

Hazard
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Victorian Injury
Surveillance System

Monash University
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VicHealth

This edition of Hazard examines horse related injury in the VISS database, the Victorian Coroner's Facilitation System and the Victorian Inpatient Minimum Dataset. The analysis is undertaken in two sections, with the first assessing injuries occurring during horse riding, the second, injuries sustained during other horse related activities. Prevention strategies are a major focus. The article updates and investigates in more detail horse related injuries as presented in Hazard 7, and for the first time looks at adult horse related injury

Horse Related Injuries

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Summary

Horses and horse riding provide enjoyable recreational and sporting activities, however the potential for injury is high due to the size and sometimes unpredictable nature of horses. (Sherry, 1991).

Of the 1330 cases of injury involving horses on the Victorian Injury Surveillance System database 80% were to horse riders, the remainder occurred during horse handling activities or unrelated activities around horses. The latter categories will be referred to in this article as non-riding activities and activities specified as horse riding will encompass those

activities named as equestrian activities in the associated literature.

The morbidity and mortality associated with horse riding activities varies greatly according to a variety of factors such as age, sex, type of activity, experience, helmet use, the type of helmet and both the age, size, character and temperament of the horse.

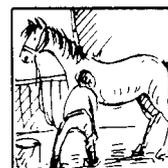
The VISS data shows a predominance of injury to girls (10-19 years) who account for 41% of riding and 23% of the non-riding related injuries.

Children's injuries (under 15 years) were of a more serious nature than their adult counterparts accounting for 31% of children vs 22% of adult

admissions for horse riders and 42% vs 14% of non-riders.

Head injuries are responsible for the majority of serious horse riding injuries and the risk of head injury is higher in younger and less experienced riders. (Barone, 1989, Bixby-Hammett et al, 1990).

The prevention of horse riding injuries requires adherence to standard horse handling safety practices and the use of protective equipment, such as approved safety helmets and appropriately designed stirrups, shoes, tack and other protective equipment. Detailed recommendations for prevention are included.



Introduction

Horse Related Activities – the Risks

The majority of injuries in most reported studies occur whilst horse riding or driving (or whilst preparing for/completing these activities) which have been noted as equestrian activities, but around 25% of horse related injuries are sustained during general horse handling activities (feeding, grooming, shoeing, leading into/out of floats etc) and unrelated activities (eg. playing in the vicinity). Horse riders were named as one of four priority population groups to be targeted for reductions in sports and recreational injury in the Commonwealth Department of Human Service and Health's Injury Prevention and Control Implementation Strategy. (Nutbeam et al, 1993, Commonwealth Department of Human Services and Health, 1994). Although total injury rates are relatively low compared to some other sports, international studies estimate that participants in equestrian sports are at higher risk of serious injury, in terms of exposure (participation in hours), than participants of most other sporting recreational activities, including motorcycle and automobile racing. (Firth, 1985) (Silver et al, 1991).

Injury incidence in Australia

To date, only limited information has been available on the incidence of horse riding injuries in Australia. A recent report ranked horse riding activities in the top twenty sports/recreational activities resulting in presentation to a hospital emergency departments for treatment. Of more concern, however, was their ranking as the third highest sport/recreational activity requiring hospital admission following presentation to an

emergency department for children (34% of cases were subsequently admitted) and as the fourth highest for adults (20% of presentations were admitted). (Finch et al, 1995). In Victoria, the average annual frequency of horse riding injuries requiring hospitalisation in public hospitals is approximately 700. (Watt, 1995) This figure is estimated from the mechanism of injury code "animal being ridden", based on 96% of animals being ridden being identified as horses among VISS admitted cases. The New South Wales Farmsafe Committee has identified horses as involved in 8% of injuries occurring on farms, paddocks and fields and has set, as a priority, the prevention of horse related injury (Farmsafe Australia, 1994). Eighteen horse related fatalities occurring in South Australia during 1973-1983 were examined by Pounder, who found that head injuries were responsible for 78% of these deaths. None of these cases wore helmets. Unfortunately, information from other sources about equestrian injuries has yet to be reported. (Pounder, 1984).

Horse Riding Related Injuries

These cases related to riding or driving a horse or whilst preparing to start or finish these activities (saddling, mounting, dismounting etc.). Horse riding is integral, for example, to hacking (ie riding for recreation and pleasure), trekking, racing, show jumping, dressage, eventing, hunting and polo, but not to horse driving trials, trotting or harness for pleasure. Participation data in equestrian activities is limited in Australia, but in 1993/94, estimates were at least 120,000 regular and 100,000 social horse riders in Australia. (Brokensha, 1994). The Population Survey

Monitor conducted by the ABS in 1994 estimated a total of 150,000 participants aged 15 years or more in organised horse riding activities throughout Australia. At least 60% of all participants are female and about one third of all Australian horse riding activity occurs in Victoria.

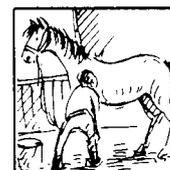
Emergency Department Data (VISS) (N = 1068)

Seven campuses of five public hospitals have participated in the collection of emergency department data for the VISS database, which as of February 1995 contained 160,000 records. The collection periods differ between hospitals and are as follows: Royal Children's Hospital (1988-93), Preston and Northcote Community Hospital (1989-93 children, 1992 adult), Western Hospital (1989-93 children, 1991-92 adult), Royal Melbourne Hospital (1992-93 adult), and Latrobe Regional Hospitals (from July 1991-present, all ages). Of the Latrobe Regional Hospital and Western Hospital, when all age collections, only one third of cases were to children. However, a bias towards children in the total VISS database results in 58% of total cases being to children.

'Rural' as used in this study refers to the Latrobe Regional Hospital and 'urban' the remaining hospitals, all located in Melbourne.

Age and Sex Distribution

Studies conducted elsewhere report that the majority of equestrian injury cases occur in young females (Nelson et al, 1992, McGhee et al, 1987). VISS data in the two all-age collections, Western and Latrobe Regional Hospitals show that overall children account for 35% of cases. The age groups with the greatest case numbers of injury were the 10-14



year olds (24% of cases at each of the two all age collection hospitals) and the 15-19 year olds (24% at WH and 18% LRH).

The predominance of riding-related injuries in females to age 20 is likely to be a reflection of their greater levels of participation. Bixby-Hammett and Brooks suggest, however, that given the increasing proportion of injuries in males in the U.S.A. over recent years, further research is needed into the role of gender (Bixby-Hammett et al, 1990).

Females predominated both in child cases (77%) and the adult collections (59%). Males began to dominate slightly from the age of 30, however, this only becomes marked in the LRH 40-49 year age group (16%), perhaps reflecting the greater proportion of occupational injury cases in this collection.

Seasonal Variations

The warmer months, October to April, are the most common months for horse riding injuries.

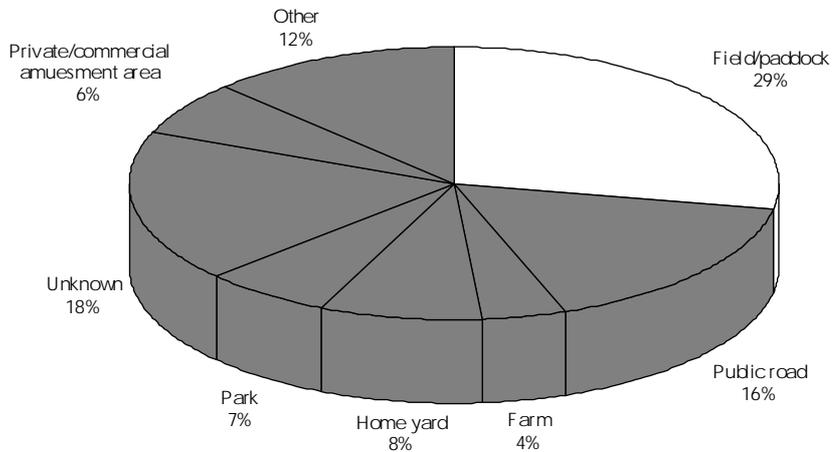
Location

The most frequently reported locations for horse riding injuries are fields/paddocks (29%) and public roads (16%). The yard of a private home (mainly the victim's), national (or other) parks and private/commercial amusement areas (racetracks, riding schools and centres) were also notable proportions at 8%, 7% and 6% respectively. (See figure 1).

The pattern of locations was similar for adults and children, but differed between the urban and rural regions. Not surprisingly, fields and paddocks were more frequently reported in rural regions for both adults (33% rural vs 22% urban) and children (38% vs 26%).

Horse Riding Injury by Location

Figure 1



VISS: RCH, WH, PANCH, RMH, LRH (N = 1068)

Injuries occurring on public roads were also much more frequently reported in the rural regions for both adults (22% rural vs 8% urban) and children (34% vs 12%). The data also showed a greater proportion of injuries occurred during transport and travel activities in rural areas.

The importance of roads as a factor in equestrian injuries, generally, has been recognised by the draft Proposed Australian Road Rules currently undergoing consultation. (AustRoads, 1995). The draft includes a proposal that the use of specified safety measures by horse riders when on public roads be made mandatory. The proposals include requirements that all horse riders wear a helmet, reflectors when riding at night and be allowed to use footpaths and nature strips. The promotion of equestrian helmets in Australia is likely to need a similar approach to that used to promote and effectively introduce mandatory helmet wearing for bicyclists in this country. (Finch et al, 1992).

Riding schools are reported in a number of studies as the location of the injury event (Pounder, 1984 Bixby-Hammett, 1992). VISS data shows that at least 10% of child injuries in the urban area and 12% of injuries in the rural areas occurred in riding clubs/schools/centres.

Activity

Horse riding activities differ with riding speeds, terrain, and fitness and experience levels of the rider. (Firth, 1985). In turn, these factors have different implications for frequency, nature and severity of injury. (Firth, 1985). In the VISS data, although the specific riding activity (dressage, mustering, cross-country) was recorded in the narratives of only a few cases, important data on the stage of the activity undertaken was provided in many of the case narratives. Of the 1068 cases of riding-related injury, all but 34 appear to have occurred whilst riding the horse. These 34 cases of injury occurred whilst preparing to/finishing ride, dismounting/mounting and horse driving (it must be remembered that



these cases exclude non-riding related injury cases, which are covered in the second section).

Whilst riding (n=1034)

Contributing factors

Useful data on factors contributing to the injury event was provided in the narratives of 251 (24%) cases. The major groups of factors recorded were: horse behaviour (39%); jumping (16%); ground conditions (14%); equipment problems (8%); rider behaviour (8%); and 'other' (15%). In a further 182 cases (17%) it was recorded that the horse bolted, bucked or reared but no details on underlying reasons were given.

Horse behaviour (n=98)

In all but 15 cases, a fright received by the horse was the factor leading to the injury event. Dogs (17) and vehicles (10) were the leading sources of fright, but the reason for fright was not specified in 31 cases. Another horse was involved in a further 11 cases, contributing to changes in horse behaviour. Horse behaviour was given as a factor in a greater proportion of child cases (61% or cases relating to horse behaviour), compared with adults (39%).

Jumping (n=41)

Injury to 18 children and 23 adults was reported to have occurred whilst jumping. In a few cases, a fall during the jump was noted to have occurred when the horse clipped or struck the item to be jumped (hurdle, gate, fence etc) but in most cases further detail on the injury event was not recorded.

Ground conditions (n=34)

In 19 cases, the horse stumbled, slipped or tripped. Muddy/soft ground (8) and avoiding ditches (6) were further contributing factors. This is

not surprising given the predominance of paddocks as locations of injury.

Equipment problems (failure and dislodgment) (n=29)

In 5 cases, failure (ie. breakage) of equipment was reported and included breakage of stirrups (3) and girth (2). In a further 24 cases, dislodgment of equipment was noted and included: saddles (10), stirrups (6) and loss of reins (7).

Rider behaviour (n=19)

Rider behaviour was given as a contributing factor in 19% of child cases where a contributing factor was apparent, and in only 4% of such adults. Twelve cases were associated with bareback riding, and 10 of these occurred in metro areas. Other factors mentioned were incorrect seating (1), riding too fast (1), inexperience (1) and lack of concentration (1).

Other (n=30)

The rider was injured by a horse other than the horse he/she was riding in 14 cases. In a further 18 cases, the horse and/or rider struck an object such as a tree, fence, traffic sign or other structure. Although striking an object did not constitute a major proportion of events, 2 of the 10 fatalities to be discussed later were the result of striking an object.

Other factors associated with injury

Other factors such as rider experience and supervision, previous injuries to the rider and details of the horse involved (eg. age, size, type) have been reported by in-depth studies overseas (Ingemarson et al, 1989), but this level of data is generally unavailable from a general injury surveillance system.

The proportion of injured riders, who had sustained a previous injury was

around 40% in 2 reported studies (Silver et al, 1991, Bixby-Hammett, 1990). In fact, almost one-fifth of injured riders were reported to have had more than 3 previous injuries, and one-quarter of injured riders reported having had horse related incidents before beginning horse riding. (Bixby-Hammett, 1990).

Factors such as the age, size and character of the horse are also associated with injury occurrence, with each being inversely proportional to injury occurrence. Thus, the older and smaller the horse, the less is the risk of injury (Ingemarson et al, 1989).

Preparing for/completing riding (n=10)

In 10 cases, injury occurred while the victim was preparing to ride or drive the horse (7) or preparing to finish (3). Injury was most frequently reported to have occurred whilst saddling the horse. Scenarios included the rider being distracted (and hit in the face by the stirrups) and the rider tripping on the reins after the horse moved its head.

Mounting/dismounting (n=14)

Injuries at the time of mounting the horse were reported in 11 cases (5 children, 6 adults). Again, no pattern was evident, but scenarios included: the horse kicking over the item being used by the victim to stand on (drum, stool etc); or the horse becoming upset or frightened. Only 3 injuries were reported as occurring at the time of dismounting, and included falling awkwardly and dismounting backwards.

Driving the horse (n=10)

In 10 cases, the horse was being driven and injury occurred when the victim fell off a buggy or out of a sulky. In 2 cases, this followed a fright to the



horse and in another 2 it followed collision with another horse in a race.

Mechanism of injury

(N = 1068)

Falls predominated in both children and adults and in urban and rural areas accounting for 77% of all cases. Also reported were crushes when the horse rolled on or stood on the victim (7%), kicks (4%) or the rider being dragged after getting their foot caught in the stirrup (2%).

Resulting injuries are shown below in Table 1.

The predominance of falls as a mechanism of injury has been recognised in many studies, (Barone 75%, McGhee 90%, Hobbs 63%). Ingemarson, in an analysis of 406 cases of riding injury reported that falls predominated in leisure riders,

but the horse rolling over was responsible for more of the contest riders and suggests that the predominance of falls reflects the predominance of leisure riders.

Injury Severity

Nearly half (48%) of victims of horse riding injuries required significant treatment, ie, a referral or review after the initial consultation in the emergency department. A further 27% of victims required admission to hospital. Table 2 shows a breakdown of treatment required.

The severity of falls from a height (over one metre for horse riding) is evidenced by 27% of fall victims requiring hospital admission.

Nature of Injury

VISS allows up to 3 injuries per case to be recorded. Fractures were the

most common injury, followed by soft tissue injury (lacerations, bruising, abrasions), strains/sprains and concussion. Fractures accounted for 43% of child injuries and 30% of adult injuries. This compares with 18% of child presentations in the entire VISS database and 16% of adult presentations, indicating the serious nature of horse riding related injury.

Fractures were predominantly to the upper limbs, particularly the radius/ulna (16% of children's injuries vs 5% of adult injuries), humerus (8% vs 2%) and wrist (4% vs 5%). Another 4% of adult injuries were rib fractures.

Soft tissue injuries (bruising, lacerations, abrasions) accounted for 33% of child injuries and 29% of adult injuries. Most soft tissue injuries were to the face and scalp (4% of total injuries sustained).

Body Regions Injured by Mechanism of Injury

Table 1

Body Region	Fall/thrown from horse n = 1009%	Kicked n = 51%	Rolled/trod on by horse n = 111%	Dragged by horse n = 33%	Other n = 126%
Head/face injuries	20	35	24	33	18
Upper limbs	47	12	20	27.5	39
Lower limbs	19	43	33	27.5	33
Trunk	13	6	17	9	10
Other	1	4	6	3	-
Total	100	100	100	100	100

VISS: RCH, WH, PANCH, RMH, LRH (N = 1330). NB up to 3 injuries per case.

Injury Severity by Age and Sex - Horse Riding Injuries

Table 2

Disposition of patient	<15 years				15+ years				<15 all		15+all	
	M		F		M		F					
	N	%	N	%	N	%	N	%	N	%	N	%
No treatment given	9	7	32	8	7	3	18	6	41	8	25	5
Treated, no referral/review	22	16	63	15	40	20	79	25	85	16	119	23
Review/referral	58	43	190	47	110	53	155	48	248	45	265	50
Admission to hospital/ transfer	46	34	121	30	49	24	68	21	167	31	117	22
Fatality	-	-	1	0	-	-	-	-	1	0	-	-
Total	135	100	407	100	206	100	320	100	542	100	526	100

VISS: RCH, WH, PANCH, RMH, LRH (N = 1068)



Sprains and strains accounted for 6% of child and 15% of adult presentations, with the most commonly affected areas being ankles (2%), shoulders, wrists and neck (each 1%).

Concussion accounted for 8% of presentations in both children and adults, 65% of whom required admission to hospital. The proportion of child and adult presentations for concussion is greater for horse riding injury than for all sports injuries on the VISS database, where 4% of child and 3% of adult injuries are for concussion.

When the first injury only is examined, compared with up to 3 injuries recorded, fracture proportions are higher, soft tissue injuries are lower and sprains/strains and concussion shows little difference.

Body region injured - (up to 3 injuries per case)

VISS data showed that 50% of child and 34% of adult injuries are to the upper limbs, most commonly to the radius/ulna (9% of total number of injuries-all ages, all cases), the elbow (5%), the humerus (4%) and the shoulder (4%). Figures 2 (children) and 3 (adults) show the most common body regions injured.

Lower limbs also accounted for a substantial proportion (17% of children and 27% of adults), but Hobbs suggests that lower limb injuries are less likely to be associated with falls and are more likely to be associated with being trodden on or fallen on by a horse.

The head and face comprise 22% of child and 20% of adult injuries, but they are over-represented in those admitted to hospital (36% of child and 27% of adult admissions). This

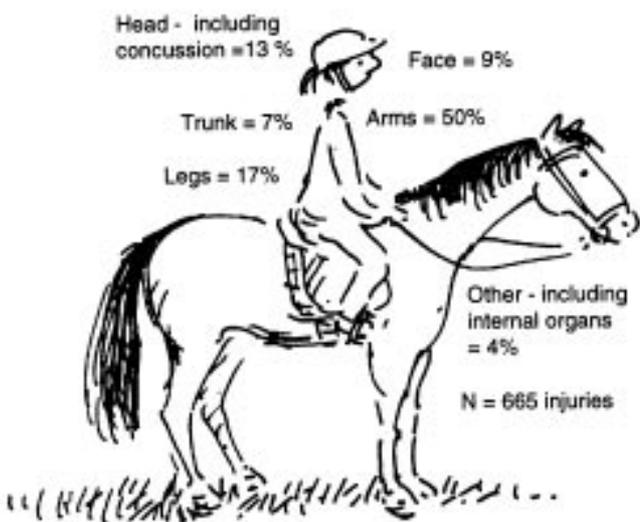
is not surprising given that the rider's head can be 3 metres above the ground level prior to a fall (McGhee et al, 1987) and that the speed of a horse can be up to 65 km/hour (Silver et al, 1991).

Prevention of injury is important particularly for (i) upper limbs because of their frequency and (ii) head region because of the predominance of severe injury. In the case of head injury, the standards-approved equestrian helmet is (despite the lack of a full evaluation) currently the most important item of protective equipment. (Firth, 1985)

Hospital Admissions Data

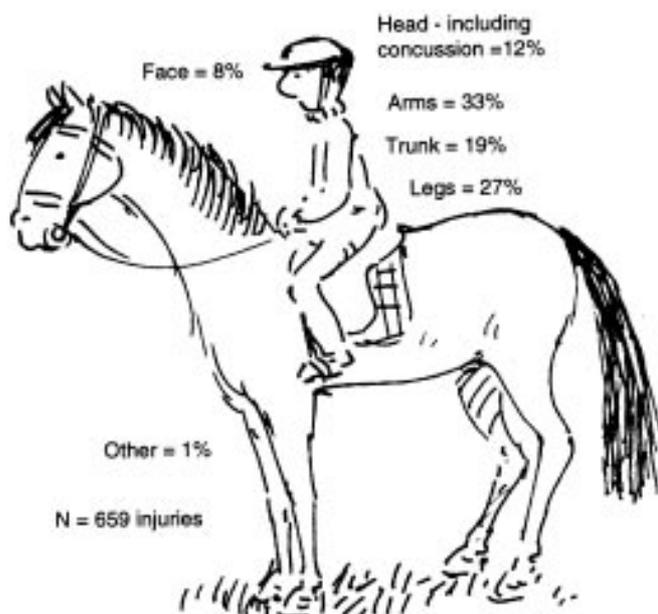
The Victorian Inpatient Minimum Dataset provides data on all public hospital admissions in Victoria. Data covering the years 1987-1993 has been examined to explore riding injuries. The ICD9 coding system is limited to "animal being ridden" for identifying relevant cases. This figure is estimated

Children's Horse Riding Injuries by Body Part



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

Figure 2 Adult Horse Riding Injuries by Body Part

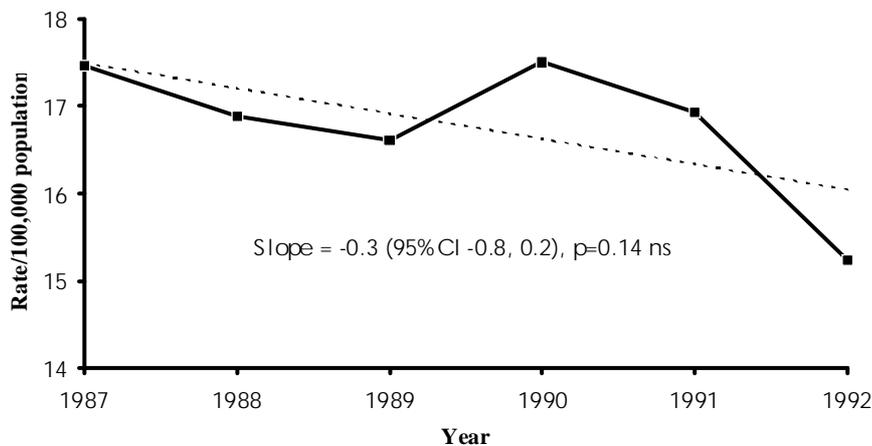


(NB up to 3 injuries per case).
VISS: WH, PANCH, RMH, LRH.

Figure 3



Trends in all age Horse Riding Injuries - Victorian Inpatient Minimum Dataset Figure 4



VIMD: July 1987-June 1993 (Public Hospitals)

from the mechanism of injury code “animal being ridden”, based on 96% of animals being ridden being identified as horses among VISS admitted cases. Thus, there were an estimated 4109 cases identified in this way representing a rate of injury of 16 per 100,000 population, with an annual average of 685.

The peak age for injury was 10-14 years (consistent with the VISS data). Head and face injuries combined accounted for 29% of injuries sustained including, importantly, intracranial injuries (12%), concussion (11%) and other head/face injuries (6%). A further 26% of injury was to the upper limbs and 4% to the spine including 14 cases over the 5 year period of injury to the spinal cord.

The average stay in hospital was approximately 4 days with a median of 2 days. Figure 4 shows the trends for horse riding injury as recorded in the VIMD.

Although a downward trend in horse riding injuries requiring hospitalisation is observed, this trend is not statistically significant.

It should be noted that cases of horse riding injuries are also frequently admitted to private hospitals in Victoria. In an 18 month period from January 1993 - June 1994, 162 admissions were recorded, with a ratio of 2 females to 1 male. Thus this impacts on the total state incidence, increasing the annual average frequency to approximately 785 and the rate to 18 per 100,000.

Mortality Data

Data from the Coroner’s database is available for the period 1988/89 and 1991/92 inclusive. Seventeen horse related deaths were reported in this time, with 10 of these being riding-related injuries. In two of these 10 cases, the victim was riding a horse and fell; in two cases, the victim struck an object (fence, power pole); the victim was struck by a vehicle in a further case and in the final case, two horses collided and fell on the victim. Two of these cases resulted from equipment failure (broken reins), one from the horse stopping suddenly and one where the horse stumbled. In 3 cases, bolting by the horse (reason not specified) led to the injury event

and in one case, the victim’s foot was caught in the stirrup and the victim was dragged for some distance.

Of the 17 cases, 71% recorded injuries to the head and a further 71% to the chest. Helmet use was not recorded in the narrative of any of the cases.

Most previous studies report the predominance of head injuries amongst fatalities. Few mortality studies have been done in Australia, but Pounder examined 18 fatalities (inc. two natural deaths) in South Australia from 1973-1983. Head injuries accounted for 14 of the 18 fatalities.

Studies in Sweden (Aronson & Tough, 1993, Ingemarson et al, 1989) and USA (Bixby-Hammett, 1992) also reported that head injuries account for the majority of fatalities, with helmet use almost nil in the former study. Ingemarson reported that all fatalities followed cerebral trauma, and that of the 22 out of 38 who wore helmets, only two helmets provided protection. The rest were the classic riding helmet (consisting of only two layers - an outer concussion - preventive and an inner layer for comfort), this offers poor protection for avoiding serious head injury.

Prevention of Injuries

The prevention of horse riding injuries requires adherence to standard horse handling safety practices and the use of protective equipment, such as approved safety helmets and appropriately designed stirrups, shoes, tack and other protective equipment. The most important of these is a safety helmet that meets the current Australian Standard AS2063.3. Training (of horses, riders and horse handlers) is also an important strategy for safety. Other prevention measures include responsible course



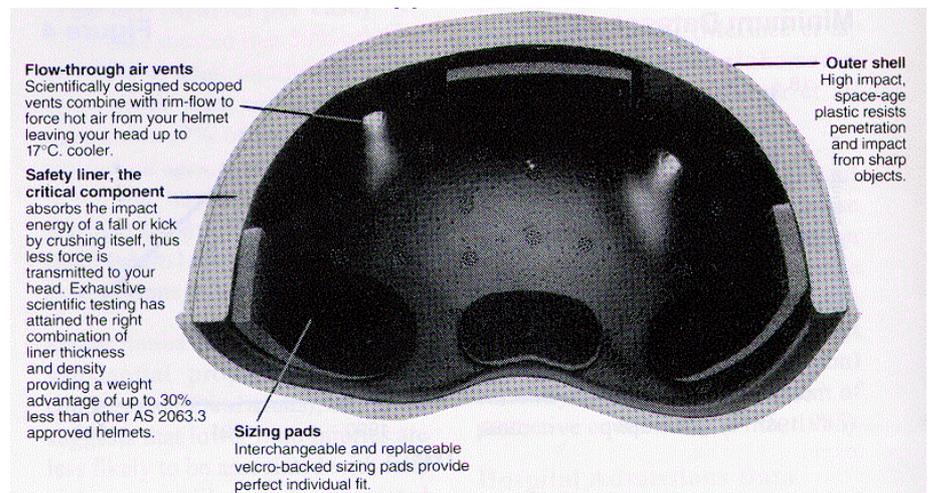
construction, adequate casualty preparation, practice in falling techniques and licensing of riding schools and supervisors.

Protective Equipment Helmet

Although a full evaluation of the effect of equestrian helmets on injury rates is yet to be reported, one study has shown that the wearing of an approved helmet by professional jockeys is associated with a reduction in the incidence of severe head injury. (Barone et al, 1989). Overseas studies report that many injuries are associated with the wearing of no helmet, the wearing of an inadequate helmet or a helmet that dislodges from the head during a fall. (Ingemarson et al, 1989, Sherry, 1991, Nelson et al, 1992). Further, concussion in children in the United States Pony Clubs decreased from 12% to 8.7% following the requirement for children to wear a safety helmet with chin strap (Barone, 1989). In addition, helmet use (usually type of helmet not specified) was reported as low in a number of studies of persons injured or killed during equestrian activities. (Sherry, 1991) (Barone et al, 1989). This is further supported by the decreased risk of head injury in bicyclists and motorcyclists associated with helmet wearing.

The VISS data shows that 42% of urban child riders and 49% of rural child riders recorded wearing a helmet. In adults, only 23% of metro cases wore a helmet, with 41% of those in non-metro areas wearing a helmet. In many cases, as in other studies, no information was provided about the type of helmet used and, given the variation in available helmets, about the level of protection afforded.

Features of a Standards approved riding helmet **Figure 5**



In those reported to have worn helmets, the level of protection afforded is questionable given that only standards-approved equestrian helmets are designed to provide adequate safety and that even these helmets have been reported to provide inadequate protection. The function of the equestrian helmet is to (i) prevent skull penetration and deformation and (ii) absorb and transfer energy, reducing energy transfer to the brain. (Firth, 1985). The helmet needs to be properly worn and needs to stay on and in place throughout impact. (Firth, 1985). Helmet design should incorporate an outer cover for aesthetic reasons, a hard smooth shell to prevent penetration and major distortion, spreading localised blows over a larger area of the impact energy layer, a lining (space or structure) that is energy absorbing and a chin strap with 4 point suspension (Firth, 1985).

In Australia, to be approved as a national safety standard (AS 2063.3), helmets need to be extensively tested for such factors as shock absorption, penetration resistance, vision clearance, strength/retention systems

and peak flexibility (Sherry, 1991). The helmet shown in figure 5 meets with the AS 2063.3.

The classic riding helmet is considered inadequate in that it is designed with two layers only (an outer layer to help prevent concussion and a comfort-promoting inner layer) and thus provides poor protection against head injury. It is also only secured at two points, not the recommended four points and often is only secured by an elastic strap.

Surveyed horse riders report low levels of regular helmet wearing, despite demonstrating a high awareness of the need for helmets. In Australia, a study of school pupils in rural areas by Lower and Wolfenden (1995) also reported a high level of safety knowledge generally, but reported that this was not reflected in attitudes and behaviour. Although 90% specified a standards-approved (ASA) helmet as correct gear, only 57% wore an ASA helmet when riding and one-quarter believed that it was safe to ride without a helmet.



Attitudinal barriers to the use of protective helmets were reported as: discomfort (heavy and hot); expense; appearance of the helmet; the fact that they are quickly outgrown (insert pads not used as in bicycle helmets); and the inappropriateness for some riding styles where a brimmed hat is traditionally worn (such as in western and trail riding). (Condie et al, 1993, Nelson et al, 1994).

Lower and Wolfenden also report low levels of formal instruction as a potential barrier to reported safety behaviour generally. Only 40% of respondents had received formal instruction, with the remainder receiving information from family and friends. The authors reported that the logistics and costs of transporting the horse to clubs for instruction were major barriers. The frequency of opportunistic (unplanned) riding is also a barrier to formal instruction.

Overcoming barriers to helmet wearing clearly needs to be multi-faceted, requiring attention to many factors. Making helmet wearing mandatory is likely to be difficult to enforce, except on public roads and at riding clubs or events, particularly given that much riding is on private property (Lower & Wolfenden, 1995) and attention needs to be directed to factors such as design, risk perception and instruction.

Heeled riding boots, stirrups and safety stirrups

Given the predominance of injuries from falls, protective equipment and precautions allowing rapid disengagement during a fall are vital. Trapping of the rider's foot in the stirrup may result in dragging of the head and body along the ground, with the potential for severe injury. The combination of boots and stirrups

worn is essential, heeled riding boots must be individually matched to the stirrup for size and fit to be effective against injury and thus help prevent the rider's foot from being trapped in the stirrup. (Firth, 1985, Ingemarson et al, 1989). Boots should be without grip, featuring smooth heels and soles, and should feature elastic sides to ensure the foot can be pulled out if the victim is falling and prevent being dragged if the shoe were to be caught.

Correct stirrup size is important, a stirrup that is too large is a risk for instability.

Safety stirrups that feature a curved front on one side of the stirrup iron, which should always be placed to the outside, are recommended widely. However improper usage ie, the curve not being placed to the outside could plausibly cause the foot to become caught in the stirrup, thus care should always be taken in the securing of the stirrup.

Safety stirrups with a pressure release allow quick release of the stirrup on increased foot pressure. These may be more appropriate for leisure riding than competition. Evaluation studies are required to determine the effectiveness of the various safety stirrups for particular activities.

Recommendations

1. Choose a horse of appropriate size, temperament, character and age for the rider's size and skill level, in conjunction with a trained and experienced horseperson. No beginner or child should have a horse aged less than five years, older horses are better for beginners.
2. Routine checks before mounting: check equipment for signs of fatigue and correct adjustment of fit. Regular maintenance checks of all equipment should be undertaken.
3. Strongly recommended equipment: ASA-approved helmet, stirrups matched to size of smooth heeled and soled boots with elastic sides and non-slip gloves. Loose clothing should be avoided, long hair should be tied back and do not wear spectacles (if possible).
4. Where possible, avoid excessively soft/muddy ground and ditches, holes and uneven terrain with rocks and exercise caution if these surfaces are unavoidable.
5. Develop riding skills progressively and thoroughly and have a good knowledge of horse behaviour. Over time, develop a bond with the horse and don't undertake bareback riding.
6. Exercise caution when riding in the presence of objects or animals that could frighten the horse (eg. other horses, dogs, vehicles) - this is particularly applicable to children.
7. An educational program is recommended to encourage recreational riders to have riding lessons with accredited instructors.
8. Limit riding in outside paddocks to experienced riders, inexperienced riders should always be supervised whilst riding.
9. Consider parental training schemes in instruction methods in rural areas.



Other protective equipment

The efficacy of body protectors has not yet been established, but it has been suggested that these, as a secondary safety measure, may protect from soft tissue injuries and fractured ribs. (Bixby-Hammett et al, 1990).

Spectacles are suggested as inadvisable due to the risk of facial fractures or facial-ocular laceration. As a result contact lenses are mandatory under Jockey Club rules (Firth, 1985). Gloves should be non-slip (Firth, 1985) and loose clothing should be avoided because of the risk of catching on passing objects (eg. tree branches) (Nelson et al, 1992). Long hair should be tied back to avoid possible scalping injuries.

Safety precautions

Along with the protective equipment outlined above, strategies such as good instruction and good maintenance of equipment are important. (Firth, 1985).

Routine checking and maintenance of all equipment (saddles, bridles etc) and of pre-mounting and pre-dismounting checks are suggested as important safety measures.

Further research

The need to conduct further research into equestrian injury countermeasures has been identified by the Equestrian Federation of Australia in the 1995 edition of the Australian Sport Commission's Sports Research Needs publication. The following potential countermeasures, in particular, require implementation and evaluation: increasing general awareness of safety issues by riders, adequate supervision of children, coach awareness, use of protective clothing, particularly helmets and back

protectors and the correct fitting of helmets. Further information is required in the extent and nature of exposure to horse riding and barriers to use of countermeasures.

Horse Related Injury – Non Riding (N = 262)

The definition of non-riding related injury, for the purposes of this article, includes injuries occurring other than during horse riding/driving (or whilst preparing for/completing these activities). This includes horse related activities (feeding, grooming, shoeing, leading into/out of floats etc) and unrelated activities (eg. uninvolved bystanders). Two hundred and sixty-two cases of injury occurred while undertaking these activities and most were the result of horse behaviour.

These injuries, although less numerous than riding injuries, are a serious problem, particularly in children. One half of child injuries were to the head and face and 42% of children required admission to hospital. Age and sex patterns are discernible in certain non-riding activities. For example 10-14 year old females predominate in injuries occurring whilst walking and leading the horse, boys under 5 years of age were commonly injured whilst playing around the horse, and adults were more commonly injured while grooming and shoeing horses. In terms of the body region injured, the head and face was the most common region injured in children (50%) while adult injuries were more common to the upper limbs (42%), particularly the fingers. The single most common mechanism of injury was kicks (44%).

Age and Sex Distribution

VISS data in the two all-age collections, Western and Latrobe Regional Hospitals show that overall children account for one quarter of

cases. The age groups with the greatest case numbers of injury varied between the urban and rural hospitals. Children in the 10-14 year old age group were the most common victims at the urban hospital (24% of WH vs 10% LRH). In contrast injury peaked in the 30-34 year old age group for the rural hospital (17% of LRH vs 3% WH). Nearly two thirds of child and one half of adult cases were to females.

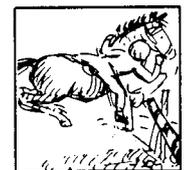
Fields and paddocks (29%), the victim's own home yard (18%) and areas of transport (7%) were the most common sites for injury. Another 18% of cases occurred at an unspecified location.

Safety devices were not commonly used when undertaking these other horse activities, only 7 cases recorded any use of a safety device. Four victims were wearing helmets and 3 were wearing protective footwear.

Injury Details

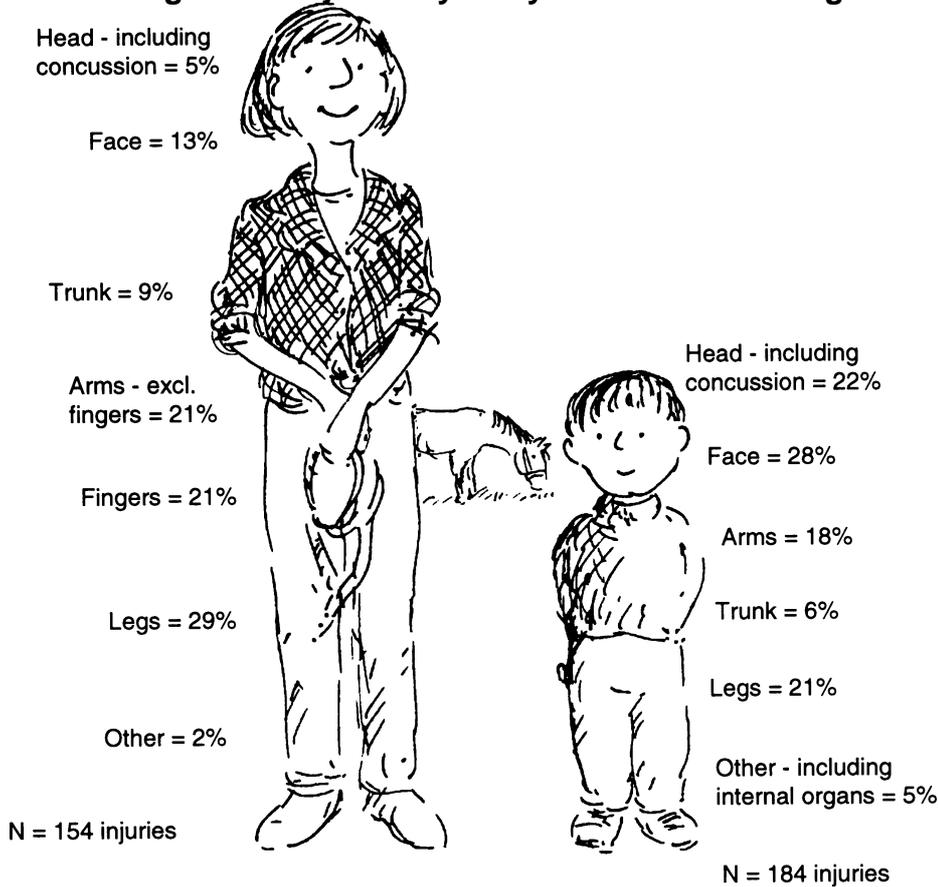
Bruising (23%), fractures (22%) and lacerations (19%) were the most common injuries, however there were considerable differences between children's and adult injuries in regard to the body regions injured. (See figure 6). This is not surprising given the nature of activity differs between the age groups.

Half of child injuries were to the head and face, the most common being lacerations to the face and scalp (9%), fractures of the skull (8%), concussion (8%) and bruising to the face and scalp (4%). Of the total 184 injuries (VISS can record up to 3 injuries per case), bruising to the abdomen (4%) and feet (3%) were also common. Bites represented only 2% of injury, but Hobbs has suggested that many bite victims may not seek attention for their injuries, thus making the true proportion of bite injuries difficult to ascertain. (Hobbs, 1994).



Non-Riding Horse Injuries by Body Part

Figure 6



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

There were a total of 154 injuries to adults, most frequently to the upper limbs (42%), particularly the fingers (21% of total injuries). The most common injuries sustained were finger lacerations (6%), lacerations of the face and scalp (5%), fractures of the foot (4%) and fractures of the finger (3%).

Forty-two percent of child victims and 14% of adult victims were injured seriously enough to require admission to hospital. It is worth noting that the admission rate for children in *non-riding* related injuries is higher than the children's admission rate for *horse riding* related injury (30%). Adult victims were more often treated and referred to a general practitioner (27%) or treated without further referral

(26%). Another 20% of child victims were treated without further referral. (See table 3).

Common Injury Scenarios

An examination of the case narratives indicates common scenarios associated with other horse related injury, the most frequent of these are discussed below. Of the 262 cases, 72% provided sufficient information in the narratives for further examination and half of these are categorised and discussed below. The remainder, due to the small numbers involved, have not been analysed further.

Walking/Leading (N = 52)

Fifty-two victims were injured while walking or leading a horse, with 16 of these cases involving loading or unloading the horse onto a float. These scenarios most frequently involved girls in the 10-14 year old age group (21%) and in one third of cases the location was a field or paddock.

Just over 20% of cases involved the horse shying or taking fright, however only 3 cases noted any reason for this (2 horses were frightened by motor vehicles and 1 by a dog).

Another 11 victims were injured when their finger or hand was caught in the lead rope or rein, this is reflected in

Other Horse related injury by treatment received Table 3

Disposal	Children % (N = 132)	Adult % (N = 130)
No treatment	8	1
Treated, no referral	20	26
Treated, referral Outpatients	6	15
Treated, referral GP	10	27
Other referral	1	2
Casualty review	8	15
Admission	46	14
D.O.A or died in casualty	1	-
TOTAL	100	100

VISS: RCH, WH, PANCH, RMH, LRH (N = 262)



the fact that 26% of injuries in this group were to the fingers, particularly fractures and dislocations. *“Attempting to remove horse from float. Horse reared. Finger caught in rope.”*

AN SW Pilot Education Program (year 5 and 6 students) concluded that “knowledge about horse handling as distinct from riding, was less certain and appears to be an area which requires further emphasis”. (Lower et al, 1995). For example only two-thirds knew the correct way to hold a lead.

Feeding (N = 25)

Again one third of injury was to children in the 10-14 age group and half occurred in paddocks. Kicks (12 cases) and bites (6 cases) were prevalent and in 3 cases these injuries were inflicted by a horse other than the one the victim was feeding. While the injuries sustained in this group were varied, 12% of injury were bites to the finger. eg. *“Feeding horses. Another horse attacked her to get feed. Bitten by horse”*. Children should be instructed that hand feeding of horses should always be done with a flat palm to ensure fingers do not get in the way and risk being bitten.

Playing/Bystander (N = 23)

Nearly three quarters of injuries in this category were to children aged under 5, particularly boys (61% of total group). Nearly half of these injuries were to the head and face, and 19% of total injuries (7 cases) were fractures of the skull. Sixteen of the total cases (70%) were kicks, four of which occurred when the victim moved either behind a horse or into a group of horses. *“Whilst playing, chased horse. Horse kicked child in mouth.”*. There was one associated fatality on the VISS database which falls into this category, a 2 year old

was kicked by a horse after climbing from a pusher and running behind a horse at a pony club event.

Grooming (N = 16)

This group encompasses activities such as brushing (5 cases), grooming (3) and washing (2) the horse. Victims in this group tended to be older than in the other groups, three quarters were aged 20 years and over. Three quarters of victims were female. Bruising accounted 35% of all injuries to this group and again finger injuries were the most common (4 cases).

Half of the victims were kicked by horses, in two cases these were horses other than the one the victim was attending to. Where possible the horse being treated should be isolated from other horses.

Shoeing (N = 12)

All but one victim was aged over 15 years and two-thirds of victims were male. Injuries most frequently occurred when the horse moved its leg while being shod and the shoe nail cut the victim, *“Shoeing a horse. Horse dropped his foot. Nail exposed. Cut by nail”*. Another 4 victims were injured when the horse stood on the victim’s feet and fingers, *“Picking out horses back hoof. Horse stood on fingers.”* Of the remainder, 3 victims were kicked and one was lacerated by a knife used in the shoeing process.

Other Injuries

There were 8 cases of road traffic collisions with a horse on the data base, these involved 4 cars, two minibuses and two motorbikes. Of the remaining cases a further 65 victims were kicked by horses, 6 while patting the horse, 3 while catching the horse, two while assisting the mating of the horse and two when letting the horse out of its enclosure. Another 18

victims were trod on by the horse, 8 were knocked by the horse, 6 had fingers caught in ropes or reigns while holding the horse, a further 4 were bitten and 4 were jammed between the horse and another object.

Work Related

Of the 262 cases discussed in this article 20 victims were working at the time of injury. Three quarters of victims were male and were most commonly aged between 15 and 19 (30%). Victims were most commonly employed in the animal handling industry (55%), and were most frequently walking/leading (8 cases), holding (3) and shoeing (2) the horse when the injury occurred. Still only 3 victims recorded the use of any safety device, 2 wore skull caps and the third work boots.

Mortality Data

Of the 17 deaths relating to horses on the Victorian Coroners Database occurring during the period 1989/90 and 1991/92, 7 were related to non-riding activities as defined in this article. This figure is a much higher proportion than that found on the VISS database, thus re-enforcing the possible serious nature of these types of injuries. Three victims were kicked by horses, two were involved in road traffic crashes when their car hit a horse that strayed onto the roadway and the remaining two were trampled by horses.

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Recommendations

1. Small children should be separated from horses. Safety precautions around horses should be taught from an early age under close supervision. The routine use of helmets in any smaller children around horses is recommended.
2. Further emphasis on safety in the area of risk factors for horse handling (as distinct from horse riding) is needed. Awareness of the potential hazards associated with horse handling needs to be increased as does knowledge of the behaviour and unpredictable nature of horses.
3. Sturdy boots should be worn when undertaking horse handling activities.
4. If possible the horse should be isolated from other horses when undertaking the types of activities described in this article.
5. Effective hand, particularly finger protection warrants investigation, with particular relevance to rope handling.
6. Avoid the back legs of horses at all times.

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* Special edition



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Latrobe Regional Hospital (Traralgon and Moe)

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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.

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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