head injury. Intracranial injury and superficial wounds of the head and face accounted for 45% of all injuries in this age group presenting to EDs. Head injury is the second most commonly recorded injury among 1-4 year olds. This includes intracranial injury along with superficial and open wounds of the head and face. Fractures rated highest for children aged 1-4 (27%), 5-9 (51%) and 10-14 years (41%). Fractures accounted for a higher proportion of high falls that low falls and most commonly involved the forearm, wrist and elbow. Like falls from low heights, sprains/strains involving the wrist or ankle, rated second for high falls among children aged 1-4 years and 10-14 years.

Compared to low falls, VEMD admission rates for high falls increased by approximately 4 to 12 percent for all age groups with the greatest increase (12%) and admission rate (29%), occurring in children aged 5-9 years.

Factors associated with injury causation

The nature of factors involved in fall injury varies across age groups. This is influenced by the changing range of environments experienced by children as they grow older as well as the developmental, sociological and behavioural factors (Ozanne-Smith & Brumen, 1996).

Ozanne-Smith and Brumen (1996), in an earlier review of Victorian child falls data, found that the products most frequently involved in fall related injury, across most levels of severity, were playground equipment, stairs and steps, bicycles, football, chairs and stools, nursery furniture, skates and skateboards, conventional beds and fences/fence posts/poles.

Descriptive text narrative data is valuable for injury prevention purposes as such data enable detailed examinations of injury circumstances in order to identify the factors that contribute to injury, including falls. Analysis of VEMD 100-character text 'Description of Injury Event' data revealed that approximately half of the recorded narratives were of insufficient detail to identify factors contributing to the fall. One third of fall cases repeated the diagnosis eg. "*Injury to left shoulder and forearm*" or "*Head injury with loss of consciousness*" and a further 16% simply stated "*fall*" or "*fell, hurt ribs*".

Ranking of the approximate 35,000 ED presentations with adequate narratives was undertaken by age group and by severity (Tables 6 & 7). The proportion of case narratives with useful detail was greater for admitted cases (55%) than for non-admitted cases (50%).

Table 7 reveals that bikes, monkey bars and in-line/roller skates rank within the top 5 factors contributing to child falls at both the moderate and severe levels of injury, accounting for approximately one in five admissions and presentations. The top 10 factors account for around 42% of each VEMD admitted and non-admitted cases.

Table 6 presents rankings by age group which reveal that household furniture items were represented in 4 of the top 10 rankings in the two youngest age groups. Nursery furniture accounted for most of the remaining items in the <1 age group. As the age of injured child increases so does their exposure to items and activities outside the home, reflected in the predominance of recreational and sporting activities in the 5-9 and 10-14 age groups. Steps and stairs were represented in all age groups.

The following discussion focuses in detail on commonly represented factors associated with child falls as indicated in the VAED and VEMD datasets.

Rank order of factors contributing to fall ED presentations by age group, Victoria **Table 6**

	<1 year	1-4 year	5-9 years	10-14 years
1	Conventional bed	Conventional chair/ stool/seat	Bicycle	Bicycle
2	Pram/stroller/ Carriage	Table/ bench/ counter	Monkey bar	In-line/roller skates
3	Table/ bench/ counter	Conventional bed	Trampoline	Football
4	Change table	Stair/ step	Tree	Basketball
5	Stair/step	Bicycle	In-line/roller skates	Horse riding
6	High Chair	Sofa/lounge/ couch	Slide	Skateboard
7	Sofa/lounge/ couch	Trampoline	Bunk bed	Motor/trail/dirt bike
8	Conventional chair/stool/seat	Slide	Flying fox	Netball
9	Bouncer/ rocker	Bunk bed	Swing	Stair/step
10	Baby walker	Swing	Stair/step	Tree

Source: Victorian Emergency Minimum Dataset, January 1996 to December 1999

Rank order of factors contributing to child fall ED presentations by severity, Victoria **Table 7**

	Admissions	% of cases where factors are known*	Non-admissions	% of cases where factors are known**
1	Bikes	11.2	Bikes	12.5
2	Monkey bars	8.0	In-line/roller skates	4.0
3	Trees	4.2	Stairs/steps	3.7
4	In-line/roller skates	3.8	Chair/stool	3.7
5	Trampoline	3.4	Monkey bars	3.6
6	Slides	2.8	Conventional beds	3.2
7	Horse riding	2.7	Table/bench/counter	3.2
8	Motorbikes	2.2	Trampoline	3.0
9	Chairs/stools	2.1	Nursery furniture (aggregate)	2.7
10	Flying fox	1.8	Football	2.4

** n = 5,756 admitted VEMD cases; ** n = 29,654 non-admitted VEMD cases*
Source: Victorian Emergency Minimum Dataset, January 1996 to December 1999

Recreational items

Bicycles (n = 4,351 VEMD)

Falls from bicycles is the most common factor associated with admitted and non-admitted ED presentations for falls. They are the leading factor in both the 5-9 and 10-14 year age groups (13 and 22% of known factors respectively; Tables 6). Bicycle injuries on the VAED coded as transport, rather than fall injuries, and are indistinguishable from other non-collision motor vehicle traffic accidents.

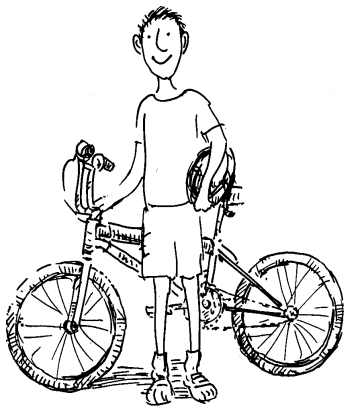
Of the 4,351 falls from bicycles recorded on the VEMD for the 0-14 years age group, most were to children aged 10-14 years (53%) and 5-9 years (35%). Seventy-three percent of injuries were to males. With increasing age bicycle related falls occurred more frequently away from the home ie. on public roads and highways.

Falls from bicycles most often resulted in fractures (27% of total) or open wounds (22%). The proportion of children sustaining fractures increased with age. Intracranial injuries were consistent at 5-6% amongst the age groups. Open wounds to the face were the single most common injury, representing 10% of all injuries.

Fifteen percent of VEMD falls from bicycles resulted in hospital admission with admission rates consistent amongst the age groups. Almost half of admitted cases were fractures, particularly to the forearm/wrist (25% of admitted VEMD cases).

Dinking ie. two or more children on one bike, was reported in only 0.3% of fall injury cases but has been reported elsewhere as a contributing factor to injury (Stathakis, 1997; Ozanne-Smith & Sherry, 1990).

Helmet wearing status was reported in only 1% of VEMD cases again reflecting on the quality of narratives. Ashby et al., (1998) reported helmet wearing rates for children aged 5-11 years of 77% in 1992, however 52% of helmet offences reported by the Victoria Police in the period 1991 to 1997 were to persons aged less than 18 years.



Recommendations

- Promote wearing of bicycle helmets that meet the Australian Standard (AS2063.2-1990)
- Ensure children's bicycles are regularly tested for safety, by a bicycle mechanic if necessary. Safety tests should:
  - check wheels for bending and warping
  - ensure spokes are tight and in place
  - check chains, saddle stems and head stems holding handlebars, at both frame and handlebar ends, for tightness
  - test front forks for strength and stability
  - test brakes to ensure pads are of sufficient depth and brakes are functional
  - ensure saddles are adjusted for correct height
- Monitor the effectiveness of helmet wearing laws by means of cycling rates, helmet wearing rates and comparisons of trends in head injuries versus non-head injuries
- Improve helmet design to include facial protection

In-line & rollerskating (n = 1,414 VEMD)

There were at least 1,414 falls associated with in-line or roller skating presenting to VEMD EDs in the 4 year period under consideration. Most (86%) were associated with in-line skating. Due to their predominance the following analysis focuses on in-line skating injuries.

Almost all injuries were in the 5-14 age group with children aged 10-14 accounting for almost two-thirds of the total; most (58%) were to males. In-line skating falls were most common at home and on public roadways (33 and 28% respectively).

Seventeen percent of injured in-line skaters required hospital admission. Forearm/wrist fractures were the most common injuries. The literature is consistent regarding fractures of the forearm, wrist, elbow and hands being the most common in-line skating injuries, usually the result of falls onto outstretched hands (Routley, 1997).

Sherker and Cassell (1998), in a review of in-line skating injury, found that falls are the direct cause of 85% of in-line skating injury. They found that typical falls involve two scenarios: firstly, novice skaters wearing little or no safety gear either spontaneously lose their balance or strike a road defect or debris and fall onto an outstretched arm onto a hard landing surface. The second scenario involves experienced skaters performing tricks. The main risk factors for injury are the speed at which the skater travels, obstacles in the pathway and hard landing surfaces (Sherker & Cassell, 1998).

Protective equipment provides a barrier between the body and the ground, absorbing or dissipating the potentially injurious forces. Hence, it is generally recommended that skaters wear, and ensure proper fit of, protective equipment including helmet, wrist guards, knee and elbow pads (Sherker & Cassell, 1998).

Recommendations

- Promote use of protective gear such as helmets, wrist guards, knee and elbow pads whilst skating
- Ensure protective gear is of good fit
- Ensure novice skaters take lessons to learn the basics of controlled skating and stopping and "safe fall" techniques in supervised settings eg. lessons provided by hire shops

Skateboards (n = 517 VEMD)

There were at least 517 falls associated with skateboards presenting to participating EDs in the 4-year period 1996-1999. Seventy-seven percent of injured children were aged 10-14 years and 86% were male.

Falls from skateboards were almost as common on public roads (39% of total skateboard falls) as at home (36%). A further 12% occurred at places for recreation such as skate ramps.

While less frequent, falls in young children (1-4 years of age, n = 17), were more severe than for older children (29% admitted 1-4 years vs 18% 10-14 years). Almost a quarter of injured older children sustained fractures, particularly to the wrist/forearm. Imberger (1997) in an earlier review of Victorian skateboard injuries, noted the instinctive reaction to attempt to break falls with outstretched arms, resulting in a force transmitted to the forearm, wrist or elbow.

Falls accounted for approximately 87% of skateboard related ED presentations, including falls from skateboard ramps and bowls which make up 15% of the total. Other falls were associated with skaters hitting road irregularities or obstacles causing the skateboard to stop suddenly and the rider to project forward and fall (Imberger, 1997). Further detail on skateboard injury can be found in *Hazard* 31.

Recommendations

- Modify the wheels on beginner skateboards to increase friction and slow them down ie. soft or used wheels. New fast wheels can be refitted once adequate skills have been acquired
- Promote use of protective gear such as helmets and wrist guards whilst skateboarding
- Ensure boarders receive formal instruction on how to ride skateboards safely ie. learn balance and control, in a supervised setting eg. City Skate Park who provide tuition for school groups
- Use impact absorbing surfaces around and under ramps (where possible)
- Maintain skating surfaces in skateboard areas and parks ensuring they are free from irregularities and debris

SCOOTERS

In the 4-year period 1996-1999 there were 38 scooter related injury cases recorded on the VEMD, 84% of which were attributable to falls. In 2000 there has been an alarming increase in the reported number of scooter related injuries apparently related to their increasing popularity. To July 2000 there are 48 reported cases, ten more than for the previous four years in total. Of the total 72 scooter falls, 60% were to children aged 10-14 and 65% were males. Like in-line and skateboard injuries, most occurred on public roads (including footpaths) (38%) and at home (33%). Seventeen percent required hospital admission and injuries were commonly open wounds to the face and forearm/wrist fractures. Ten percent of fall cases were noted to be from motorised scooters.

In comparison to skateboards, scooters have potentially better steering and braking capability which makes them appealing to younger riders. However, the 2-wheeled nature of scooters may make them less stable than a 4-wheeled skateboard. Scooter design and construction, particularly the small wheels and the friction brake require attention. In addition, there is the potential for serious injury caused by impact with scooter handlebars as seen in bicycle injury.

While only two VEMD cases reported collisions between scooters and motor vehicles a scooter-related death was recently reported when a 9 year old Victorian boy riding a scooter was struck by a reversing cement truck (Herald Sun, 1 July 2000, p5).

The issue of classification of riders of scooters as either "pedestrians" or "motorised vehicles users " requires urgent review. Currently in-line skaters and skateboarders are considered the former and are not required to wear helmets. In contrast, bicyclists are considered as a "motorised vehicle users" and in Victoria are legally required to wear helmets. This review process should include all relevant stakeholders including road traffic authorities, scooter riders, council representatives, researchers, scooter and personal protective equipment manufacturers and venue operators.

Like bicyclists and in-line skaters, scooter riders should wear adequate protective gear, including helmets and be instructed in safe riding techniques. Alternative designs of wrist guards are required for scooter riders. Wrist guards designed to prevent in-line skating injury may not be appropriate as the rigid structure that protects the wrist does not allow sufficient flexibility to properly grip scooter handle bars.

It is not recommended that scooters be towed by other moving objects, including animals eg. when hooking dog leads onto handle bars in order to run/walk dogs.

This developing trend in scooter injury should be monitored.

Furniture (n = 4,859 VEMD)

There were at least 4,859 falls from, or onto, furniture reported on the VEMD. Children aged 1-4 years were over-represented, accounting for 61% of furniture related falls (Table 8).

Fifty-five percent of furniture related falls were to males; 89% occurred in a residential location and a further 4% at schools or day care centres.

The admission rate for furniture related falls was 10%. Whilst less frequent in the older age groups, furniture related falls were more severe.

Chairs and stools (n=1,205 VEMD)

Chairs and stools ranked first and eighth in ED presentations as the most common factors associated with child falls in the 1-4 and <1 age group respectively (Table 6) and ninth overall for those requiring hospital admission (Table 7). Stools represented 14% of the ED category. The VAED reported an annual average of 401 child (0-14 years) hospitalisations as the result of a fall from a chair or bed, more than half of these children are in the 1-4 year age group (Table 2).

VEMD data reported that most falls from chairs and stools (78%) occurred at home and 6% were over 1 metre. Falls from stools were more likely to be over 1 metre (13% of stool falls) than falls from chairs (5% over 1 metre). Analysis of VEMD narratives indicated that 16% and 6% respectively of the <1 and 1-4 age groups involved falls against the chair/stool, with the majority of remaining cases falls from the chair/stool.

Ten percent of VEMD chair and stool falls leading to ED presentation resulted in hospital admission with the highest rate admitted in the 5-9 age group (14%). Open wounds to the head and face accounted for a quarter of all chair/stool falls resulting in ED presentation, and intracranial injury another 8%.

Recommendations

- Use of stable chairs which have a solid build, wide base and non-slip bottoms on chair leg ends
- Discourage children from playing on furniture

Furniture related falls by furniture type and age group, ED presentations, Victoria **Table 8**

Furniture Type	Age in years								Total	
	<1		1-4		5-9		10-14			
	N	%	N	%	N	%	N	%	N	%
Chair/stool	44	9.6	784	26.3	243	23.2	134	35.4	1205	24.8
Conventional bed	204	44.5	580	19.5	188	18.0	60	15.9	1032	21.2
Table/bench/ counter	117	25.5	697	23.4	163	15.6	51	13.5	1028	21.1
Bunk bed	1	0.2	230	7.7	268	25.6	82	21.7	581	11.9
Sofa/couch/ lounge	67	14.6	365	12.3	68	6.5	13	3.4	513	10.6
Bath/shower/ basin	12	2.6	188	6.3	64	6.1	26	6.9	290	6.0
Wardrobe/ cupboard	6	1.3	80	2.7	39	3.7	7	1.9	132	2.7
Dresser/ drawer/ tall boy	4	0.9	29	1.0	11	1.1	4	1.1	48	1.0
Shelf/ room divider	3	0.7	23	0.8	3	0.3	1	0.3	30	0.6
Total	**458**	**99.9**	**2976**	**100**	**1047**	**100.1**	**378**	**100.1**	**4859**	**99.9**

Source: Victorian Emergency Minimum Dataset, January 1996 to December 1999

Conventional beds (n = 1,032 VEMD)

Conventional beds ranked first and third in ED presentations as factors associated with child falls in the <1 and 1-4 age groups respectively (Table 6). The VAED reported an annual average of 401 child hospitalisations as the result of a fall from a chair or bed, half of which were in the 1-4 age group (Table 2).

VEMD data reported that most falls from conventional beds (95%) occurred at home. Most were low falls, with only 7% from a height over 1 metre. Twenty percent of all children were sleeping when injured. More than half of the injuries in the 1-4 and 5-9 age groups occurred during play (59% and 54% respectively). Fifteen percent of children aged under one year had a recorded activity of *being nursed or cared for*. Narratives for these cases however did not give sufficient detail for further explanation. Routley and Valuri (1993), in a review of early Victorian ED surveillance data, noted that 60% of conventional bed related injuries to children aged less than three occurred whilst resting on the bed and thus suggest that children are being placed on beds when cots may be more appropriate.

Nine percent of falls from conventional beds resulted in hospital admission. Open wounds and superficial injuries to the head and face accounted for 21% and 12% respectively of falls from conventional beds resulting in ED presentation, and intracranial injury another 7%.

Analysis of VEMD narratives indicates that almost all falls from a conventional bed for the under 5 year age group were from the bed. A small proportion of falls (7%) in the 1-4 age group were against the bed.

Bunk beds (n = 581 VEMD)

The 1998 Australian Bureau of Statistics (ABS, 1999) survey of safety in the home indicated that 17% of Victorian households with young children have bunk beds (n = 39,500). Bunk beds ranked ninth and seventh respectively in the 1-4 and 5-9 age groups as common factors associated with child falls (Table 6). Most (95%) occurred at home.

The majority of falls from a bunk bed were from a height of over 1 metre (60%). Fifteen percent of all bunk bed falls recorded on the VEMD resulted in hospital admission. Falls from bunk beds resulted mostly in fractures to the forearm/wrist (18% of bunk bed injury) and intracranial injury (9%).

Watson et al. (1999) reviewed Australian and international data and literature on bunk bed injury to children and estimated that nationally there are at least 2,100 bunk bed injuries to children treated annually by EDs of which 19% require hospital admission. Thompson (1995) estimated that the risk associated with bunks as compared to conventional beds is five times greater for children aged between 2 and 12 years.

Watson et al. (1999) also reported that 80% of bunk related injuries were falls from the top bunk, one third of which occurred during play and a further 7% resulted from jumps from the bunk. There have been at least 2 bunk bed related deaths from asphyxia in Australia in the last 10 years due to entrapment in the bunk structure when the child slipped

between the guard rails and the mattress of the top bunk.

Watson et al. (1999) concluded that while the existing voluntary safety Standard *AS/NZS 4220:1994 Bunk Beds* is sufficient to prevent many of the injuries associated with bunks, including falls and asphyxiation, universal commitment by suppliers to the Standard is difficult to achieve, and hence a mandatory Standard is required. Currently the Consumer Affairs Division of the Treasury is considering the recommendation to mandate the bunk bed Standard, and a regulatory impact statement is being finalised (Pulford, 2000 personal communication). It is encouraging that recently a number of bunk bed suppliers have initiated safety strategies with respect to safe gaps and roll-out protection (Strachan, 2000 personal communication).

Recommendations

- Mandate the existing Australian voluntary bunk bed Standard AS/NZS 4220:1994
- Restrict the use of top bunks to children aged over 9 years and, when the maximum height of the mattress exceeds 1550mm, to children aged over 12 years
- Restrict the use of conventional beds to children over 3 years of age; or modify beds by placing mattresses on the floor or by use of devices to resist rolling eg. guardrails
- Gaps and spaces in bunks should not exceed those indicated in AS/NZS 4220:1994, so as to avoid entrapment hazards
- Ensure guardrails are permanently attached to all sides of the top bunk, the top of which should be at least 160mm higher than the top of the mattress
- Avoid sharp edges or protrusions on bunks upon which children could be caught when falling
- Access ladders should not be removable from the bunk
- Discourage children from using beds, both conventional and bunks, as active play areas or for jumping

Tables, benches and counters (n = 1,028 VEMD)

Tables, benches and counters ranked third and second in ED presentations as common factors associated with child falls in the <1 and 1-4 age group respectively (Table 6). Conventional tables represented 51% of the ED category, coffee tables 29% and the remainder benches and counters. Most falls involving coffee tables were in the 1-4 age group (82%). Three percent of cases involved glass tables or coffee tables.

While most falls from tables/benches/counters reported on the VEMD occurred in the home (88%), the proportion occurring away from home increased with the age of the child, such that only 47% of the 10-14 age group occurred at home and 37% at school.

VEMD data indicated that the proportion of falls over 1 metre decreased with the age of the injured child, ie. 21% of falls from tables/benches/counters in the <1 age group compared to 9% of the 1-4 year age group. This correlates with a reduction in the number of falls from, and increase in, falls onto or against tables/chairs/counters as the age of the injured child increases ie. 65% of falls in the <1 age group were falls from vs 37% falls from in 1-4 age group (NB: remaining cases in each age group are falls onto or against tables/chairs/counters).

Eight percent of VEMD table, counter or bench related falls presenting to ED's resulted in hospital admission with the admission rate highest in the 10-14 age group (14%).

Injury patterns were similar to those for falls associated with conventional beds. Open wounds and superficial injuries to the head/face accounted for 43% and 12% respectively of falls from tables/benches/counters resulting in ED presentation, and intracranial injury another 8%.

Recommendations

- Install corner protectors on sharp edges on tables, benches and counters
- Ensure glass topped tables are made with safety glass of sufficient strength to resist a fall by an adult
- Place furniture in appropriate locations considering traffic flow within rooms
- Avoid placing children on benches particularly in bouncers
- Discourage children from climbing onto tables and benches

Nursery Furniture (n = 860 VEMD)

The 1998 Australian Bureau of Statistics (ABS, 1999) survey of safety in the home reported ownership of various nursery furniture items by Victorian households - summarised by Table 9 (page 12).

Falls are the most common cause of non-fatal injury for all nursery furniture products (Watson et al., 2000). There were at least 860 ED presentations for falls associated with nursery furniture recorded on the VEMD in the 4 years January 1996 to December 1999. While nursery furniture falls represented only 2% of all child falls for which contributing factors are known, they accounted for 21% of falls in the <1 age group.

Children aged <1 year account for 58% of nursery furniture related falls with 5 separate items ranking in the ten most common factors ie. prams/strollers/pushers, change tables, high chairs, bouncer/rockers, and baby walkers (Table 6).

Fifty-five percent of nursery furniture related falls were to males and 79% occurred in a residential location. The admission rate for nursery furniture related falls presenting to EDs was 7%, and slightly higher in the <1 age group (8%). Hospital admission in the <1 age group was highest for falls from change tables and cots (each 14% admitted; Table 10). Sixty-percent of baby walker falls were associated with steps and stairs.

Hazard 37 (December 1998) provided a detailed overview of injuries associated with nursery furniture and showed that falls were the most common non-fatal injury in all nursery product categories, accounting for between 43% (baby bouncers) and 78% (change tables) of all nursery product injuries. Children who are not adequately restrained often attempt to stand in or climb from items such as high chairs and prams. Refer to *Hazard* 37 for details of injuries associated with specific nursery products.

Australian safety standards are developed for products where substantial injury rates occur so as to facilitate design, behavioural and environmental changes required to reduce such injuries. There is currently no Australian/New Zealand standard for change tables, and the voluntary standard for prams and strollers has recently been reviewed to include requirements for head barriers, seating and reclining surfaces (AS/NZS 2088/ Amendment 1/1998). Development of Australian Standards for high chairs and baby walkers is currently under consideration. The United States implemented new enhanced baby walker standards in 1997. Evaluation studies indicate a subsequent reduction in injuries since 1992 of 57% a portion of which is attributable to the new ASTM standards (Jacobsen, et al., 1999). Australia has been slow to act, but in September 2000 NSW introduced a requirement that baby walkers sold in NSW must comply with the US ASTM standard. There is a maximum six months for compliance.

The Australian/New Zealand Standard for cots (AS/NZS 2172-1995) became mandatory as of July 1998 and applies to both new and second-hand cots. Mandation was recommended (Watson et al., 1997) as voluntary standards and the marketplace were ineffective in both achieving compliance and reducing the death rate associated with cots (approximately 9 times that for other nursery furniture; Watson et al., 1997).

Nursery furniture ownership, Victoria **Table 9**

Nursery product	Total no. owned	% of households with young children (<5 yrs)
Baby walker in household	39,100	16.7
- in use	*14,800*	*6.3*
Pram or stroller in use	170,800	73.0
- with harness fitted	*148,600*	*63.5*
High chair in use	108,700	46.4
- with harness fitted	*60,100*	*25.7*
Cot in use	125,100	53.4

Source: Australian Bureau of Statistics Home Safety Survey 1998

Nursery furniture related falls by product in children aged <1 years, ED presentations, Victoria **Table 10**

Nursery Product	N	% requiring admission
Pram, stroller, pusher	196	4.1
Change table	115	13.9
High chair	74	8.2
Bouncer, rocker	44	11.4
Baby walker	43	4.6
Cot/Crib	29	13.8
Total	**501**	**8.2**

Source: Victorian Emergency Minimum Dataset, January 1996 to December 1999

In 1998 and 1999 Kidsafe Australia and the Infant Nursery Product Association of Australia (INPAA) developed, with financial support from the Commonwealth Department of Health and Aged Care, a code of safe practice for nursery products. These set minimum safety and performance requirements for a basic range of nursery products based on research and national and international standards. The "Safe Baby" Code provides safety criteria for nursery equipment. Products must be independently assessed against these criteria before being accepted. It is intended that the "Safe Baby" swing tag will permit consumers to more easily select safer items and provide an incentive for industry to comply. The program, including industry training programs, is currently being implemented out and INPAA estimates that producers of 75% of the products covered by the Code have committed to the program.

'Keeping Baby Safe – A guide to nursery furniture' is a joint publication effort of the Ministerial Council of Consumer Affairs based on MUARC research and Kidsafe publications. It includes a checklist to assist with the purchase of nursery furniture and advise on use. It is available electronically from the Ministerial Council on Consumer Affairs website: http://www.consumer.gov.au/ or by contacting the Consumer Affairs Department in any State.

General recommendations

Industry and regulators

- Provide point of sale information for parents and care-givers on the correct use of products and associated hazards
- Consider the development of a restraint standard common to all nursery furniture
- Develop Australian nursery product standards where none exist or adopt relevant standards from overseas (eg. high chairs and baby walkers). Review both new and existing standards at least once every five years as new information becomes available
- Support INPAA efforts for compliance with standards and codes of safe practice
- Consider mandation of standards where voluntary standards and the marketplace are ineffective in achieving compliance and are warranted by evidence
- Actively promote compliance with voluntary nursery furniture standards, including in the second-hand market
- Investigate design options to weight strollers in a manner less prone to tipping

Consumers

- Choose nursery furniture which meets safety standards, where applicable
- Look for the "Safe Baby" swing tag
- Choose cots with a minimum of 500mm (600mm preferable) between the top of the mattress and the top of the cot sides; and drop-side mechanisms that are secure
- Avoid leaving babies on change tables
- Use five point harnesses as (shoulder, waist, through the legs) in strollers and high chairs to keep children secure and less able to stand
- Avoid hooking heavy shopping bags over the handles of strollers as they may cause the stroller to tip
- Be cautious about using baby walkers. If walkers are used, select products that comply with the US ASTM standard
- Avoid placing bouncers on elevated surfaces such as tables
- Use lifts, rather than stairs or escalators when transporting children in prams and strollers

Playground Equipment (n = 6584 VAED, n = 3819 VEMD)

The 1998 Australian Bureau of Statistics (ABS, 1999) survey of safety in the home indicated that some 183,500 Victorian homes owned playground equipment (excluding trampolines), particularly swings and slides (ABS, 1999). However, it is likely that the greatest exposure occurs where equipment and children are aggregated in school, public and commercial playgrounds.

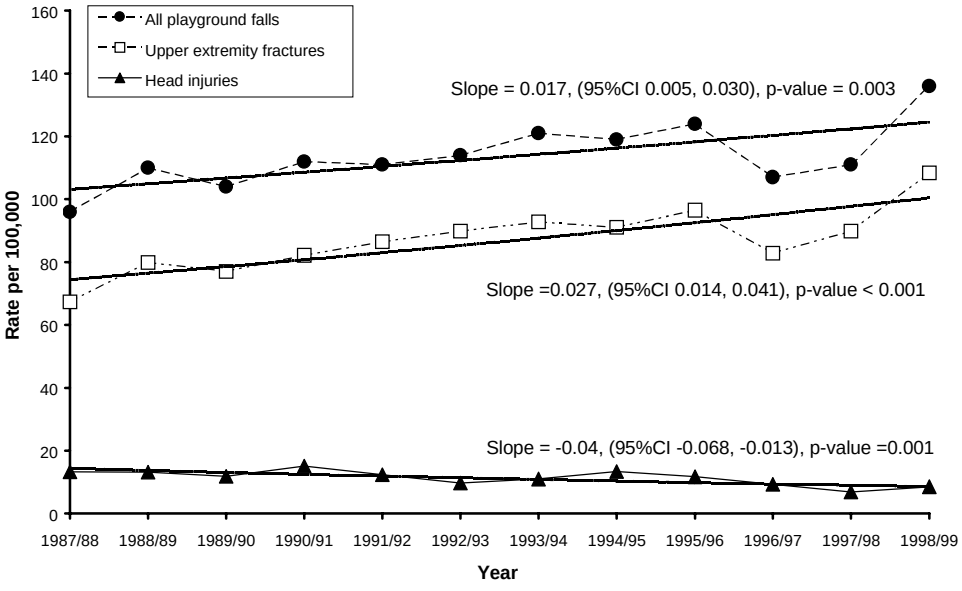
The majority of playground equipment injuries are caused by falls. Eighty-three percent of Victorian admissions and almost three-quarters of ED presentations for playground equipment injury were the result of falls (Watson et al. 2000). VAED data indicated that annually almost 1,100 children are hospitalised as the result of a playground fall (Table 2). Hospitalised playground falls were particularly prevalent among children aged 5-9 years who accounted for two-thirds of the annual average. The 12-year trend for playground falls in the 5-14 age group showed a statistically significant increase (Figure 3). In the last 7 years playground falls resulting in arm fractures have decreased for males but are increasing steadily for females at a rate of 1.26% annually (adapted from Stathakis, 1999; Fig 47).

Where contributing factors are known, falls from playground equipment represented 11% of ED presentations. Altmann et al., (1996), in *Hazard* 29, noted that more than a third of all playground equipment injuries are related to climbing equipment, of which 80% are monkey bars. Monkey bars ranked second to bicycles on the VEMD as the factor most often associated with falls requiring admission (Table 7).

Falls from monkey bars accounted for 40% of all child fall ED presentations. Falls in younger children (1-4 years) were mostly associated with slides and swings while injuries in older children were more often associated with monkey bars (Table 11). Almost two-thirds of playground ED fall presentations were to children aged 5-9 years.

Approximately one quarter of playground equipment falls reported to the VEMD resulted in hospital admission.

Falls from playground equipment, 5-14 years, rates and trends, public hospital admissions, Victoria **Figure 3**



Source: Victorian admitted episodes dataset; July 1987 to June 1999

Admission rates were highest for falls from see saws (33%), flying foxes (31%) and monkey bars (30%).

Fractures of the upper limbs, especially the forearm/wrist and elbow accounted for 48% of all and almost three-quarters of admitted VEMD playground falls.

Two major factors influence the severity of playground equipment falls – fall height and ground surfacing (Chalmers, 1996). The laws of physics dictate that as the height of the equipment increases so does the risk and severity of injury in the event of a fall. The 1981 Australian Standard for playground equipment states that the maximum fall height of equipment should not exceed 2.5m. A New Zealand study by Chalmers et al (1996) found that children falling from over 1.5m were found to have four times the risk of injury of those falling from less than 1.5m. A more detailed discussion of fall height, undersurfacing and breakdown of circumstances surrounding injuries specific to particular playground equipment items, can be found in *Hazard* Edition 29. Selected recommendations are outlined below. A current NH&MRC funded MUARC study is addressing the specific risk and protective factors for arm fractures in playground falls.

One-third of VEMD playground falls were from a height of 1m or above. VEMD data was not of sufficient detail to draw conclusions about the surfaces onto which these injured children fell.

Playground equipment related falls by equipment type and age group, ED presentations, Victoria **Table 11**

Playground Equipment	Age in years* 1-4 N	1-4 %	5-9 N	5-9 %	10-14 N	10-14 %	Total N	Total %
Monkey bars	104	13.1	1234	50.5	205	35.1	1543	40.4
Slide	275	34.8	321	13.1	85	14.6	681	17.8
Swing	189	23.9	239	9.8	101	17.3	529	13.9
Flying fox	24	3.0	257	10.5	64	11.0	345	9.0
See-saw	8	1.0	16	0.7	6	1.0	30	0.8
Other	191	24.1	377	15.4	123	21.1	691	18.1
Total	**791**	**100**	**2444**	**100**	**584**	**100**	**3819**	**100**

**<1 year age group excluded from Table 12 as represents only 0.2 % of playground equipment injuries*
Source: Victorian Emergency Minimum Dataset, January 1996 to December 1999

Recommendations

- Develop an evidence based safety standard for playground equipment covering fall height, installation, safety rails and undersurfacing
- Develop a comprehensive, easy to follow guide for the selection, installation and maintenance of playground equipment
- Reduce the maximum fall height for new equipment to 1.5 metres
- Use impact absorbing surfaces in fall zones of all equipment (as per AS/NZS 422:1996)
- Regularly inspect and maintain equipment and impact absorbing materials
- Encourage and assist local government, schools and others controlling playgrounds to comply with best practice and to adopt safe maintenance and management practices
- Supervise children at playgrounds to prevent unsafe practices

Trampolines (n = 1081 VEMD)

Trampolines ranked seventh and third, in the 1-4 and 5-9 age groups, as contributing factors to child ED presentations (Table 6) with 1,081 trampoline related falls recorded on the VEMD in the 4 year period under consideration. Murphy (2000) reported that an annual average of 179 Victorian children are admitted to hospital each year as the result of a fall from a trampoline.

Nine percent of all Victorian households and 18% of those with young children (ie. under 5 years of age) own trampolines (Murphy, 2000). A detailed review of trampoline related injury was undertaken by Murphy (2000) in *Hazard* 42 and hence these injuries will not be reported in detail here. A key recommendation within this review was for the adoption of the US ASTM F381:99 as a voluntary Australian safety standard. This proposal is currently being considered by a Consumer Product Advisory Committee, representative of State, Territory and Commonwealth governments.

Stairs/Steps (n = 6225 VAED, n = 1204 VEMD)

The 1998 Australian Bureau of Statistics (ABS, 1999) survey of safety in the home indicated that of 230,300 Victorian homes with five or more inside steps or stairs, 13% were occupied by children aged 4 years or less. Eight percent of homes with 5 or more internal stairs had stair guards, half of which were occupied by young children (ABS, 1999).

There are an average of 100 Victorian children hospitalised each year as the result of a fall involving stairs and steps (Table 2). In addition, falls involving stairs and steps ranked amongst the top 10 factors contributing to fall ED presentations for each age group. Stairs and steps ranked fifth and fourth for children aged <1 and 1-4 years, respectively (Table 6). The majority of

falls presenting to EDs occurred in the home (93% and 83%) for both these younger age groups. For children aged 5-9 and 10-14 years falls from stairs/steps which ranked tenth and ninth respectively in ED presentations, occurred mostly at home and at school (including day care facilities or public administration areas). For children aged 5-9 years, 60% of falls from stairs/steps occurred at home while 19% occurred at school. When compared to 5-9 year olds, children aged 10-14 years fell from stairs/steps less at home (45%) and more often at school (38%). The majority of falls from stairs/steps for each age group occurred during leisure activities.

For ED presentations, injuries to the head involving stairs/steps were most common in children aged <1 and 1-4 years. The majority of head injuries to children <1 were either superficial injuries (38%) or intracranial injuries (16%). For children 1-4 years of age, head injuries were mostly superficial (22%) or open wounds (33%). A large proportion of head injuries were also recorded for children aged 5-9 years (31%), the majority being open wounds (21%).

Forearm/wrist fractures, along with ankle and foot sprains/strains, were the highest VEMD stairs/steps injuries in the 5-9 and 10-14 age groups. Fractures and sprains/strains among 5-9 year olds each accounted for 24% of injuries, with most fractures occurring to the forearm/wrist (51%) and sprains/strains being to the ankle (47%) and foot (16%). Sprains/strains were highest for 10-14 year olds, accounting for half of all stairs injuries in this age group, and mainly involved the ankle (58%) and the foot (12%). Fractures were less common among 10-14 year olds (22%) than in the 5-9 age group, and were most common to the forearm/wrist (38%), ankle (21%) and foot (17%).

Analysis of VEMD narratives indicate that 4% of falls involving steps/stairs were falls from a flat surface onto stairs/steps rather than whilst walking on stairs/steps. Interestingly, almost 2% of falls involving stairs/steps were associated with the child either being carried up or down the stairs by a parent/carer, or the child carrying objects or items such as toys or food up or down the stairs. Inappropriate use of stairs/steps, such as skateboarding, in-line/roller skating, or using prams or baby walkers on stairs, accounted for 3% of falls. Of all baby walker related falls, 60% were falls down stairs/steps. Such baby walker related falls were to children aged 1 year or less.

VEMD admission rates for stair/step related falls were highest for 5-9 year olds (12%) and lowest for 10-14 year olds (5%). Admission rates were similar for children aged <1 and 1-4 years, with an average rate of 8%.

Recommendations

- Install stair guards to restrict access by young children ie. under 4 years of age to stairs, which may include guards at both top and bottom of stairs
- For new homes minimise changes in floor levels and keep flights of stairs short by using landings
- Use non-slip, highly visible edging strips to provide resistance and visibility
- Install sensor lighting at the top of stairs to improve visibility
- Balustrades should be designed to resist climbing eg. vertical rather than horizontal in-fill, and their height should exceed the centre of gravity of most adults (1,100mm)

Sports (n = 1491 VAED, n = 2837 VEMD)

Children aged 10-14 years represented 79% of VEMD and 82% of VAED sports related falls in the under 15 years age group. VEMD data were further analysed to identify the type of sport in which the injured child was participating when they fell (Table 12).

Of the 2,837 sports related falls reported on the VEMD, 63% were to males. Almost 40% occurred at formal sports fields and arenas, a further 25% at school, 22% at parks and other similar recreation places and 7% during play at home.

Sprains/strains (36% of VEMD sports falls) and fractures (34%) were the most common sports related fall injuries to children. In particular, ankle sprains (13% of total), and fractures of the forearm/wrist (19%) were common.

MUARC and Deakin University recently completed a series of countermeasure reviews for sports injury. The following is adapted from the netball review (McGrath & Ozanne-Smith, 1998) but is equally applicable to other sporting activities:

Children are becoming involved in sports at earlier ages with higher levels of intensity and expectation. When it comes to sports performance, children must not be thought of as little adults. Growth and maturation rates in children demonstrate marked variability, (as do) co-ordination and strength, flexibility and endurance.

Sports related falls by activity in children aged 10-14 years, ED presentations, Victoria **Table 12**

Sporting activity	N	% requiring admission
Australian Rules Football	662	10.0
Basketball	634	5.8
Netball	333	1.5
Soccer	231	16.0
Other	382	9.7
Total	**2242**	**8.0**

Source: Victorian Emergency Minimum Dataset, January 1996 to December 1999

Recommendations

- Where available, children should play modified versions of popular sports eg. Netta Netball, "Aussie footy", Rooball (soccer), Kanga Cricket and Minkey (hockey)
- Match children on height and weight, rather than age, when playing in teams
- Inspect playing fields for potential obstacles prior to commencement of play
- Encourage the use of personal protective equipment in children
- All coaches should possess at least National Coaching Accreditation Scheme (NCAS) Level 1 accredited coaching training

A framework for action

The *National Injury Prevention Action Plan: Priorities for 2000-2002* (Dept. of Health & Aged Care, 1999) provides a broad framework for national activity in high priority areas of injury prevention. The *Plan*, developed by the National Injury Prevention Advisory Council (NIPAC), identifies child falls as an area of both high priority and for immediate attention.

The objective of the *Plan* is to decrease the incidence, severity, mortality and morbidity associated with falls in children between the ages of 0-14. The Commonwealth Department of Health and Aged Care is commissioning a review of regulations and gaps in state and national regulations, standards and codes relevant to child safety.

At the same time the Consumer Affairs Division of the Treasury has sought comment on substantial proposed policy changes to product safety in Australia. Proposed changes include consideration of a legal requirement to comply with a general provision of safety, along the lines of the European safety directive. If implemented these would be expected to have far reaching effects of child safety, including falls (Dept of the Treasury, 2000).

Australian safety standards are proposed for cases where substantial injury rates occur to facilitate the design, behavioural and environmental changes required to reduce such injuries. While safety Standards should, in principle, be effective in reducing product related injury, voluntary standards need to be accompanied by industry committment and/or public demand in order to obtain compliance. When compliance with existing voluntary standards is difficult to achieve, such that the injury rate continues to be of concern, mandation of the standard is recommended (Watson et al., 2000).

The Commonwealth Department of Health and Aged care is currently developing a detailed strategy broadly based on the *Plan* developed by NIPAC.

Key strategies and tasks of the Commonwealth strategy are as follows:

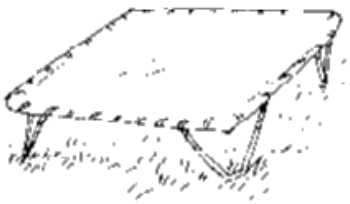
Promote best practice

- Review of legislation which impacts on the safety of children
- Work with the relevant regulatory and standard setting bodies and key stakeholders to improve and strengthen product and environmental design standards in areas such as nursery equipment, soft fall surfacing and reducing fall height for playground equipment
- Link with positive parenting and grandparenting programs to promote child safety awareness and falls prevention
- Increase child safety awareness through local, State and Territory and national promotion and educational activities in conjunction with key stakeholders
- Develop and implement a range of interventions targeted directly at children that are appropriate to their stage of development
- Ensure that child safety competencies, including falls prevention, are included in education and training of the child care and education workforce
- Implement risk management strategies in care settings, including schools, day care centres and family day care
- Respond to special needs of rural and remote communities, indigenous communities, and people from culturally and linguistically diverse backgrounds and children with disabilities

Research and surveillance

- Identify and promulgate best practice from current programs and emerging research
- Establish performance indicators to identify achievements of the objectives for reduction in child fall incidence and severity
- Undertake cost benefit analysis of falls prevention and falls injury interventions in a variety of settings, including the home, child care, schools, areas for sports and recreation
- Continue to enhance current injury surveillance systems managed by states, territories, emergency departments and sports injury data collection
- Identify gaps in falls prevention knowledge and commission research, conduct trials and promulgate best practice to all stakeholders
- Improve the specificity (detail) and application of the International Classification of Diseases

Source: Department of Health and Aged Care, 2000



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DATABASE DESCRIPTIONS

Coroners' Facilitation System (CFS)

The Coroner's Facilitation System is a database containing all unnatural deaths and is collated from the findings of the Victorian State Coroner over the period 1989/90-1994/95. These include deaths that were unexpected, unnatural or violent, or which resulted from accident or injury (See *Hazard* 38 for a recent overview of this database). This system is in the process of being replaced with a high quality National Coroners' Information System.

Victorian Admitted Episodes Dataset (VAED)

The VAED contains information on admissions to Victorian hospitals over an 12 year period – July 1987 to June 1999. For most of the period covered, the data was collected by Health Computing Services Victoria under the direction of Human Services Victoria. Detailed information on hospital admissions, from admission to discharge, is collected. The information on the nature of injury is based on the diagnosis by physicians. MUARC has access to those records which involve injury and poisoning. In this and earlier editions of *Hazard* admission data based on the ICD 9 version of coding has been used. However, from July 1998 ICD version 10 has been applied in hospitals.

Victorian Emergency Minimum Dataset (VEMD)

The electronic VEMD database records details of injuries treated at the emergency departments of 26 major public hospitals, 23 of which cover a general adult community (see page 17). The total number of cases on the database to July 2000 was approximately 825,063. For most hospitals the period January 1996 to June 2000 is covered. The injury variables collected include injury cause, location, activity, nature of main injury, body region, human intent and a narrative describing the injury event. VEMD hospitals represent approximately 80% of statewide emergency department presentations. The data provided to MUARC does not include all ED presentations, only injury specific cases. Hence it is not possible to analyse any VEMD data which may have been re-categorised to a non-injury grouping. A MUARC study found that the VEMD captured only 82% of possible VEMD presentations.

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Editorial Board

Guest Editors

VISS Staff

General Acknowledgements

Participating Hospitals

From October 1995
Austin & Repatriation Medical Centre
Ballarat Base Hospital
The Bendigo Hospital Campus
Box Hill Hospital
Echuca Base Hospital
The Geelong Hospital
Goulburn Valley Base Hospital
Maroondah Hospital
Mildura Base Hospital
The Northern Hospital
Royal Children's Hospital
St Vincents Public Hospital
Wangaratta Base Hospital
Warrnambool & District Base Hospital
Western Hospital - Footscray
Western Hospital - Sunshine
Williamstown Hospital
Wimmera Base Hospital

From November 1995
Dandenong Hospital

From December 1995
Royal Victorian Eye & Ear Hospital
Frankston Hospital

From January 1996
Latrobe Regional Hospital

From July 1996
Alfred Hospital
Monash Medical Centre

From September 1996
Angliss Hospital

From January 1997
Royal Melbourne Hospital

Coronial Services

Access to coronial data and links with the development of the Coronial's Services statistical database are valued by VISS.

National Injury Surveillance Unit

The advice and technical back-up provided by NISU is of fundamental importance to VISS.

How to Access VISS Data:

VISS collects and tabulates information on injury problems in order to lead to the development of prevention strategies and their implementation. VISS analyses are publicly available for teaching, research and prevention purposes. Requests for information should be directed to the VISS Co-ordinator or the Director by contacting them at the VISS office.

Contact VISS at:

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Recent issues of *Hazard*, along with other information and publications of the Monash University Accident Research Centre, can be found on our internet home page:

http://www.general.monash.edu.au/muarc

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