Hazard
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Victorian Injury
Surveillance System

Monash University
Accident Research Centre

VicHealth

This edition of Hazard covers product related injury with particular reference to domestic architectural glass, lawn mowers, shopping trolleys and chainsaws. Reference is made to appropriate Australian Standards and recommendations made for injury prevention.

Product Related Injuries - a selection

Summary

Injuries from architectural glass were more severe than injuries from other glass products. The majority of these injuries occurred in the home environment, 86% for children and 68% for adults. Injuries were mainly to victims in younger age groups and were also more severe in these younger victims. Fighting and quarrelling were the activities being undertaken by 19% of adult victims at the time of injury.

Lawn mowers, were responsible for 22% of yard and garden equipment injuries to adults on the VISS database. While three quarters of these injuries were to adult victims, the admission rate for child victims was 44% (compared with 18% for adults). Ride-on mowers caused the most severe injuries with 71% of child victims requiring admission to hospital. One-third of all injuries sustained were to the fingers.

Shopping trolleys were responsible for 268 injuries, predominantly to children aged under 5 (69%). Fifty-four percent of shopping trolley injuries were to the head and face. Injury most commonly occurred when the victim stood up in the trolley or when the trolley toppled over. The use of adjustable safety harnesses to prevent children from standing in or reaching too far out of trolleys would prevent many of the injuries seen here.

There were 138 chainsaw injuries, predominantly from the Latrobe Valley, in the VISS database. Injuries were mostly lacerations to the fingers, hands and legs followed by foreign bodies in the eyes. Loss of control or slipping of the chainsaw, woodchips or sawdust entering the eyes, or the chainsaw user slipping were the major causes of injury. Only one-third of chainsaw victims wore safety gear of any kind.

Introduction

It has been estimated that the cost of product related injury in Australia is in the order of $2.8 billion per annum and that this cost is largely borne by the consumer and the health system. Product related injuries are determined by the man-made environment and the abilities, skills and behaviour of the user. The task of improving consumer safety is multi-sectoral and in Victoria involves the Federal Bureau of Consumer Affairs through the Trade Practices Act, the Office of Fair Trading, Standards Australia through its mandatory and mostly voluntary standards, the manufacturers through product design and safety programs and other injury prevention and consumer bodies eg Australian Consumers Association, Occupational Health and Safety Authority. (Moller, 1984).

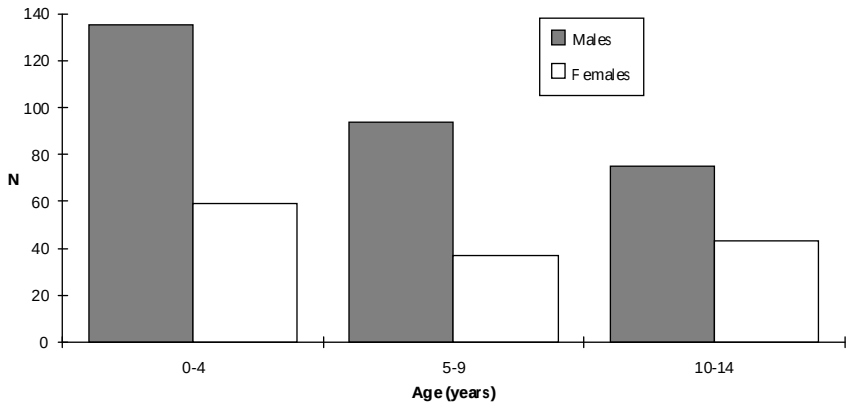
The following articles focus on a selection of products - **domestic architectural glass, lawn mowers, shopping trolleys and chain saws.**

Domestic Architectural Glass Injuries

Giulietta Valuri

The Building Code of Australia has required safety glass installation in locations in both new and renovated homes since April 1991 (Nassau, 1995). No clear trend towards injury reductions from domestic architectural glass injury can be determined to date. This could be explained by the relatively slow process of introducing safety glass to existing housing stock, the non-specific nature of codes in hospital admission data, or possibly by the Australian Standard or Building Code requirements being insufficient to make a difference. Further research would be required to determine whether the Australian Standard together with the Building Code is adequately protective against domestic architectural glass injuries.

Children Age and Sex Distribution **Figure 1**



VISS: RCH, WH, PANCH, 1989 - 1993, < 15 yrs *n = 443*

Most architectural glass injuries recorded in the VISS database occur in the home: children 86% and adults 68% sustained in the home. Previous studies conducted in New South Wales also found that a majority of architectural glass injuries occurred in the home (Jackson, 1981; Maitra & Han, 1990).

Architectural glass in this article includes glass windows, doors, shower and bath screens. The following will examine injuries to children and adults separately as data collection for the two age groups commenced at different times.

Children (n = 443)

During the period 1989 to 1993, 443 children (14 years and under) presented to the emergency departments of the Royal Children's Hospital, Western Hospital and Preston and Northcote Community Hospital. Of these, 67% were males.

Most of these injuries (44%) occurred to children under 5 years of age with over half occurring to 1 and 2 year olds. (Figure 1).

Twenty-six percent of the injuries were sufficiently severe to require admission to hospital with the highest admission rate being to the 5 to 9 year olds (30%).

Falls led to a third of the injuries occurring, glass collapsing/caving in made up 10%, injuries from practical jokes/horse-play 5% and fighting, quarrelling 3%. The majority of these fall injuries (88%) occurred while the child was playing.

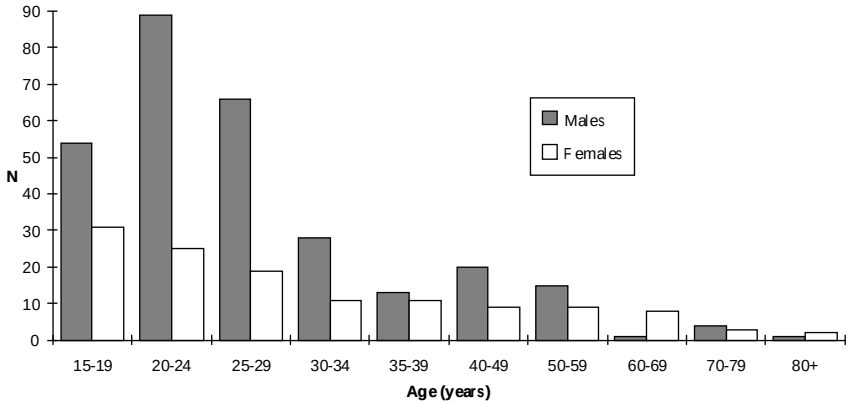
Over three quarters (78%) of the injuries occurred in the living/sleeping areas of the home.

Seventy-eight percent of injuries resulted in lacerations, mostly to the upper limbs (53%) and head and face (26%).

Adults (n = 419)

Injuries to adults (15 yrs and over) involving domestic architectural glass are based on data collected from the Western Hospital (2 yrs), Royal

Adult Age and Sex Distribution — Figure 2



VISS: WH (2 yrs), RMH (2 yrs), PANCH (1 yr), LRH (3 yrs); >= 15 yrs, n = 419

Melbourne Hospital (2 yrs), Preston and Northcote Community Hospital (1 yr) and Latrobe Regional Hospital (3 yrs).

Over two thirds of the injuries were to males with injuries most commonly occurring in the 20 to 24 year age group (27% of all adults). (Figure 2.) Sixteen percent required admission to hospital.

Over half (53%) were involved in a leisure/recreational activity when the injury occurred, 19% were fighting/ quarrelling, 4% intended to harm themselves, 4% were cleaning and 3% were showering/bathing at the time. The mechanism of injury was falls in 36% of cases.

The majority of the injuries (70%) occurred in the living/sleeping area of the home and 20% in the garden/ garage.

Glass windows and doors were the main factors causing injuries. Alcohol was reported as a contributing factor in 5%, mainly involved with arguing and fighting. It is suspected that this figure is understated.

Lacerations accounted for a high proportion of the injuries (84%), mostly to the upper limbs (69% of all lacerations).

Comparison

The sex ratios for children and adults were similar: children 2.2 males to 1 female, adults 2.3 to 1.

Injuries to children appear to be more severe as they have a higher admission rate. A New South Wales study also found that injuries from architectural glass are more severe than from other glass and occur mainly in the younger age groups. (Maitra & Han, 1990).

The proportion of injuries occurring in the living/sleeping area of the home was quite high in both children and adults with the under 15 year olds being slightly higher. Garden/garage, kitchen, bathroom, laundry and toilet areas were higher in adults which could be due to adults being involved in household activities and maintenance (do-it-yourself) around the home.

Laceration rates from architectural glass were high in both categories, though injuries were more severe for children (26% admitted) than adults (16% admitted). Table 1 compares the distribution of severe lacerations in children and adults.

Almost all the injuries involved windows/window glass (57% children, 76% adults) and glass doors (41% children and 22% adults). The majority in both adults and children were from windows but windows caused more injuries to adults than to children (76% and 57% respectively).

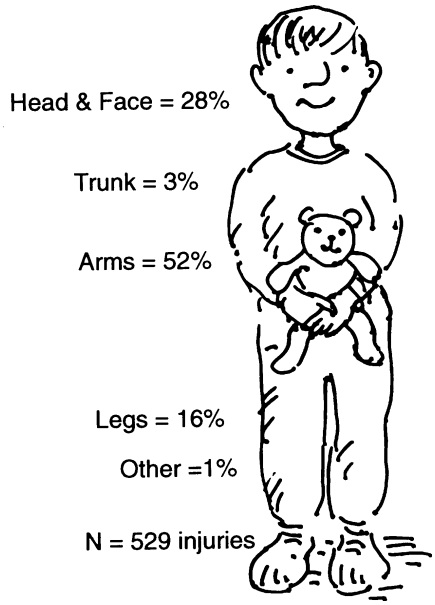
A comparison between the body parts injured for children and adults is shown in Figures 3 and 4.

Proportion of Admissions by Body Part Injured Children and Adults — Table 1

Body Part (lacerations)	Children (N = 157) %	Adults (N = 96) %
Forearm	13	27
Finger	12	10
Face & scalp	10	1
Wrist	6	11
Hand	6	11

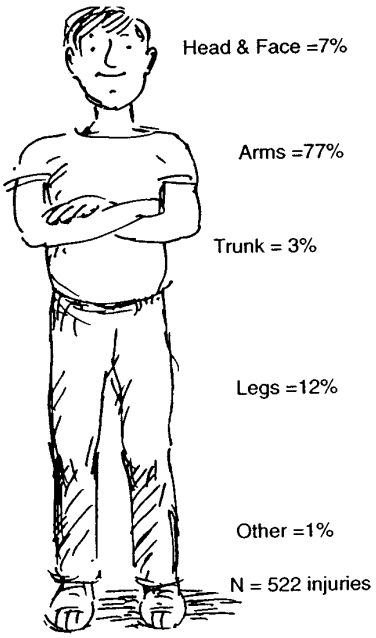
VISS: RCH, WH, PANCH, RMH, LRH

Body Part Injured - Children
Figure 3



VISS: RCH, WH, PANCH, 1989-1993, < 15 yrs
(up to 3 injuries per case)

Body Part Injured - Adults
Figure 4



VISS: WH (2 yrs), RMH (2 yrs), PANCH (1 yr), LRH (3 yrs); >= 15 yrs (up to 3 injuries per case)

Window/window glass

Most of the window glass related injuries to children occurred when they fell through a window (20%), eg. *"Playing with sister, lost balance and fell through plate glass window"*; when a window dropped on/caught hand (14%), eg. *"Opening the window. Window dropped down, glass broke & fell onto finger"*; when they fell out of an open window (11%) or when they hit against a window (10%).

Adult injuries, on the other hand, were predominantly caused when the patient inflicted the injury themselves (19%), eg. *"Arguing with girlfriend and punched the window in anger."*; when they fell through a window (14%), were cut by a window (12%), eg. *"Putting in a window. Cut finger on broken window"*; or while fighting (11%), eg. *"Fighting, punched window instead of person, broke glass."* Of self inflicted injuries, over half were a result of being angry after a fight or argument and alcohol was a contributing factor in 11 cases.

Most of these injuries occurred when the patient put their hand through a window.

Glass Doors

Children running/walking into glass doors was one of the main causes of glass door related injuries (21%) eg. *"Running in from verandah into living room. Ran through glass sliding door."* Hitting against doors, mostly from falls, caused 18% of injuries, eg. *"Playing, tripped over, hit head on glass door."*; fingers getting caught in doors and pushing against glass doors both caused 10%.

Injuries to adults were mostly from tripping/slipping and falling through glass doors (24%), eg. *"Walking, tripped and put arm through a glass door."*; hitting against doors (15%), eg. *"Running into kitchen and hit against glass door."*; and self inflicted injuries (8%), eg. *"Argument broke out with parents and placed fist through glass door."*

Prevention

1. Most glass in domestic settings in Australia is of the annealed variety, which has less strength than safety glass and breaks into sharp pieces. All Australian states and territories except South Australia have adopted the 1989 revision of the Australian Standard (AS 1288) "Glass in Buildings - Selection and Installation". Victoria adopted the standard in 1991. This requires that safety glazing materials, either toughened glass, laminated glass or organic glass be used in some residential situations where annealed glass was previously acceptable. Annealed glass breaks with relatively low impact into jagged pieces, whereas toughened glass breaks less readily into small particles with blunt edges.
2. Replace low level glass with safety glass whenever glass is replaced in existing homes.
3. Reduce the price differential between safety glass and annealed glass.
4. To improve the safety of existing low glass, appropriate plastic film should be applied to the glass surface to reduce potential for injury if the glass is shattered.
5. Bars/rails across glass afford visibility and some protection and stickers can be affixed to identify the presence of glass.

Deaths

Four deaths (Victorian Coroners' Facilitation System 1989-1992) resulting from glass doors and windows involved victims aged between 33 and 56, including 3 males. One case was a suicide and alcohol was a contributing factor in 2 cases.

References

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VISS Database

The products discussed in the remainder of the article - lawn mowers, shopping trolleys and chainsaws have been taken from the database as a whole.

As of February 1995 the VISS database contained 160,000 records. Of the two all age collections (Western Hospital and Latrobe Regional Hospital) only one third of cases are to children. However a bias towards children in the total VISS database results in 58% of total cases being to children.

The collection periods for each participating hospital are as follows, Royal Children's Hospital (1988-93), Preston and Northcote Community Hospital (1989-93), Western Hospital - Footscray and Sunshine campuses (1989-93), Royal Melbourne Hospital (1992-93) and Latrobe Regional Hospital - Traralgon and Moe campuses (1991/92 - Feb. 1995).

Lawn Mower Injuries (n = 416)

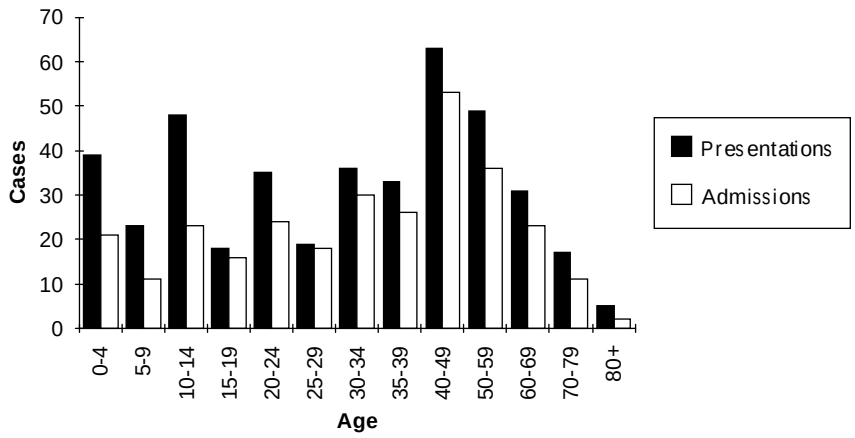
Karen Ashby

Most lawn mowers sold today in Australia are power mowers of the petrol fuelled variety, (approximately 90%), and cost less than $500. (Choice, 1991 & 1993). Of the 416 cases of lawn mower related injury recorded on the Victorian Injury Surveillance System database 36% were petrol powered, another 10% were ride-on mowers, 2 were tractor mowers, there was only one recorded case of use of an electric mower. Of the remainder only 2 were specifically noted as being non-powered models, the remainder (54%) were unspecified as to the nature of the mower. The 416 cases will be discussed in the following article.

Lawn mowers are associated with 22% of yard and garden equipment injuries, and 0.7% of all injury to adults on the VISS database.

Figure 5 shows the most common age breakdowns for these cases. Although there are greater frequencies in some age groups there is no obvious age pattern.

Lawn Mower Injuries by Age **Fig. 5**



Source: VISS: RCH, PANCH, WH, RMH, LRH n =416

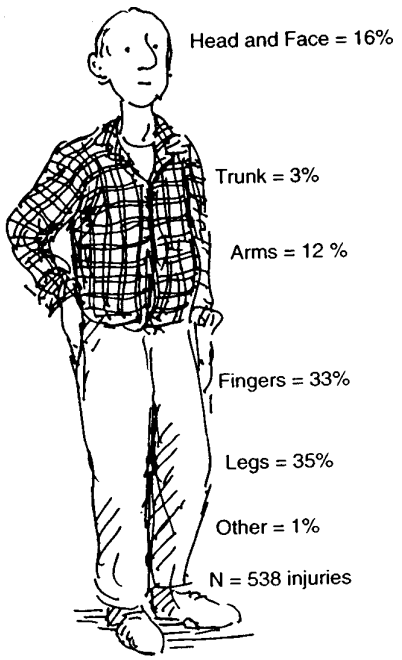
Just over one half of injuries occurred in times of high usage, ie on the weekend, especially on Saturdays afternoons (17% of cases). Injuries were more common in the warmer months, particularly December (15%), October (14%) and January (13%).

Eighty percent of cases occurred in a residential location, particularly in the victim's own home yard (69%).

Just over half of the victims required significant treatments with 23% requiring a review in the casualty department, another one quarter of victims required admission to hospital.

Figure 6 shows the most common body parts injured.

Body Part Injured
Figure 6



Source: VISS: RCH, PANCH, WH, RMH, LRH. n = 519
(NB: up to 3 injuries per case)

Adults (n=306)

Nearly three quarters of lawn mower injuries on the VISS database were to adults, particularly those in the 40-60 age group (37%), with males accounting for 73% of all adult victims. With an admission rate of 17%, nearly half of the total injuries sustained were to the upper extremities, with just over one third of all injuries to the fingers, particularly lacerations (20%), amputations (5%) and fractures (5%). Other common injuries were lacerations to toes, (8%), foreign bodies in the eyes (6%) and lacerations to the foot (4%).

Gardening or maintenance were the most common activities acknowledged at the time of injury.

Causes of Injury

Injuries most commonly occurred when the victims either caught a body part under, slipped under or were run over by the lawn mower (17% of cases), eg. *"Cutting grass at home, slipped and foot went underneath lawn mower."* and *"Patient was gardening and accidentally put hand under lawn mower"*.

A similar proportion of victims (17%) were injured when they were hit by an object thrown up from the operating lawn mower, commonly stones or nails.

Twelve percent of victims were injured when clearing wet grass out of the mower, taking off the grass catcher or attempting to adjust the height of the mower, commonly while the mower was still switched on, resulting in catching or lacerating their fingers and hands in or on the blades of the mower. The blade tip velocity of powered lawn mowers has been estimated at 371 km/hr, making any attempts to remove grass or the grass cutter, adjust the height of the mower, or move the mower whilst it is still turned on, dangerous. (Love et al, 1988).

Other injuries occurred when the victim suffered a laceration from an unspecified part of the mower (9%), fell off, or over the mower (6%), strained or over-exerted while mowing or moving the lawn mower (6%), received a foreign body in the eye (6%) or were bitten by an insect whilst mowing (4%). Other serious injuries occurred when the victim was hit by the blade of the mower when it flew off an operating lawn mower (3%) and another 2% of victims received burns from the mower. A leading Australian lawn mower manufacturer has developed a safety drop device where if the blade disc from a mower comes loose, it drops away from the engine preventing it from flying out from the mower and perhaps hit a victim.

Safety Devices

The use of safety devices was recorded in only 6% of cases. These devices included work boots, safety glasses, gardening gloves and ear plugs.

Manufacturers in the United States have developed a safety switch that cuts out the engine on the lawn mower when the operator leaves the normal operating position eg. to remove the catcher from the mower. These devices are generally not available on Australian manufactured lawn mowers but would help to prevent many of the injuries mentioned in this article.

Another safety design is the raising of the starter rope handle up the mower so users are now less likely to place feet under the mower when starting it as they don't need to bend/lean so far over the mower.

Concerns with the use of electric powered lawn mowers usually extend to a fear of running over the power cord causing electrocution. The one

recorded case on the VISS database of injury from an electric mower was an electrocution. However, use of safety devices such as double insulation providing a barrier between the metal parts of the mower and the live conductors, portable safety switches which cut off the electricity in the event of a live wire becoming earthed, blade rotation indicators and extension cord grips make these mower safer as long as the user still exercises care when mowing. (Choice, 1991).

Potential buyers should look for a lawn mower that meets with Australian Standards, it seems that currently only 3 companies do so. Lawn mowers are covered by the following standards, - 1992 'Approval and Test Specifications - Electric lawn mowers', AS3792 - 1992 'Ride-on lawn mowers', which specifies requirements for design and construction of powered rotary ride on mowers relating to safety and robustness, and AS2657 - 1985 'Powered Rotary lawn mowers', which specifies safety requirements for rotary lawn mowers including both petrol and electric types.

Children's Lawn Mower Injuries by Mechanism Table 2

Incident	0-4 n = 39	5-9 n = 23	10-14 n = 48	TOTAL n = 110
Object ejected from mower	7	5	4	16
Victim slipped, caught under, run over by mower	4	6	11	21
Clearing grass/catcher, adjusting mower height	-	2	8	10
Unspecified laceration	9	3	10	22
Falls	10	5	5	20
Strain or over-exertion	-	1	2	3
Burns	8	2	1	11
Poisoning	2	-	-	2
Cut by flying blade	1	-	2	3
Electric Shock	-	-	1	1
Animal/Insect related	-	-	1	1

Source: VISS: RCH, PANCH, WH, LRH n = 110

Children's Lawn Mower Injuries: most common nature of injury and body part Table 3

	0-4 yrs % n = 52	5-9 yrs % n = 34	10-14 yrs % n = 64	TOTAL % n = 150
Upper Extremities	**31**	**53**	**52**	**45**
finger laceration	2	24	30	**19**
finger amputation	6	-	8	**5**
finger burns	-	9	-	**2**
Lower extremities	**33**	**29**	**39**	**35**
foot lacerations	6	3	8	**6**
toe lacerations	-	3	6	**3**
metatarsal fractures	-	6	-	**1**
foot amputation	-	6	3	**4**
Head injuries	**29**	**18**	**8**	**17**
eye haemorrhage	8	3	2	**4**
face and scalp lacerations	6	3	-	**3**

Source: VISS: RCH, PANCH, WH, LRH n = 110 (NB: up to 3 injuries per case)

Children

There were 110 injuries to children from lawn mowers, representing just over one quarter of all mower injuries on the VISS database. These injuries were predominantly to boys (78%), especially those aged between 10 and 14 (37% of all children's lawn mower injuries). There was a one third admission rate for children in this age group.

Table 2 shows a breakdown by incident for the cases of child related lawn mower injury.

The under 5 age group accounted for one third of all mower related injuries to children. Predominantly to boys (72%), these injuries occurred in the victim's own home yard (72%) and in another residential yard (10%). The victim was commonly playing (82%) when injury occurred, one quarter of injuries related to falls, four of which were from a ride-on lawn mower. The admission rate for this age group was one third.

Children in the next age group (5-9 years) accounted for another 23 incidents. Three quarters of injuries were to boys with 87% of these injuries occurring in the victim's own backyard. The admission rate for this age group of 48% was high.

Twenty-two percent of victims in this age group were either assisting with mowing or mowing themselves. Just over one quarter of victims were

caught under or run over by the mower, 3 of these victims were passengers on a ride-on mower who fell and were caught underneath the mower.

Two thirds of victims aged in the 10-14 group were mowing the lawn when the injury occurred, however there was no recorded use of any safety device. Sixty percent of these injuries occurred in the victim's own home, another 21% in another residential location. Half of the victims injured in this age group required admission to hospital, again a high rate. Although no follow-up study was undertaken, it is clear that several injuries were severe and disabling.

Table 3 shows the most common injuries sustained by children relating to lawn mower injuries.

Ride-on Mowers

Ride-on mowers were involved in 10% of all lawn mower related injuries (40 cases). These cases represent nearly 20% of specified mower related injuries to children and 6% of mower injuries to adults. Fifty-three percent of the 40 ride-on mower cases were to children aged under 15 years. Seventy-eight percent of the total number of victims were male.

Residential locations were the site for 78% of these injuries, areas of production accounted for another 8%. In only 2 cases was the use of safety devices recorded.

Over half of the injuries sustained (57%) were to the lower extremities, with 20% being to the feet. Lacerations accounted for half of the types of injuries sustained, particularly to the toes (11%), feet (7%), fingers (7%), face and scalp (5%) and hand (5%). Other injuries sustained were amputations of the finger (5%), amputation of the foot (5%) and strain/sprain of the ankle (5%).

Injuries to children were more severe than those of their adult counterparts with an extremely high admission rate of 71%. One third of child victims (total n=21) were injured when they were playing around the mower and were either not seen by the operator and hit, or fell in front of the mower. Another 24% of injuries occurred when the child was riding on the mower on the operator's lap, and fell, usually under the blades of the mower. All victims injured in this way were serious enough to be admitted to hospital. Hospital studies have found that in the case of injuries related to ride-on mowers (to children), the severity of the injury, the period of hospitalisation and the need for follow up surgery was much greater than those victims injured by non-ride on type lawn mowers. (Johnstone et al, 1989).

Adult injuries (total n=19) often occurred when the victim was repairing or maintaining the mower (26%), when the mower tipped over (21%), when hit by the mower after disembarking or slipping off the mower (21%), when their foot slipped off the decking or went under the decking coming in contact with the mower blades (11%) or were hit on the head by a branch while mowing under a tree. Other single cases occurred when the victim touched against the hot exhaust and attempted to lift a mower stuck in a gutter. The admission rate for the adult victims was 11%.

An American study, which estimated 26,800 ride-on mower related injuries in the US per year, identified contact with powered rotating blades as one of the hazards that produced the most serious ride-on mower related injuries. (Adler et al 1995). This study found that in 92% of cases this type of contact involved the mower operator and in 70% of these cases contact occurred after the operator had left the operating position often to undertake tasks such as clearing the discharge chute and changing the height of the mower deck. In most cases the engine of the mower was left running whilst these activities were taking place. In an attempt to address this problem the American National Standard Institutes voluntary standard B71.1 was amended in 1986 to introduce an operator presence control (OPC). This device will stop the blade within 5 seconds from the operator leaving the operating position. The US study discovered through testing that typical blade access times for the above mentioned activities was approximately between 2-4 seconds, less than the time allowed for blade shutdown with the OPC. However the study concluded that approximately 200 injuries per year were prevented by the introduction of the OPC.

Findings from analysis of the VISS data show that blade contact was made by the operator in only half of blade contact cases, the other half of victims were children either playing in the area being mowed or riding on the operators lap. Thus while the introduction of OPC's is important in preventing injury to operators from blade contact there are other issues that also need to be addressed to further prevent ride-on mower injury, particularly in the areas of allowing children to ride on the lap of the operator or of play in areas where mowing is occurring.

Prevention

1. Review of mower designs to reduce the tip speed of the blade, and provide a discharge chute so that any objects deflected will be in a downward direction.

2. A design modification providing an auto shut off of the engine or a device which reliably quickly prevents the mower blades from turning if the operator leaves the normal working position or if the mower is left unattended for a short period of time. Lawn mowers should never be left unattended while it is still running.

3. Hands should never be placed near blades without first turning off the mower, eg prior to attempting to remove the grass catcher or clear clogged grass from the mower. It needs to be understood that with current designs the blades continue to turn briefly after switch-off.

4. Never lift or carry the mower while it is running.

5. Children should be prevented from playing in an area where lawn mowers are in operation and should never be allowed to be passengers on ride-on lawn mowers.

6. Before the commencement of mowing, stones and other debris should be removed from the area to be mowed to avoid objects being thrown up and causing injury.

7. Electric lawn mowers should not be used near water such as swimming pool surrounds, or when it is raining. Particular care should be taken not to pull the mower towards the operator (reducing the risk of running over the power cord).

8. Improved consumer awareness of the potential dangers that mowers can cause. Operators should be encouraged to use all available safety features and should endeavour to wear all available forms of protective clothing including eye protection, boots, gloves and ear muffs when operating a lawn mower. Lawn mowers should never be used with bare feet, open toed sandals or thongs.

9. Younger children should not be allowed to operate a lawn mower, if older children are to use a lawn mower they should have attained a reasonable age and maturity, be trained properly, wear the protective clothing mentioned above, and their work should be supervised at all times.

10. Moves should be made towards the implementation of mandatory safety regulations to ensure that all mowers meet with the Australian Standard.

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Shopping Trolleys (n = 268)

Karen Ashby

Victorian Injury Surveillance System data shows head and face injury accounts for 69% of shopping trolley related injury to children under five, compared with a 45% rate of injury to the head and face for cases of all injuries to children under five recorded by VISS. The following article will discuss the 268 cases of shopping trolley related injury recorded on the Victorian Injury Surveillance System database.

Children aged under 5 years were most commonly the victims in these incidents (69% of cases), 58% of which were males. Figure 7 shows an age breakdown for all cases, and shows that the peak ages for these injuries are between 1 and 3 years inclusive.

The predominance of injuries in the under 5 age group is consistent with findings from the Queensland Injury Surveillance & Prevention Project (QISPP). QISPP found that over a 3 year period (1988-91) of 101 cases of shopping trolley related injury to children under 15, 81% of victims were aged under 5.

Injuries were more common around Christmas time (13% in December), the most common days of the week for injuries were Thursday through to Saturday, especially between 11.00am and 2.00pm, presumably reflecting times of high exposure.

Not surprisingly 77% of injuries occurred in areas of commerce. Other injury sites were parking areas (7%), the victim's own home yard (3%) and the footpath (2%).

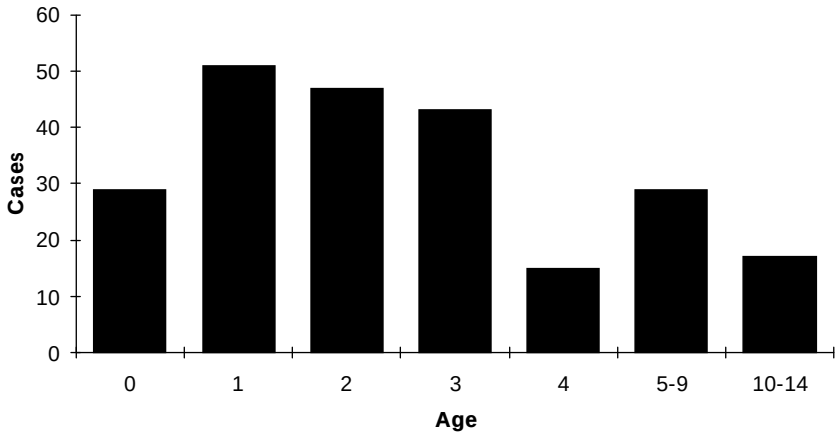
Over half (56%) of injuries were caused by falls from trolleys, of these 18% of the injured children were standing in the trolley when they fell, 18% simply mentioned sitting in the trolley and 8% were climbing on the trolley. Another 19% of injuries occurred when the trolley toppled over, two thirds of such victims were travelling inside the trolley when it tipped over, and 9% of victims hit against the trolley sustaining an injury.

The use of safety devices was recorded in only 3 cases, with two mentioning the use of a restraining strap or harness.

The admission rate for these injuries was 18%, however the majority of victims (54%) required only minor or no treatment. Another 11% of victims were treated and referred to a General Practitioner.

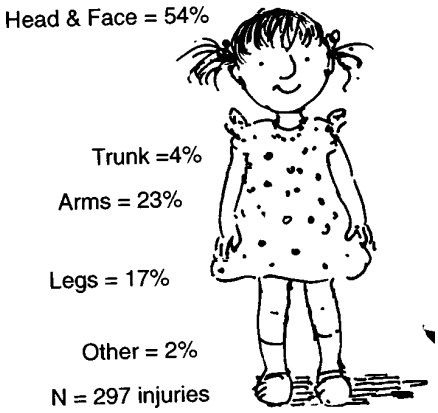
There were 297 separate injuries (up to 3 injuries per case). Just over half of these injuries were to the head and face especially bruising (18%), concussion (12%) and lacerations (7%). Fractures of the radius/ulna accounted for another 3% of injuries sustained. Figure 8 shows the most common body parts injured.

Shopping Trolley Injuries to Children by Age **Figure 7**



Source: VISS: RCH, WH, PANCH, LRH n = 231

Body Part Injured **Figure 8**



(NB: Up to 3 injuries per case).
VISS: RCH, WH, PANCH, LRH

Children Under 5 Years of Age

Studies in the USA report approximately 22,000 injuries per annum from shopping trolleys, two thirds of these serious enough to require medical treatment; they also report a similar age distribution with 60% of victims aged under 5 years. (Harrell 1994).

Common injury scenarios for this age group are shown below. It must be noted however that often a combination of these incidents led to a single case occurring. Examples of these types of incidents are "*Sitting in a shopping trolley, brother tried to get up, trolley tipped over.*"

Trolley toppled over (n=45)

Trolleys have a high centre of gravity thus making them top heavy when loaded and under many circumstances easy to tip over, such incidents accounted for nearly one quarter of injuries to this age group. These incidents were sometimes initiated by the actions of the victim and sometimes by a person other than the victim. Nearly one quarter of trolley tips resulted in the victim falling to the floor. Falling onto concrete, shelving or counters and being hit by the falling trolley each accounted for another 11% of cases. Of the remaining cases, 4% were tipped from the trolley onto the footpath and another 4% of victims squashed or caught their finger in a tipped trolley.

QISPP notes in their report that the risk of having a child in the trolley was compounded when the trolley tipped over as the trolley was then likely to become a mechanism of injury also.

Standing, fell from trolley (n=45)

Placing a child in the trolley, particularly as they get older and heavier, tends to make the trolley top heavy. When this child stands up their chances of falling from or tipping the trolley increase. Over 60% of these cases offered no real explanation other than the victim stood in trolley and fell out. Other injuries were incurred when the victim fell after leaning out of the trolley (11%) and another 9% when they overbalanced and fell. In five cases the victim actually caused the trolley to tip over (these cases are also noted in the section above on trolley tips). Common examples of these injuries are as follows, "*Stood up in shopping trolley. Lost balance, fell out landing on asphalt*" and "*Sitting in shopping trolley. Stood up onto seat, fell onto the floor.*"

Sitting in trolley (n=44)

A child, other than the victim, leaning, climbing onto, pulling over the trolley or causing the trolley to tip over was responsible for nearly one quarter of these injuries, eg. "*Sitting in shopping trolley. Older sibling pulled it over. Hit head on concrete floor* " and "*Sitting in a grocery trolley, brother tried to get up, trolley tipped over*". A similar amount of cases occurred when the trolley the victim was seated in tipped over in unknown circumstances, "*Sitting in a shopping trolley, the trolley tipped over and she landed on the ground.*" (NB - all but one of the total of 19 cases referred to above were also recorded in the 45 cases of trolley tips mentioned previously). Another three victims fell when they leaned over too far while sitting in the trolley (one was attempting to climb out at the time) and 2 fell out when the trolley hit a bump.

A further 41% of these cases were recorded with not much more information than "*Sitting in trolley. Fell out and landed on floor*".

Climbed on trolley (n=19)

Climbing out of the shopping trolley was the activity of just over half of these victims, "*Climbing out of shopping trolley, fell out onto her nose*". Another quarter were climbing on the trolley, usually the side where they were injured.

Leaning/reaching out of trolley (n=9)

This is not only a dangerous practice as it often led to children falling, representing seven of the total cases mentioned here, but also because it can give the child access to possible harmful substances. In one of the remaining two cases the victim was thought to have gained access to, and ingested fabric softener. This problem was addressed in a US Study (Harrell Reid, 1990), which claimed that "a sizeable percentage of young children accompanying parents on shopping trips may be at risk because of a failure to restrain children in shopping carts, failure to monitor children, or a combination of both." They found that of their study group of 236 pre-school children, 24% handled potentially damaging products at least once.

Other causes

Victims hitting against the trolley (6%), catching fingers in the trolley (6%), and being injured when the trolley malfunctioned (3%) were the most common of the remaining injuries.

Table 4 presents a breakdown of the incidents leading to injuries for each age group. It must be noted that cases may appear in more than one category if a combination of incidents led to injury.

Shopping Trolley Injuries by Age and Event Leading to Injury

Table 4

	0-4 n=185	5-9 n=29	10-14 n=17	Adult n=37	TOTAL (n=268)
Trolley tipped/fell over	45	2	3	1	**51**
Standing fell from trolley	45	3	2	-	**50**
Sitting fell from trolley	44	2	1	-	**47**
Unknown fall	23	3	3	3	**32**
Climbing out/on trolley	19	3	1	-	**23**
Hit against trolley	12	2	1	6	**21**
Ran into/over by trolley	3	5	1	9	**18**
Finger caught in trolley	11	3	2	1	**17**
Leaning out of trolley	9	1	-	-	**10**
Tripped over trolley	1	-	1	5	**7**
Standing on end of trolley	3	3	-	-	**6**
Malfunction of the trolley	5	-	-	-	**5**
Child in capsule, capsule fell	3	-	-	-	**3**
Other	3	2	2	5	**12**

Source: VISS: RCH, WH, PANCH, RMH, LRH n = 268

Prevention

1. The use of adjustable shoulder harnesses with side straps in shopping trolleys to restrict children's movements, particularly in relation to standing up in the trolley, is recommended. Safety harnesses should meet with the voluntary Australian Standard 3747-1989 'Harnesses for use in prams, strollers, and high chairs (including detachable walking reign)'. Adjustable harnesses that fit not only shopping trolleys but high chairs and strollers by means of plastic clips, can be purchased from the Child Safety Centre at the Royal Children's Hospital or leading nursery furniture retailers for approximately $14.00.

   A supermarket chain in Australia (Coles Supermarkets) provides a limited number of shopping trolleys with baby capsules securely attached to the top of the trolley, for both customer convenience and safety. This intervention is not aimed at the age group most at risk, 1-3 year olds.

2. Children should be discouraged from riding on the end a trolley. This practice is likely to cause the trolley to tip over, perhaps falling onto the child or as seen in these cases causing a younger sibling to fall/be thrown out of the trolley, practices such as these were a factor in approximately 10% of the cases discussed in this article.

3. Stability testing of loaded trolleys (including child passengers) is required possibly leading to design modifications such as a lower centre of gravity.

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Chainsaw Related Injuries (n=138)

Virginia Routley

The chainsaw, particularly the smaller 'consumer' models, enjoyed an upsurge in sales in the late 70's and early 1980's due to the back-to nature movement and the energy crisis. However its popularity, as shown by retail figures, has since declined. Environmental restrictions and population spread have made timber less accessible and commercial timber working has become more mechanised. (Stroud, 1985, Power Equipment May 1990, March 1992).

Despite this decrease in usage and an improvement over time in safety features injuries are still occurring. Chainsaw teeth produce a ripping effect and cause a ragged, destructive skin laceration with tissue loss over an 8 to 10mm width. (Riefkohl et al, 1986). The wound is often contaminated with grease, clothing and sawdust making infection likely unless there is adequate cleansing. (Stroud, 1985).

To date 138 cases of chainsaw related injuries have presented to VISS hospitals during the collection period, particularly the Latrobe Regional Hospital (78% of cases). Chainsaw related injuries represented 0.2% of injury cases on the database (0.5 % at Latrobe Regional Hospital) and 3% of garden equipment injury cases. Twenty-one percent were sufficiently severe to be admitted to hospital and an additional 59% required significant emergency department treatment. Almost all cases were male and although occurring across all ages were most common in the 30-34 year age group. Injuries to the older age groups tended to be more severe.

Injuries most commonly occurred in a home garden (44%) with a further 20% occurring in areas of bushland or paddocks. National Injury Surveillance (NISU) data, as reported in *Choice* magazine, also found that almost half of injuries occurred in the home/yard. (Choice July 1994). Two thirds of injuries occurred during maintenance and one quarter while on duty at work, particularly while forestry labouring in the Latrobe Valley. (The Latrobe Valley is the only rural area from which VISS collects data).

Table 5

Common Causes of Injury	Presentations N	% of total cases
Loss of control or slipping of the chainsaw	18	13
Woodchips, sticks or sawdust hitting against or embedding in the eye	13	9
Chainsaw user slipping	12	9
Maintenance related, especially sharpening	12	9
Kickback [1]	10	7
Slipping of wood or log being cut	10	7
Tree related incidents eg ' Knocked off balance by limb. Cut by chainsaw'	9	7
Chainsaw caught or jammed	8	6
Knocked against or falling onto the chainsaw	5	4
Chainsaw cutting disc related	4	3
Catching fingers in the chainsaw	3	2
Body parts too close to the chainsaw while operating.	2	1
Injury description not sufficiently detailed	32	23
Total	**138**	**100**

Source VISS: RCH,WH,LRH,RMH,PANCH

[1] Kickback occurs when the upper quadrant of the nose of the bar contacts a solid object or when the chain is pinched. The reaction of the cutting force of the chain causes the chain to rotate in the opposite direction to the required chain movement causing the saw to be flung back towards the operator. It has potential to cause extremely serious wounds.

Causes of Injury

The most common causes of injury where there was sufficient detail are shown in Table 5. Typical examples of the most frequent were 'Slipping or loss of control of the chainsaw', 'Cutting wood with chainsaw. Saw slipped. Thrown on foot. Saw cut foot.', 'Cutting wood. Lost grip of the chainsaw'.

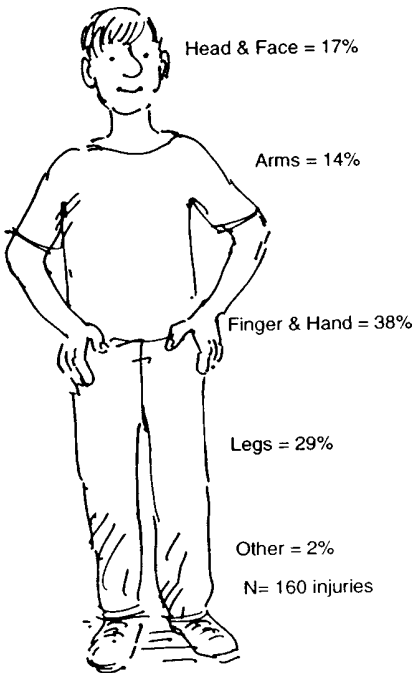
NISU also reported similar common situations leading to injury - Kickback, the operator's hand slipping while sawing, operators coming into contact with the chain after falling and burns from petrol saws still hot after use. (Choice, July 1994).

Nature of Injuries

Lacerations were the most frequently sustained injury (72% of injuries), regardless of how the injury occurred, (44% to the hand, including 28% to the fingers). Hand injuries accounted for 38% of all injuries caused by the chainsaw. The figure for lacerations

is consistent with Accident Compensation Commission data (1985 to 1989) where 75% of injuries were of an open wound nature. (Peake et al, 1989). Abrasions and foreign bodies in eyes accounted for 11% of the injuries eg '*Whilst using a chainsaw cutting timber sawdust got into eyes, no goggles on'*. Chainsaw literature notes that injuries usually occurred to the left side of the body due to the required method of holding the saw. (Haynes et al, 1980) (See figure 9).

Body Part Injured Figure 9



VISS: RCH,WH,PANCH,LCRH,RMH

There were 28 cases associated with chainsaw use admitted to hospital. Lacerations represented 59% of admitted cases, fractures 29%. For five of the admitted cases the injury was directly caused by a log or tree, fractures being the most common outcome for this scenario. There were no eye injuries among the admissions. The more serious injuries directly caused by the chainsaw were '*Cutting wood with chainsaw, chainsaw kicked injured leg*' causing lacerations to the hand, lower leg and a fractured metacarpal'; '*Demolishing building, chainsaw slipped'* causing lacerations and a fracture to the face/scalp and lacerations to the shoulder , '*Started a chainsaw*' causing a fracture and lacerations of the forearm including nerves and '*Caught fingers in the chainsaw*' resulting in an amputation of the finger.

As far as could be discerned from these initial diagnoses based on the VISS form even serious injuries did not appear to be as serious as those reported from American literature in the 1980's, especially in regard to kickback injuries to the face and neck. Face and neck (excluding eye) injuries represented 40% of chainsaw related admissions to a hospital in Alabama over the period 1972-79. (Haynes, 1980). In contrast only 7% were injuries of this type for admitted cases on the VISS database. Fifty-six percent of Accident Compensation Commission Workcare claims (1985-1989) for the Victorian timber industry were located in the lower limb, 25% in the upper limb. The figures for the head and neck were negligible. Only 2 and possibly 3 of the VISS admission injuries were reported to be incurred by chainsaw kickback. There were no deaths in the 3 year period 1989/90 to 1991/92 in Victoria. (Coroner's Facilitation System). Relevant Australia-wide or Victorian mortality figures previous to this period are not available. However there were at least 139 deaths from chainsaw related injury in the United States in 1982, international figures being relevant since all chainsaws are manufactured overseas.(Stroud et al, 1985). It appears that improvements in chainsaw safety may be having an effect in reducing serious injury. See the later section on improvements.

Safety equipment

Only 33% of the people injured stated that they had worn safety equipment of any type. Most commonly worn were eye protection such as goggles or face shields (n=17), ear muffs (n=15), boots (n=14), padded trousers (n=12), helmets (n=7), gloves (n=7) and vests (n=3). Injuries from those who did not wear protection of any type were more serious (admission rate 27% for no protection compared with 11% for some type of protection).

In 35 of the 54 cases where safety gear was worn the protection was not related to the injury eg ear muffs and finger lacerations. For the 15 cases which were related 5 injuries to the leg (3 lower leg) were received when safety pants were worn, 4 were wearing glasses when foreign bodies entered the eyes, 3 received injuries to the feet, 2 to the lower leg, when wearing boots and there was one case of finger injuries when wearing gloves. Only 2 cases wearing relevant protective gear were sufficiently serious to be admitted to hospital.

It should be noted that of those on-the-job two thirds were wearing safety devices but only one third of those not on-the-job did so.

Forest Operators

An injury and safety study was undertaken in 1989 of 300 professional chainsaw operators in Victoria. The survey indicated that 14% had incurred an injury in the past 5 years and that young forest labourers and those with a high level of chainsaw use were at the greatest risk of injury. The chainsaw operators had criticisms of the current design of goggles, mesh shields, gloves, cut-resistant pants and boots. (Peake,C, Magill,J, 1989).

Since September 1989 all professional forest operators must undertake courses in both Occupational Health & Safety and Environmental Care and pass competency tests in order to receive a licence from the Victorian Department of Conservation and Environment. Safety gear, particularly ear and head protection, high visibility vests, cut-resistant pants and steel capped boots are emphasised in these courses. The enforcement of the wearing of the safety gear and other safe work practices vary within Victoria. Australian Paper Mills Forests Pty Ltd (APM) are regarded as a model in the occupational health and safety field. They employ 3 former forest workers to check on the wearing of safety equipment in logging areas and wage penalties are incurred for those not dressed correctly. The inspectors' role is also to give on-site remedial training for unsafe work practices. Gloves and eye protection are given a lower priority than other protective gear. (Coates, 1995).

Australian Standards

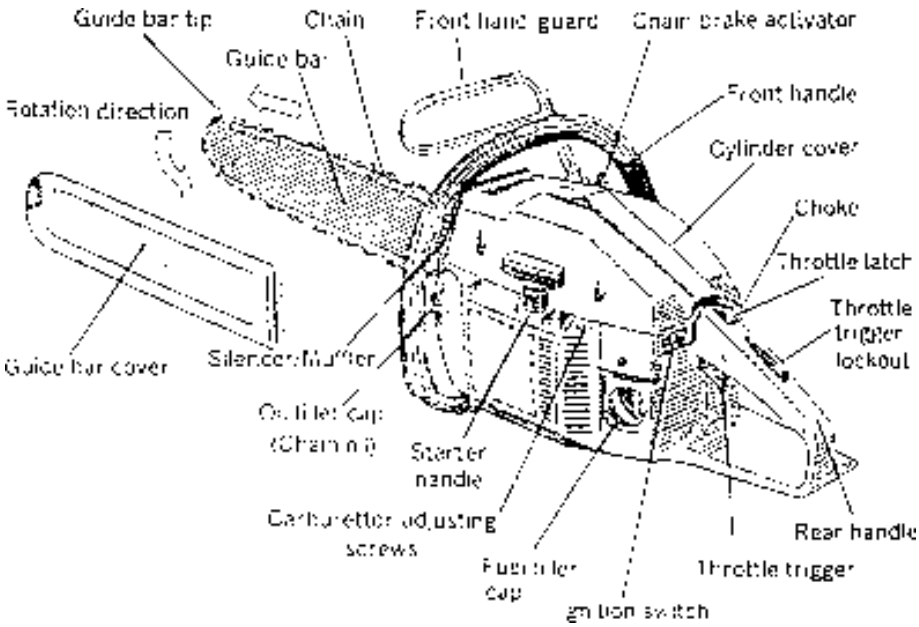
There are two relevant Australian Standards for chainsaw safety AS 2726-1984 'Chainsaws - Safety Requirements' and AS 2727-1984 'Chainsaws - Guide to Safe Working Practices'. These apply to portable, hand-held, electrically or petrol driven chain saws. The former covers the design and construction and the mechanical requirements, the latter hazards and protection, safe operations and maintenance schedules. The former standard is mandatory, the latter is enforced to varying degrees in the workplace. There are no restrictions on the casual user. The casual user appeared to have the largest proportion of retail sales during 1989, consumer saws - 37%, farm saws - 40%, professional saws - 13%, therefore its importance cannot be dismissed (Power Equipment Australia, 1990).

Improvements in Safety

There have been several ergonomic, legislative and design improvements which have over time facilitated chainsaw use and improved safety. Examples are mandatory training courses for forest workers, Australian standards for chainsaws, chain brakes (manual or more recently inertia), saws which are easier to work with because they are lighter, no longer need to be manually oiled every 30 seconds, have more effective muscling devices and anti-vibration handles, lockout devices on the trigger so the hand must be wrapped around the pistol grip for the motor to operate, a roller nose bar to reduce kickback, a chain catcher in the event the chain is derailed or broken and a non-kick chain with links designed to reduce kickback. (Coates,D,1995).

"Raynaud's phenomena" or "white-finger" caused by chainsaw vibration is no longer a problem due to the anti-vibration handles.

Main Parts of the Saw **Figure 10**



Prevention

1. Investigate design change to require two handed operation (since many injuries are to the hand).
2. Given the high proportion of finger and hand lacerations for chainsaw injuries there appears to be a strong case for the more widespread use of industrial safety gloves or chainsaw mittens both during sharpening and in motion, as noted in AS 2727.
3. Eye protection does not always protect against foreign bodies (Hazard 17). Safety goggles, but not necessarily safety glasses, should be effective against woodchips and reduce the risk of damage from finer foreign bodies. A helmet with a face shield, would be recommended protection.
4. AS 2727 notes that safety boots should incorporate a non-slip, deep tread sole or be fitted with metal sprigs or cleats. Cut-resistant trousers or chaps which have many layers of tough material (22 layers of nylon chameuse for the Spacetime brand) are generally recommended. They clog up the saw teeth on impact, thereby slowing the blade and reducing the cutting effect. The Australian Standard notes only trousers, without further specification, since testing has yet to reach consistency. Close fitting clothes should be worn.
5. Time should be taken to properly maintain, including disassembling, and preparing the saw. Correct sharpening techniques should be used (as specified in the Stihl safety video).
6. The saw should be started on the ground and not carried long distances when turned on. The chain brake should be stopped or the chain brake applied for distances of over 5 metres. (AS 2727).
7. Safety features are as noted under the safety improvements section and additional design requirements may be necessary to eliminate the problem.
8. In addition to kick-back, push-back and pull-in forces can lead to injury. To counter any reactive forces during cutting operations:-

   a) Maintain a proper balance and secure footing.

   b) Keep a firm grip on the chainsaw with both hands, with the thumb of the hand holding the front handle wrapped around the handle.

   c) Pay full attention to the operation.

   (AS 2727-1984).
9. The safety information provided by the manufacturer, eg Stihl video, should be acquired and observed. *Choice* in its survey of chainsaw brands found most included information on safe operating practices and proper protective clothing. The Forestry Commission of NSW sells a book - *'How to use a chainsaw safely'*, if additional information is required.
10. Use correct tree felling and limbing techniques as described in AS 2727.
11. Safety equipment eg cut-resistant pants, gloves, eye protection should be hired with the chainsaw if not already owned. Responsible hiring agencies should ensure that appropriate protective equipment is supplied.
12. Since gloves may reduce dexterity and eye protection may fog up further research is required into the wearing of protective equipment, especially gloves, and into the design of products which are more acceptable. The survey of Victorian forest workers in 1989 indicated dissatisfaction with the design of eye protectors, gloves, cut-resistant pants, safety boots and hearing protectors for their working environment.

Recommended Protective Clothing and EquipmentFigure 11

* Hard hat
* Ear muffs or ear plugs
* Visor or safety glasses
* Strong work boots (steel cap preferred)
* Close fitting clothes
* Leg protection (cut resistant trousers)

Acknowledgments

Stihl for their video '*Chainsaws and Commonsense*'.

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- INDEX -

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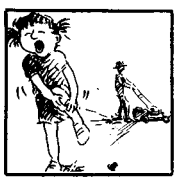
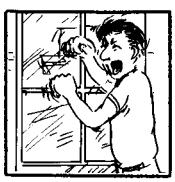


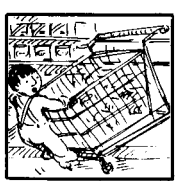


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How to Access VISS Data:

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-ordinators or the Director by contacting them at the VISS office.

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Participating Hospitals

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Coronial Services

Access to coronial data and links with the development of the Coronial Service's 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.

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