Hazard
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Victorian Injury Surveillance System

Monash University Accident Research Centre

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This edition of Hazard provides an overview of work related injuries as they present to five Victorian hospital campuses. In addition several of the most frequent causes and preventative measures are examined in some detail and issues requiring further research are identified. Less frequent causes will be discussed in the next issue of Hazard. An overview of one year of work related deaths is also presented, and the limitations of statewide hospital admissions data for work related injury is discussed.

Work Related Injuries

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Worksafe Australia estimates that every year in Australia there are some 200,000 workplace injuries and poisonings which result in more than 5 days off work. In addition there are at least 500 work-related injury deaths. Taking into account indirect costs such as having to recruit new staff, training them and absenteeism the total annual costs of workplace injury and disease have been conservatively estimated to be $9 billion. Additionally there are significant personal costs from pain and suffering, dislocation of family life, social isolation, diminished self-esteem and altered career paths. (Industry Commission. 1993)

Victorian Injury Surveillance System Data

On the VISS database there were 8,071 cases who presented to the emergency departments of the Western Hospital and Latrobe Regional Hospital (2 years) and the Preston & Northcote Community Hospital and Royal Melbourne Hospital (one year) aged 15 years and over, with injuries, as indicated by the victim, as having been incurred on the job[1]. Injuries which occurred during home duties and to bystanders have therefore been excluded. Children injured in the workplace or 'on the job' will be discussed in the next edition of *Hazard*.

These 8,071 cases represented 18% of all adult injuries presenting at the emergency departments of these hospitals over the same time period. Work injuries were less severe than adult injuries overall where admissions as a proportion of presentations are used as a measure of severity (10% work cf 18% non-work adult admission rate). There are a number of possible explanations. It is likely that workers and workplaces may require medical certification for minor injury as well as encouraging treatment and early return to work. It may also reflect a lower severity of workplace injury compared with injury occurring in other locations.

1. Western Hospital 1/1/91 to 31/12/92, Latrobe Regional Hospital 1/1/91 to 30/6/92, Royal Melbourne Hospital and Preston & Northcote Community Hospital 1/3/92 to 28/2/93.

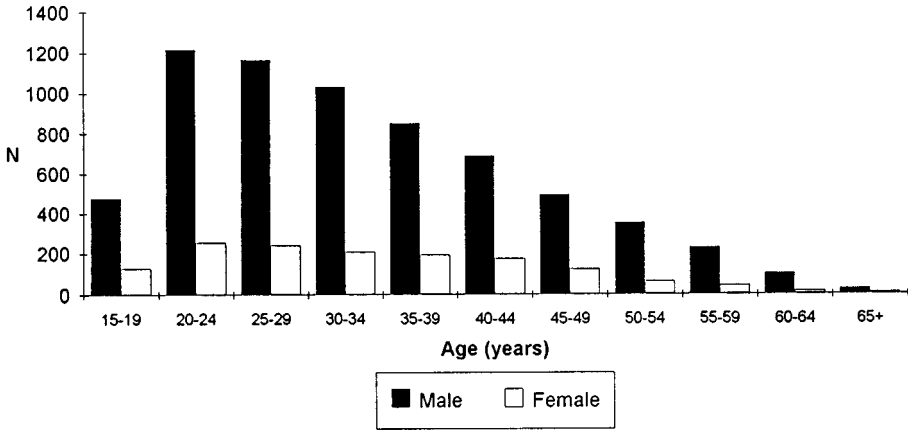
In interpreting these data it should be borne in mind that the VISS hospitals predominantly service the northern and western regions of Melbourne and the rural/industrial Latrobe Valley. Based on numbers of manufacturing establishments, industries dominant in the northern and western suburbs of Melbourne are food and beverages, clothing and footwear, metal products, and wood products and furniture. The chemical and petroleum industries have a relative concentration in the west (O'Connor, K. et al, 1990). In the Latrobe Valley electricity generation, pulp and paper processing, farming and food processing, especially of vegetables and dairy products are the major industries (O'Connor, K., 1993).

The Latrobe Valley was over-represented for work related injuries, accounting for 37% of adult work related injuries but only 30% of all adult injuries. Their injuries however did not appear to be as serious as those presenting at Melbourne hospitals (4% LRH adult work-related admission rate cf 13% for Melbourne hospitals). The high proportion (23% of injuries) accounted for by workplace eye injuries, which are rarely admitted to hospital, would have been one of the influences on this low admission rate, as would the apparent use by the community of the hospital for general practice type cases (LRH adult admission rate is 9.5% cf 19% for Melbourne hospitals).

Findings

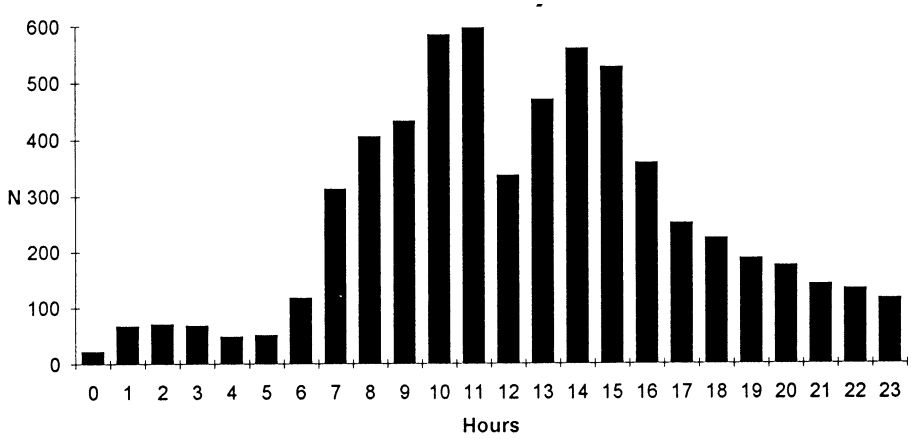
The age and sex distribution is shown in Fig. 1. Injured workers were predominantly male (82% of cases) and their injuries were more serious than for females (11% males admitted cf 5% females). As a comparison

Work related injuries **Figure 1**
Age and Sex Distribution



VISS: >= 15 yrs; WH(2yrs), LRH(2yrs), PANCH(1yr), RMH(1yr) n=8071

Work related injuries **Figure 2**
Time of Day



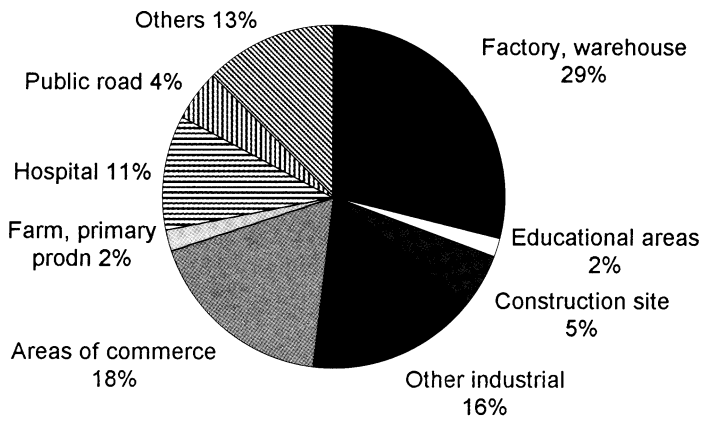
VISS: >= 15 yrs; WH(2yrs), LRH(2yrs), PANCH(1yr), RMH(1yr) n=8071

WorkCover Victoria claims were 74% males (O.H. & S.A., 1993). Men were injured predominantly in areas of production, especially factories (59% of males) whereas for females hospitals dominated (43% of females).

Clearly the dominance of hospitals for women is influenced by the hospital based nature of the collection and relatively large numbers of women being employed in hospitals. Nurses (26%), cooks, sales assistants, kitchen hands, cleaners, teachers and textile sewing machinists were the occupations most frequently injured for women. Frequent factors involved for women were syringes (11%), knives (7%), hospital medical devices (4%), vehicles (4%), floors (6%) and industrial equipment (3%).

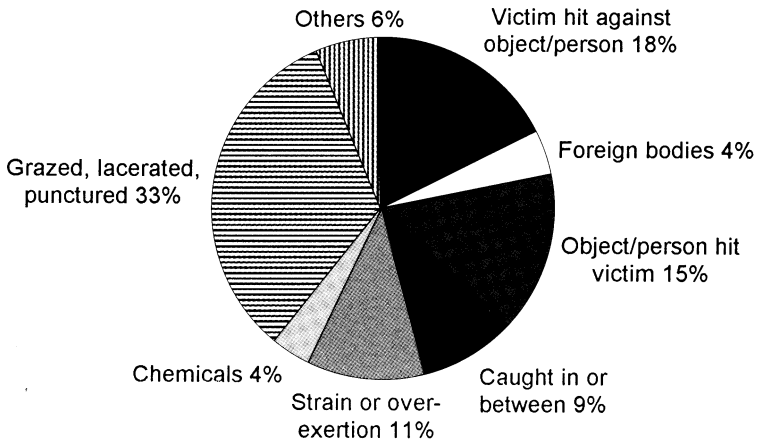
Men were most commonly trade-persons (40% cases), especially structural steel, boilermakers and welders, metal fitters and machinists, carpenters, joiners and meat trade-persons. Industrial equipment use (7% cases), metal parts (5%), knives

Work related injuries
Location **Figure 3**



VISS: >= 15 yrs; WH(2yrs), LRH(2yrs), PANCH(1yr), RMH(1yr) n=8071

Work related injuries
Mechanism of injury **Figure 4**



VISS: >= 15 yrs; WH(2yrs), LRH(2yrs), PANCH(1yr), RMH(1yr) n=8071

(4%), grinders (3%), passenger cars (2%) and welding equipment (2%) were the most frequent factors involved for males.

Older workers' injuries were more serious and severity, as measured by admission rates, consistently increased with age from 8% for 15-19 year olds to 16% for 60-69 year olds.

Injuries were fairly evenly distributed between the weekdays with weekends, particularly Sundays low. Late mornings (10am -12am) and early afternoon (2-4pm) were the most frequent times to be injured. See Figure 2. The monthly distribution showed no particular pattern, although this has not been analysed by industry.

Location of Injury

These are shown in Fig. 3. *Areas of commerce* covered mainly shops and restaurants with some service stations and panel beaters. *Other industrial* included largely power plants, paper mills and abattoirs. The high percentage for *hospitals* presumably partly reflected the convenience of this location for hospital workers, particularly for needlestick injury testing.

Mechanism of Injury

The mechanism of injury refers to the means by which the victim was directly injured. *Grazed, abraded/ lacerated, punctured by, etc.*, was mostly associated with knives, syringes and foreign bodies, the latter from grinders; *victim hit against object/person* covered mainly falls, particularly slips; *strain/over-exertion* was associated with ladders, stairs/steps, forklifts and flooring and *object/person hit* victim was usually associated with industrial equipment, hammers and beams/bars. Included in the latter category were some assaults (n= 125). See Figure 4.

Safety measures

Safety clothing and equipment were mentioned as being worn in 21% of cases. These included safety glasses, work boots, safety belts, gloves, masks, helmets and shields on the equipment itself eg on circular saws, angle grinders.

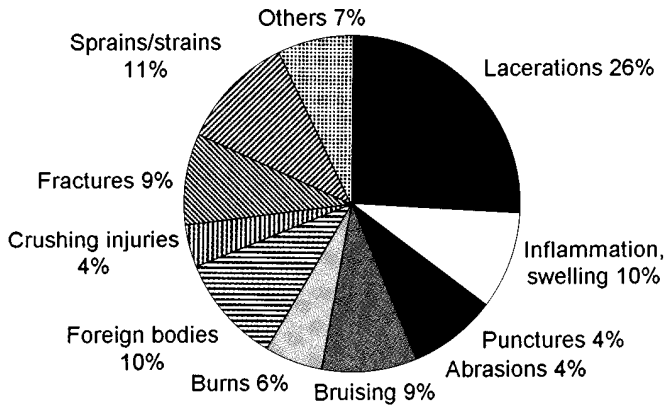
Injuries

Nature of Injury

The distribution of the nature of injury is illustrated in Figure 5. Lacerations were mostly to the fingers (12% of all injuries), face and scalp (3%); foreign bodies mostly in the eyes (9%); burns mostly to the eyes (1.4%); strains/ sprains were to the ankles (3%) and lower back (2%) and crushes to the fingers (2%).

Work related injuries
Nature of injury

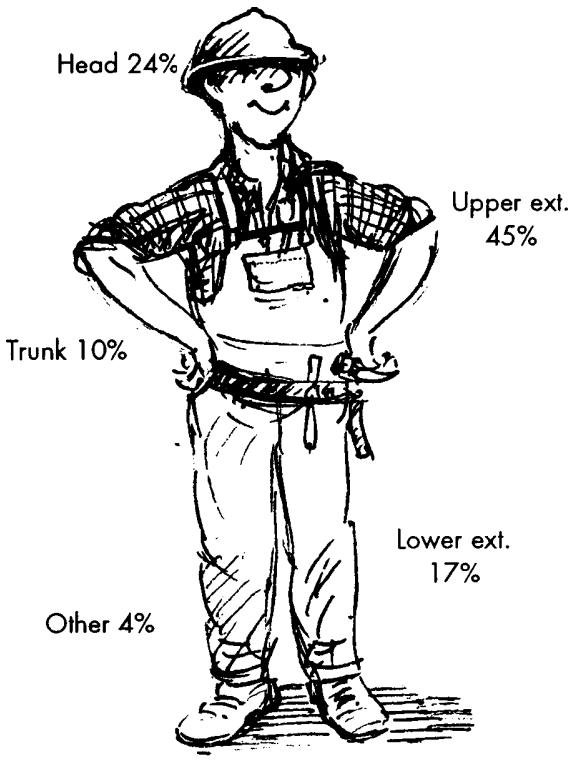
Figure 5



VISS: >= 15 yrs: WH(2yrs), LRH(2yrs), PANCH(1yr), RMH(1yr) n=8991 injuries
NB: Up to 3 injuries can be listed per case.

Injuries to body parts

Figure 6



VISS: >= 15 yrs: WH(2yrs), LRH(2yrs), PANCH(1yr), RMH(1yr) n=8991 injuries
NB: Up to 3 injuries can be listed per case.

Body Parts

These are illustrated in Figure 6. *Head injuries* were predominantly to the eyes (14% of all injuries), particularly foreign bodies (8%); the *upper extremities* predominantly fingers (24%), particularly lacerations (12%) and the trunk predominantly lower back (4%). The *other* category represented largely 'no injuries detected' and poisoning.

Finger and eye injuries, the most frequently injured body parts are discussed below. The factors associated with these injuries are mostly discussed under 'Causes of Injury'.

Finger Injuries

Two thousand finger injuries were incurred representing one quarter of all work related injuries. As was the case for injuries overall, they occurred most often to men in the 20-34 year age group.

The nature of these injuries was most often cuts and lacerations (47% of finger injuries), followed by punctures (10%), fractures (9%), crushing injuries (9%) and amputations (7%). Due to the severity of the latter 3 types of injury amputations (56% admitted to hospital), fractures (32% admitted) and crushes (26% admitted), finger injuries tended to be more serious than injuries overall (14% finger injuries cf 8% non-finger injuries admitted).

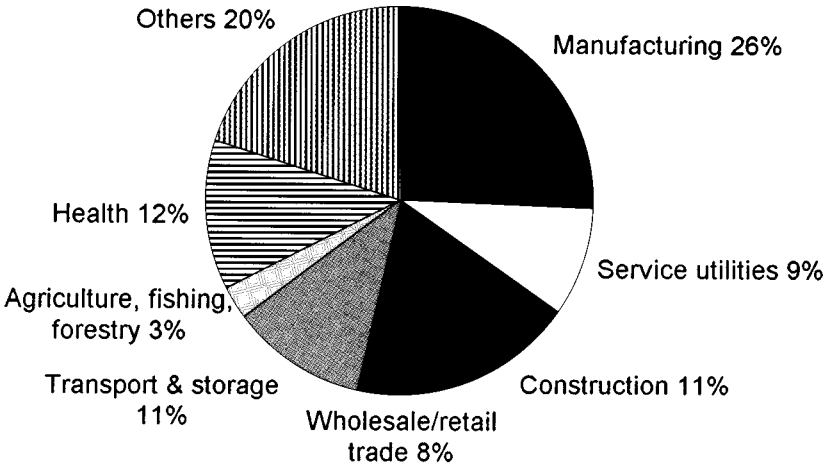
The most frequently occurring factors associated with finger injuries were industrial or retail plant or equipment (19%), knives (11%), hypodermic needles (8%), slicers and choppers (3%) and doors (2%). Injuries were most severe from industrial or retail plant or equipment (28% admitted).

Eye Injuries

There were 1,229 eye injury presentations, representing 15% of all work related injury. However these injuries

Work related injuries
Industry groups

Figure 7



VISS: >= 15 yrs: WH(2yrs), LRH(2yrs), PANCH(1yr), RMH(1yr) n=8071

Occupation distribution

Table 1

OCCUPATIONS	CASES (%) (N=8071)
Tradespersons	34
• Structural steel, boilermaking & welding	4.6
• Metal fitters & machinists	3.7
• Carpenters &joiners	2.9
• Meat tradespersons	2.6
• Vehicle mechanics	2.3
• Plumbers	1.7
• Cooks	1.6
Labourers & related workers	23
• Cleaners	1.8
• Kitchen hands	1.7
• Storeman/storewomen	1.2
Plant & machine operators & drivers	18
• Truck drivers	4.4
• Paper & paper product machine operators	1.9
• Power generation plant operators	1.6
• Forklift & related drivers	1.4
Para-professionals	9
• Registered nurses	4.8
• Police	1.9
Sales persons & personal service workers	6
• Sales assistants	2.1
Managers & administrators	5
• Farmers & farm managers	1.6
Professionals	3
Clerks	2
Total	100

nec = not elsewhere classified

were rarely serious since only 10 (2%) of these were admitted to hospital. Over half occurred to men in the 20-35 year age group (42% of all injuries in this group).

The industrial groups in which eye injuries most often occurred were paper and metal manufacturing, construction and electricity generation. Foreign bodies accounted for 60% of eye injuries, inflammation 13%, superficial abrasions 11% and partial thickness burns 9%. Grinding (19% of eye injuries) and welding (15%), often associated with wind, were major causes of eye injury. Minor causes were metal parts, foreign bodies nec, motor vehicles, chemicals and compounds and industrial equipment nec.

One third (38%) of eye injury victims were wearing safety glasses or masks at the time of injury, usually when grinding or welding (60% of those wearing safety glasses or masks).

It is interesting that the Latrobe Valley was grossly over-represented for eye injury in that its hospitals incurred two thirds of eye injuries but only 37% of all work related injury. Major sources of these were the construction (27% of LV eye injuries), the electricity generation (24%) and paper processing (7%) industries. These industry proportions were all higher than for Melbourne hospitals.

Industry Groups

Industry groups are illustrated in Figure 7. *Manufacturing* represented largely metal products (5%), food (4%), paper products (4%) and miscellaneous manufacturing (6%). *Service utilities* were mainly electricity (8%) whereas *transport and storage* was mostly trucks (6%), often occurring off the road.

Australia wide cost data shows the construction; followed by *manu-*

facturing; transport, storage and communication and *electricity, gas and water industries* were all higher than other industries regarding worker's compensation costs as a proportion of the industry's labour costs (Worksafe Australia 1993). If this cost data is seen as a measure of injury proneness then those industries which feature most often on the VISS database are roughly those which have the highest potential for injury.

Occupational Distribution

See Table 1. The structural steel, boilermaking and welding workers were usually injured while grinding and welding, causing foreign bodies to the eyes. Metal fitters and joiners were as for structural steel etc plus injuries from hammers and automotive tools. Registered nurses had largely finger and hand punctures from syringes and sprains/strains, especially to the lower back from lifting/transferring patients. One third of meat workers were in retail butcher shops, 25% in wholesale butchers and the remainder in abattoirs.

Butchers suffered mostly finger and hand lacerations from knives and band saws, abattoir workers injuries from knives, band saws and animals. Truck drivers were injured more often in areas of production (53% of injuries) e.g. the factory and warehouse (with loading and unloading) and the quarry than on the road or parking area (19%). The injuries truck drivers received and how they occurred were varied.

Causes of Injury

The non-person factors associated with injury are listed in Table 2. The cases included had the factor coded as a breakdown and/or mechanism factor. Breakdown factors led to the injury occurring whereas a mechanism factor was the direct cause of the injury. Up to two of each type of factor could be noted per case. Persons indirectly caused 18% of injuries to occur and directly caused 10%.

Causes of injury **Table 2**

Non-Person Factors	Presentations (Number of Cases)	Admissions (Number of Cases)	Adm/Pres (%)
Metal parts or pieces of unknown origin	700	51	7
Foreign bodies nec	622	0	0
Industrial equip nec	550	94	17
Knives	515	42	8
Grinders	334	19	6
Concrete & other manmade outdoor surfaces	324	59	18
Welding equipment electric & ns	228	4	2
Hypodermic needles & syringes	225	0	0
Passenger cars or station wagons	222	30	14
Ground	212	46	22
Floors or flooring materials	206	20	10
Trucks	189	39	21
Stairs/steps	179	10	6
Chemicals	158	15	10
Ladders	111	22	20
Pipes	103	9	9
Fork lift trucks	102	20	20
Nails, screws, thumb tacks	102	10	10
Wind	97	2	2
Water not hot	88	7	8
Beams, bars	84	10	12
Hammers, sledges & mallets	77	3	4
Meat & poultry (associated with knives)	75	5	7
Carts, other or n.s	62	4	6
Scaffolding	60	9	15
Skids, pallets	60	4	6
Cabinets, racks, room dividers	53	2	4
Hot water	51	2	4
Flame, fire smoke	51	11	22
Electrical wire or wiring system	51	19	38
Cardboard products	43	1	2

Non-person Factors

As can be seen in Table 2 the non-person factors causing the most severe injuries - electrical wiring, trucks, forklifts, the ground and ladders - were not the most frequently presented. Foreign bodies, welding equipment and syringes were factors frequently presented but not severe as measured by admission rate. Factors with over 200 presentations will he examined below, the remaining factors will be examined in the next edition of *Hazard*.

Knives, Slicers & Choppers (n=515)

Men were more likely than women to incur knife related injuries (75% of knife injuries) and there was a concentration to some extent in the 20-24 year age group (27% of male cases). Knife injuries tended to be as severe as other injuries (8% admission rate).

Knife injuries occurred most often in the mornings - the Monday peak was as early as 7am. The non-holiday summer months were the time of the year when most injuries occurred (February, March, November) - summer, the barbeque season being regarded as the busiest time of year by butchers. There was a reduction in injuries in December/ January

which could he attributed to the holiday season.

Losing control of the knife was the event which most often led to the injury occurring. Safety devices in the form of gloves (n=17), safety guards (n=7) and mesh aprons (n=2) were worn in 7% of cases.

Lacerations to the fingers (56% injuries), hand (13%), forearm (6%) and wrist (3%) were the most frequent injuries.

Slicers and choppers directly caused 14% of cases, knives with replaceable blades 13%. Meat and poultry were mentioned as being involved in one third of cases, fruit and vegetables in 5%, animals and cardboard products each in 3%.

Meat tradepersons (26% of cases), mostly in abattoirs and butcher shops; sales assistants (11%), in delicatessens and supermarkets; cooks (10%) and kitchen hands (5%) were the most frequently presented occupations.

The Latrobe Valley was over-represented for knife presentations compared with other work related injuries (43% of total knife presentations cf 37% of all work presentations). However relatively few of them were serious (2% L.V knife presentations admitted cf 13% non LV). There were 13 cases involving animals and these were all in the Latrobe Valley. Knife injuries were more likely to occur to farmers and workers in paper mills and power plants than in the Melbourne area, otherwise the occupational distributions were very similar.

Workshop Grinders (n=334)

Almost all of the workshop grinding injuries occurred to men (99%) with 40% of these occurring between the ages of 25 and 35 years. A quarter of these injuries occurred in a factory or warehouse, 16% on a construction site, 6% in areas of commerce (e.g. shop, pub, cinema) and 3% in the home.

Over half of the grinding injuries were foreign bodies to the eyes (56%), especially metal parts or pieces and sparks. Other injuries include abrasions to the eyes (8%), lacerations to the finger (7%), lacerations to the forearm (3%) and inflammation/ swelling to the eyes (3%).

Grazes, lacerations and punctures accounted for 65% of injuries, foreign bodies (especially in the eyes) caused 26% and the victim being hit by an object or person 4%.

Sixty-three percent (211) stated that they were wearing safety glasses/ goggles when the injury occurred. Of these, 68% received foreign bodies in the eyes. The adequacy of these safety glasses is clearly a concern.

Almost a third of the injuries were to structural steel and welding tradespersons, 8% metal fitters and machinists, 7% trades assistants and 4% vehicle mechanics. In a study conducted by Dr L. P. Fong on work related eye injuries, an occupational-activity matrix identified building tradespeople (18% of work related eye injuries), metal tradespeople (18%) and vehicle repairers (11%) who were involved in grinding and drilling as high risk categories. (Fong, 1993). It was also found that 41% of their eye injuries were from grinding and drilling.

Prevention

1. Knives should be sharp. Blunt knives mean that a greater force must be applied and there is more opportunity for the knife to slip.
2. Knives with large, rough handles which are comfortable and appropriate to the purpose should be used.
3. There should be awareness of a fat build up on the handle when cutting meat and water when cutting fruit and vegetables. (Duk,1993)
4. Workers should be effectively trained in the use of knives, slicers and choppers.
5. Guards should be used when provided and protective gear e.g. gloves, aprons, worn where appropriate.Workshop Grinders (n = 334)

Prevention

1. Wide vision goggles should he worn while grinding (S.A. Injury Surveillance, 1991).
2. Further research is required to determine why the eye protection stated as being worn was not effective. In addition, the barrier to the use of eye protection in the 37% who had no protection warrants farther investigation.
3. Safety shields provided to cover the grinding wheel should he used while grinding.

Welding Equipment (n = 228)

Twenty-four percent of injuries occurred in a factory or warehouse, 10% on a construction site and 6% in a school environment.

Eighty percent of all welding injuries were to the eyes. Most of the eye injuries (28%) were burns (mainly flash burns), foreign bodies to the eyes (24%), inflammation/swelling 18% and abrasions 9%.

Safety glasses/goggles/shields were worn by 54% of the victims. Forty-two percent of these victims wearing protective equipment received injuries from welding flashes and 35% from foreign bodies to the eyes. Forty-six percent were using no safety devices while welding and over half (56%) of these victims' injuries were from welding flashes while 15% received foreign bodies in their eyes. Again the adequacy of safety equipment is a concern.

Also of those using no safety devices, 13% were either watching or near a worker using welding equipment when the injury occurred (e.g. *'watching workmate welding and sustained flash burn to eye'; 'working beside a welder, flashes from the welder'*). Therefore care should he taken to ensure that surrounding workers are also wearing eye protection or moved away while the welder is being used.

Prevention

1. Eye protection in accordance with AS 1338 should be worn while welding and a face shield should be worn if them is a chance that splatter will come into contact with the operator's fare. (Draft Code of Practice for the Metals Manufacturing Industry).
2. Appropriate protective clothing should be worn to minimise risk of skin damage, e.g. flame resistant gloves and safety shoes. (Draft Code of Practice for the Metals Manufacturing Industry).
3. Training should be provided to ensure employees required to use personal protective equipment and clothing we trained in its correct use, fitting, storage and maintenance of the equipment. (Draft Code of Practice for the Metals Manufacturing Industry).

Needlestick Injuries (n=225)

These were almost all punctures to the fingers (70% injuries) and hand (15% injuries). Women represented three quarters of all such victims. Occupations to which needlestick injuries most frequently occurred were registered nurses (59%), medical practitioners (9%), enrolled nurses (5%) and cleaners (4%).

The means by which these injuries occurred were various but some typical examples are listed below:

i) *On duty as a nurse. Needlestick injury when recapping needle after use.*
ii) *Collecting sharps boxes when jabbed by a needle protruding out of box.*
iii) *Cleaning up trolley. A needle under linen. Injured self.*
iv) *Taking blood, the patient became agitated and nurse pricked herself with the needle.*
v) *Midwife, emptying syringe from kidney dish. Syringe bounced back, hitting victim.*
vi) *Cleaning rubbish from flooded creek, a syringe pierced his glove.*

Almost all cases (90%) occurred in a hospital, partly reflecting the hospital based nature of the VISS collection. No cases were admitted to hospital. The high number of presentations relative to admissions no doubt reflects blood borne infection awareness, rather than actual trauma. Gloves were worn in 15% of cases.

Prevention

1. Use of disposable syringes.
2. Slowing down, watching the sharps and checking the work practices of fellow employees.
3. No recapping, bending or breaking needles.
4. Disposal of the sharp by the person who has generated it.
5. Awareness of current recommendations for procedures regarding infection control practices.
6. Ongoing education to try to minimise staff who may he exposed to such injuries.
7. Development of gloves which are both dexterous and puncture resistant.
8. Use of devices which minimise direct contact with the sharp e.g. rubber sheath remover.
9. Development of new designs such as low cost retractable needles.
10. Hepatitis B immunisation for hospital staff.

(Includes advice given by K. McNaught).

Passenger Cars or Station Wagons (n = 208)

Males accounted for 71% of cases involving passenger cars. Injuries were predominantly in the 20 to 29 year age group (38% of all passenger car injuries). Injuries peaked at 3 - 4pm with 11% of all injuries, 9% occurred at 1-2pm and 8% at 7 - 8arn.

The majority of injuries (64%) occurred on public roads with 12% occurring while on the way to work and 6% on the way home. Nine percent occurred in areas of commerce, 6% at a factory or warehouse and 3% in parking areas. In regard to occupation, injuries often occurred to vehicle mechanics (15%) while working on the car leg. *'jacking up car with air jack, car slipped, hand wedged between jack and car'; 'under a motor vehicle, dirt and metal flakes fell from underneath vehicle into eye')*; 5% occurred to the police; 5% to drivers e.g. taxi drivers, couriers; 3% to production managers; 2% to registered nurses and 2% to panel beaters.

Collisions caused 50% of injuries, losing control of the vehicle 17% and being caught in a vehicle part or between the vehicle and another vehicle or object 4%.

Fifty-three percent of injuries associated with passenger cars occurred while the victim was in a passenger car or station wagon. Six percent occurred while the victim was riding a motorcycle and was hit by a car, 4% of the victims were pedestrians and 3% were bicyclists. Almost all of those injured while in the vehicle were wearing seatbelts and almost all of the motorcyclists and bicyclists were wearing helmets.

Injuries were mainly bruising (19% of injuries) especially to the knees and chest; lacerations (17%) mainly to the face & scalp; inflammation/ swelling/ pain (14%) especially to the lower back, chest and shoulder and sprain/ strain(13%) mainly to the neck.

Prevention

1. Occupational injuries related to passenger vehicles need to he addressed by safer work practices and less exposure to risk e.g. avoiding fatigue, eye protection.
2. Safety measures that aim to prevent injuries in the event of a collision can be adopted by:
   - Choosing safer cars. See 'How does your ear rate in a crash?' Available from the R.A.C.V and the N.R.M.A.
   - Insisting on new safety features in vehicles such w airbags, belt tightening devices and more forgiving vehicle interiors.
3. Safe work practices relating to passenger vehicles need to be fully implemented for off-road as well as on-road use e.g. wearing safety belts, no alcohol.

(Fildes, B. 1994)

Surfaces

These were categorized into 3 groups: concrete and other man-made surfaces (n=324), ground (n=212) and floors and flooring materials (n=206).

Injuries caused by surfaces were most often a result of the victim falling onto the surface (falls represented 75% of injuries for floors, 65% concrete and 55% ground). Injuries were most often to the lower extremities (42% of injuries for floors, 46% concrete, 39% ground), followed by upper extremities (35% of injuries for floors, 37% concrete, 39% ground).

There were similarities between concrete and ground injuries but flooring injuries differed in their nature and how they occurred. They tended to be sprains/strains, bruising and inflammation whereas fractures were the most common nature of injury for concrete and the ground (30% injuries for both) followed by those listed for flooring.

Flooring injuries tended to occur more often to women than men (males 38% flooring injuries, 90% concrete, 91% ground) and were less severe than injuries from other surfaces (10% flooring admission rate, 18% concrete, 22% ground). They occurred more often in private enterprise areas such as shops and restaurants (38% flooring injuries occurred in private enterprise) and in hospitals (29%) whereas concrete injuries were concentrated in factories (31%) and ground injuries in areas of production in general (49%) e.g. factories, construction sites, farms, mines.

Slips were the most common type of fall for all surfaces but especially for flooring (64% of flooring cases were slips cf 28% for both concrete and ground). Flooring was more likely to be an initial cause of the injury occurring (flooring 68% of breakdown factors) than was concrete (23%) or the ground (27%), the latters' association more often being a direct fall onto them. Falls onto concrete and the ground were more likely to he over one metre (4% of flooring injuries were falls over one metre, 15% for both concrete and ground).

Water (22% of cases), food, chairs, ladders and stairs/steps were the most common initiating cause of flooring injuries. Typical examples of flooring injuries were *'Slipped on mopped floor, fell, landed on left knee'* and *'Walking. Slipped on oil on the floor'*. Vehicles (22% of cases) e.g. *'loading truck when slipped off, landed on concrete'*, ladders, water and industrial equipment were most frequent for concrete and manmadesurfaces (including bitumen) and vehicles (13% of cases), horses, ladders and scaffolding for the ground.

Flooring injuries occurred most often in the health, retail trade and restaurant industries to nurses, cleaners, sales assistants, kitchen hands and cooks. Concrete injuries occurred frequently in the manufacturing, transport and storage industries to various tradespersons, plant and machine operators and truck drivers and ground injuries in the construction, transport and manufacturing industries to plant and machine operators, truck drivers, farmers and animal trainers.

Prevention

1. Spilt water and food should he mopped up and removed immediately.
2. Floors should he washed when workers are not in the vicinity.
3. Surfaces should be as impact absorbing and slip resistant as is practical.
4. Sand textured paint and an acid etching process for tiles, concrete and other smooth surfaces should be evaluated for their effectiveness in preventing slips.
5. Additional countermeasures are connected with other hazards e.g. scaffolding, ladders, stairs and steps, tracks. These will he discussed in the next edition.

Metal Parts/Pieces of unknown origin (n = 700)

Injuries from metal parts/pieces to men accounted for 97% of the injuries. A third of the injuries were to adults in the 20 to 29 year age group and 26% in the 30 to 39 year group.

Over a third of the injuries occurred in a factory or warehouse, 11 % on construction sites, 8% in areas of commerce (e.g. shop or pub) and 3% on farms or areas of primary production.

The mechanism of injury for over half of the injuries was grazes, lacerations and punctures; the victim being hit by metal parts or pieces caused another 17% of injuries; foreign bodies 11% and being caught in or between 6%.

Almost a third of the injuries were foreign bodies, especially to the eyes (29%). Lacerations accounted for 29% of the injuries, mainly to the fingers. Bruising accounted for 6% of the injuries and abrasions 6%. Grinding equipment was involved in 17% of the injuries and welding equipment in 4%.

Twenty percent occurred in the construction industry, 12% in electricity, 11 % in transport and storage and 6% in both the basic metal products and fabricated metal products industries.

Structural steel and welding tradespersons accounted for 18% of injuries, metal fitters and machinists 8%, trades assistants and factory hands 6%, and plumbers, vehicle mechanics and carpenters/joiners each 3%.

Prevention

1. Guards on equipment should be fitted before they are used.
2. Protective clothing should be worn by all employees using any equipment.
3. Eye protection should be worn if there is a risk of metal parts entering the eyes.

Foreign Bodies (nec) (n = 622)

The majority of injuries were to males (95%) especially in the 20 to 29 year age group (35%) and the 30 to 39 year group (33%).

Injuries occurring in a factory or warehouse accounted for 18% of all foreign body injuries. Sixteen percent occurred on construction sites, 6% in areas of commerce and 4% in hospitals.

Fifteen percent of the injuries occurred while the victim was using workshop grinders, wind caused 13% of injuries, 9% arose from welding equipment and 9% from industrial equipment.

Most of the injuries occurred in the construction, electricity and manufacturing industries with the majority of injuries occurring to tradespeople especially to welding tradespersons, metal fitters and machinists and carpenters/joiners.

Foreign bodies to the eyes accounted for 65% of the injuries, 11% were eye abrasions, 10% eye inflammations and 3% eye burns.

Prevention

1. Eye protection should be worn if using grinders, welding or industrial equipment.

Industrial Equipment (nec) (n = 550)

Almost a third of the industrial equipment injuries (not elsewhere classified) were to adults in the 30 to 39 year age group. Seventeen percent were admitted/transferred to hospital for further treatment, showing these injuries were more severe than most others.

Thirty percent of the injuries occurred when the victim was caught in or snagged by the equipment, falls caused 6% and a failure/malfunction of the equipment caused 5% of injuries.

Finger injuries represented 42% of all industrial equipment (nec) injuries, and over half of these were admitted to hospital. The finger being caught in the machinery was the cause of 53% of the finger injuries occurring (e.g. *'operating machine, caught right thumb between wheel and chain'*) while fingers being cut by machinery caused 34% (e.g. *'operating machine with rotating knife, cutting blocks of foam, cut finger'*). The majority of finger injuries were lacerations, crushing injuries, fractures and amputations. Hand injuries accounted for 12%, especially lacerations.

Prevention

1. Protective barriers on equipment should he fitted to prevent workers putting their hands and fingers into the equipment and getting them caught in the machinery. Also all equipment should he equipped with automatic shut-off that turns the machinery off if the workers get their body parts caught.
2. Staff should be trained on the correct use of the equipment they me using and on safety procedures.
3. Equipment should be serviced regularly to prevent failure/ malfunction.
4. Employers should ensure protective clothing is worn by employees at all times, including hand protection.

Hazard 18

The next edition of Hazard will discuss frequently occurring hazards and those causing severe injury with under 200 presentations - trucks, stairs/steps, chemicals, ladders, pipes, fork-lift trucks, nails, wind, electrical wiring, scaffolding and flame/fire/ smoke. Additionally manual handling and injuries to children in the workplace and on-the-job will be investigated.

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Work Related Hospital Admissions

Limitations of the Ninth Revision of the International Classification of Diseases (ICD9) coding system, preclude the direct identification of work related injury from public hospital admission databases. This problem should he overcome with the introduction of ICDIO, where activity and location of injury event will be identified. The interim measure of routinely utilizing "place" codes in ICD9 would partly overcome this limitation.

Estimates of Victorian public hospital admissions as the result of work related injuries can be determined by extrapolation from VISS and state-wide hospital admissions. Among admitted cases aged 15 years or greater in the VISS database, work related injuries represent 10.45% of total injury cases. According to Langlois et. al. (1992), the average yearly hospital admission rate for "all incident true injuries" (excludes medical injuries and late effects) is 35,313 for the same age group for the five year period July 1986 - June 1991. If the same proportion applies as for the VISS participating hospitals, the yearly average admissions for work related injury in Victoria would be 3,690.

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Victorian Work-Related Fatalities 1989/90

Caroline Finch

Introduction

Victorian workers' compensation claim data for workplace fatalities are collected by the Victorian Workcover Authority. The Victorian Occupational Health and Safety Authority (OHSA) has recently released a statistical profile of occupational health and safety (including fatalities) based on this data (OHSA, 1993). According to this statistical profile, the OHSA investigate one traumatic workplace fatality each week. However, workers' compensation data generally under-reports the number of work-related fatalities because it relates only to successful claims and some sectors of the workforce (i.e. Commonwealth employees and most of the self-employed) are not covered by the compensation schemes (Harrison et. al., 1989). Furthermore, some large companies are eligible to self-insure their workers and injuries from such companies do not appear in the OHSA statistics.

Coroners' data, on the other hand, is available on any sudden or unexpected death for which a post mortem is required, by law, to be performed. Coroners' records therefore are a rich source of information about work-related fatalities.

Coroner's data is currently available for all work-related deaths that occurred in Victoria over the period July 89/June 90. A summary of the Coronial data relating to all industrial deaths over this period is given below. The summary includes truck and other motor vehicle drivers only when the death occurred during the performance of normal work duties. Natural deaths and those that occurred whilst on the way to or from work have been excluded from the following sections.

Industrial deaths according to the Coroner's findings for 89/90

During the period 1/7/89 to 30/6/90, 53 industrial fatalities were examined by the Coroner, compared to 34 recorded by worker's compensation statistics. Of these, only one case was female. The ages of the fatal cases ranged from 18-75 years, with a mean of 38 years. Half of all of the fatalities were in people aged less than 35 years of age, indicating that work-related fatalities are a major cause of premature mortality.

Locations where the injuries occurred

The most common location where the industrial deaths occurred was on a public road (Table 1). Over 20% occurred at an industrial premise (e.g. factory, warehouse, production site) and 6% occurred on farms.

Mechanism of injury

Table 2 summarises the mechanisms of injury involved in the industrial deaths. The most common mechanism of injury was vehicle-related of which 11 (42%) were drivers of heavy vehicles and 7 (27%) involved tractors. Large machinery (a fork lift and an earth mover) was also involved in two other fatalities. In both cases, the machinery was switched on whilst in gear from outside of it and it ran over the person standing next to it.

Other major injury mechanisms were "exposure to flames", "hit by falling object" (brick wall, tree, concrete wall, truck load (2 cases) and "hit against victim" (sliding fork lift load; falls through a skylight and asbestos roof, fail down a 70 em gutter and fall onto a concrete floor).

Mechanism of fatal industrial injuries **Table 2**

Mechanism of injury	Number of cases	%
Vehicle accident	29	51%
Hit by falling object	5	9%
Hit against - victim	5	9%
Exposure to flame	5	9%
Caught in or between	3	5%
Electric shock	3	5%
Drowning	2	4%
Other mechanical	2	4%
Hit by moving object	1	2%
Other (lost control of skis)	1	2%
Total	53	100%

Place of occurrence of injury **Table 1**

Place of occurrence	Number of cases	%
Public road	26	48%
Industrial premise	12	23%
Farm	3	6%
Water	2	4%
Construction site	2	4%
Private home	2	4%
Mine, quarry	1	2%
Other outdoor (national park, parking area, footpath)	4	7%
Other public transport	1	2%
Total	53	100%

Occupations

According to worker's compensation data, 27% of all fatalities occur in the agricultural sectors, 22% in construction, 16% in manufacturing and 13% in transport (OHSA, 1993). Table 3 summarises the broad occupational classifications of fatal cases according to the Coroner.

Occupations of fatal industrical accident cases **Table 3**

Occupation	Number of cases	%
Transport	21	40%
Construction and mining	8	15%
Agriculture	7	13%
Community services	4	7.5
Electricity	4	7.5
Trades	4	7.5
Manufacturing	4	7.5
Public administration	1	1.9
Total	53	100%

Almost 40% (n=21) of all cases were involved in the transport industry. Of these, 16 were heavy vehicle drivers and two were aircraft pilots. Workers from the construction and mining and agriculture sectors accounted for almost 30% of all fatal injuries, most of these were related to the use of heavy machinery such as tractors and cranes. Community services includes two policemen, food services and hotel/motel trade.

Discussion

Fifty-three work-related deaths were identified in the Corner's data, compared to 34 deaths according to worker's compensation data, thus highlighting the importance of the former in obtaining a more complete assessment of the magnitude of work-related fatalities. However, it is possible that the data presented in this article is an underestimate because of a number of indeterminate cases in the Coronial databases (Harrison et. al., 1989; Harrison et. al., 1993).

Coronial data for the period June 89/ July 90 highlights transport, construction and mining and agriculture occupations as having the highest numbers of deaths. This is in agreement with published data for the whole of Australia for 1982-1984 (Harrison et. al., 1989).

A more comprehensive overview of the factors involved in work-related fatalities is needed to identify a full range of preventive measures. Improved data systems and more timely data are important in achieving this and should receive immediate attention.

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* Special edition

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Participating Hospitals

Royal Children's Hospital

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Coronial Services

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National Injury Surveillance Unit

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

How to Access VISS Data:

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

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HAZARD VOLUME 1
Bound Edition
of Hazards 1-10

These are available from VISS. A handling and postage fee of $10 applies.

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