INJURY BULLETIN

Queensland Injury Surveillance Unit
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Bicycle Injury in Queensland

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SUMMARY

- There are approx 6000 ED presentations and almost 10 deaths each year from bicycle related injury in Queensland.
- Bicycles are the most common consumer product causing injury in children in Queensland
- Nearly 75% of all bicycle related ED presentations were in children aged under 15 years
- Most fatalities were due to head injuries and involve a collision with a motor vehicle

INTRODUCTION

Australian Transport Safety Bureau (ATSB) and Queensland Transport (QT) data shows that during the period 1998 to 2003 51 Queensland cyclists died and about 1600 required hospitalisation for injury. Thirty percent of cyclists injured were children under 17 years of age. These figures comprise 2% of all traffic fatalities and 5% of all hospitalisations due to traffic crashes[1] [2]. In the 10 to 14 year old age group, cycling is the 4th leading cause of injury death in Queensland[3].

This bulletin describes the pattern of bicycle related injury presenting to emergency departments using data collected from QISU participating emergency departments.

METHODS

All Injury presentations to QISU participating hospitals with a reported activity of bicycling or an external injury cause of pedal cyclist or pedal cyclist passenger for the period 1998 to mid 2004 were extracted from the QISU database for analysis.

RESULTS

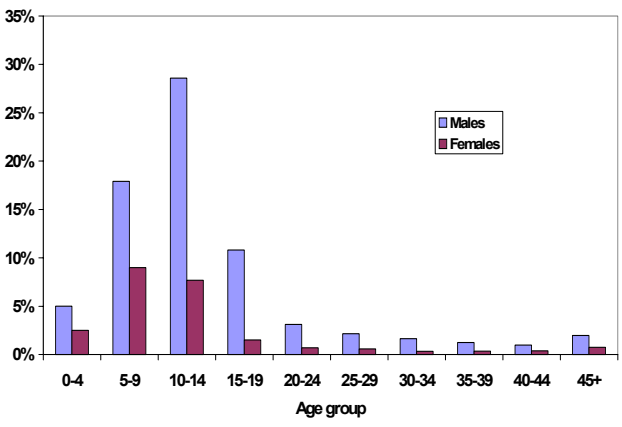
For the period 1998 to mid 2004 there were 9510 presentations to participating QISU Emergency Departments for an injury associated with bicycles or bicycle riding. This represents 3% of all injury presentations and 6% of injury presentations in children under 15 years of age. Bicycle injuries make up a third of all transport related injuries presenting to hospital EDs.

Age and gender

As with other injury data, males outnumber females 2:1. Nearly three quarters of victims were aged under 15 years.

The most common age group was children aged 10 to 14 years, making up almost 40% of the cases (30% of all bicycle related injury presentations were in boys aged 10 to 14 years), 27% aged 5 to 9 years and 8% of cases were aged under 5 years.

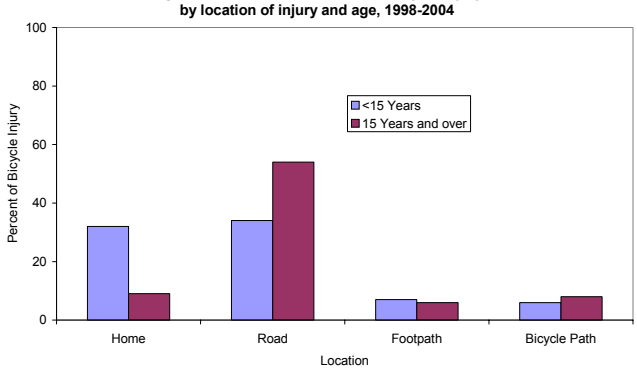
Figure 1: QISU ED presentations for cycle injuries by age and gender, 1998-2004



Location

A quarter of injuries were reported as having occurred around the home. For those under 15 years 32% of the injuries occurred at home and 34% on the road, as compared to those over 15 years where only 9% of injuries occurred at home and 54% occurred on the road.

Figure 2: QISU ED presentations for cycle injury by location of injury and age, 1998-2004



Outside of the home the most common location for bicycle related injury is the roadway (39%) followed footpath (7%) and bike path (7%). Six per cent were described as having occurred at a race track or sports arena.

One hundred and thirty two (1.3%) cycle injuries were reported as occurring at a skate park three quarters of which were aged 10 to 19 years.

Main injury factor

The majority of bicycle injury presentations (74%) resulted from a single vehicle crash (no other vehicle or object involved). Only 6% reported another vehicle as an injury factor.

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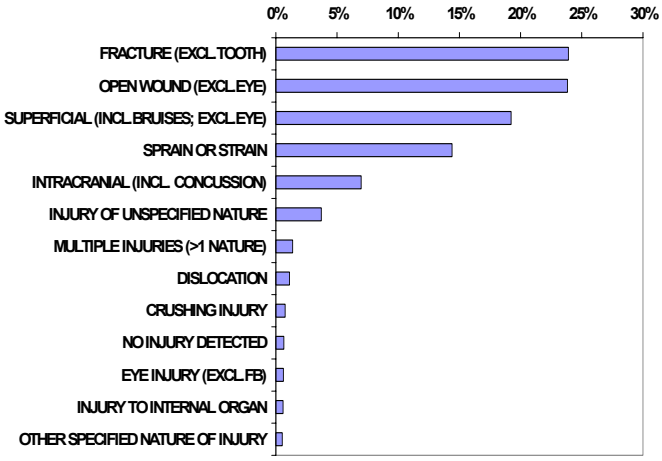
Figure 3: QISU ED presentations for cycle injury by nature of injury, 1998-2004



Mechanism of injury

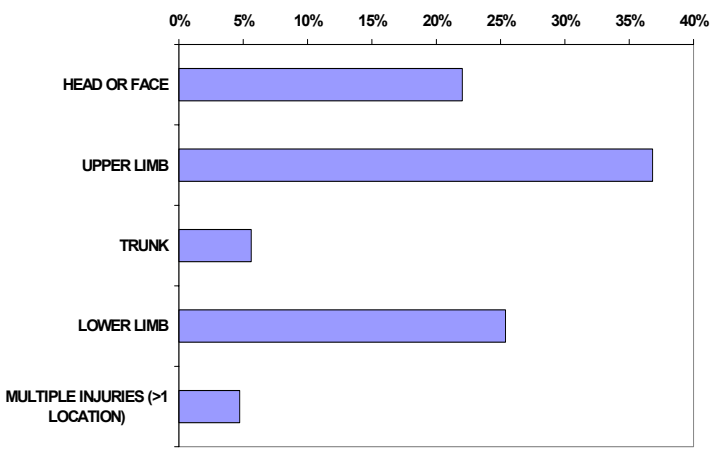
The most common mechanism of injury reported was a fall (53%) followed by contact with a moving object (8%) and then contact with a static object (8%).

Nature and body location of injury

A quarter of injuries resulted in a fracture followed by open wound (24%), superficial injury (19%), sprain or strain (14%) and intracranial injury (7%). Almost 30% of injuries involved the elbow, forearm, wrist or hand. 23% involved injury to the head, neck or face, and 22% involved injury to the knee, lower leg, ankle or foot. In school age children (5 to 16 years), 11% of all head injury presentations are bike related. Adults had more injuries to the shoulder than did children, who were more likely to have an injury to the forearm.

Less than 2% of injuries were to the abdomen and there were 56 injuries to an internal abdominal organ (<1%). Of the 459 cases that mentioned handle bars in the description, 14% were abdominal injuries. One quarter of all internal abdominal injuries in cyclists were handlebar related.
Of the crashes that involved another vehicle, 10% resulted in an intracranial injury compared to 7% overall. Five percent of injuries occurring in skate parks resulted in intracranial injury . The proportion of fractures in sustained in skate park injuries (20%) was similar to the overall proportion (24%).

Figure 4: QISU ED presentations for cycle injury by body location, 1998-2004



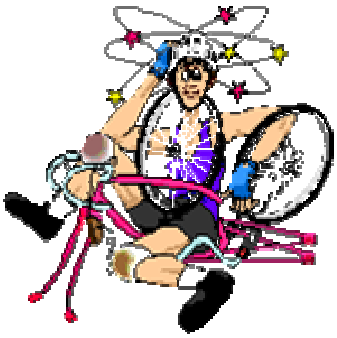
Severity

Fifteen per cent of all bicycle injury presentations resulted in admission to hospital. The percentage of children under 15 years of age admitted following bicycle related injury was slightly higher at 17%.
Twenty eight percent of all bicycle injury presentations had a triage category of urgent or higher.
The injuries occurring at skate parks tended to be of a slightly lower severity (28% urgent or above and 10% admitted) while those involving another vehicle had a higher triage score (51% urgent or above and 20% admitted).
Cycle injuries occurring on road have a higher severity (35% triage category urgent or higher) to injuries occurring in other locations.

DISCUSSION

Cycling related injury is a common reason for emergency department presentation in Queensland, comprising 3% of all injury presentations and 6% of all injury presentations under the age of 15 years. Bicycles are the most common consumer product causing presentation to a Queensland emergency department for injury in children. They are associated with 7% of all injuries in children aged 5 to 9 years and 9% of all injuries in children aged 10 to 14 years. As with other injury data, boys are twice as likely to be injured as girls are when cycling. Young children are poorly equipped to interface with traffic perceptually and are vulnerable road users. In addition, many adolescent males take part in stunt cycling at skate parks.

The pattern injury depends on the cycling location as well as age and contact with a vehicle. QISU data shows that in Queensland, the majority of adults are injured on the road (55%). In children under the age of 15 years, 36% were injured on the road, and 32% at home. In Queensland it is legal for cyclists to ride on the footpath. In QISU data 10% of child injuries and 6% of adult injuries occurred on the footpath. The corresponding figures for bike paths were 7% and 8%.



Most injuries do not involve a collision with a motor vehicle and are 'single vehicle' crashes. The most common injury in children is to a limb (soft tissue or fracture) following a fall from a bike. Children tend to sustain injuries to their forearms and adults have more injuries to their shoulders. Bicycle crashes which involve another vehicle generally result in more serious injury[4].

QISU emergency room data shows 6-8% of injuries as a collision with another vehicle while QT report 84% of bicycle crashes involve a collision with another vehicle and that all bicycle fatalities were due to head injuries. From QISU data, bicycle injuries occurring at skate parks were of slightly lower severity than in the overall cycling group. This is contrary to what might be expected, given that those involved appear to be predominantly young males attempting stunts. It may be that their cycling proficiency protects them against injury despite their activity.

An examination of admitted patients suffering a bicycle related injury at Mater Children's Hospital, a tertiary referral centre, shows that in the two years preceding the introduction of compulsory helmets in Queensland head injuries made up 34% of admitted patients with bicycle injury, while in the 10 years following this introduction, the percentage fell to 17%. Over this period there was no change in practice for admitting head injured patients.

Current literature shows helmet wearing provides a clear preventive benefit for traumatic head injury[5] [6]. The Cochrane review of bicycle helmet effectiveness found that helmets provide a 63%-88% reduction in the risk of head, brain and severe brain injury for all ages of bicyclists[6].

While handle bar injuries don't account for a large number of bicycle injury (5%) they do make up a large proportion of internal injuries which can be serious and even life threatening. Twenty- eight percent of all bicycle injury had a triage category of urgent or above; while in handle bar related injury the corresponding figure was 35%. Acton et al found that nearly a third of bicycle related abdominal injury was due to handle bars and 50% of those had life threatening injuries[7]. Injury to the liver, spleen or kidneys were generally apparent soon after the event but serious injury to the bowel and pancreas can present later and so result in greater morbidity[8].

In many European countries with a more established pattern of cycling for commuting (e.g. Denmark, Netherlands) injury occurs more frequently when the cyclist uses a dedicated cycle path compared to a cycle lane or standard road[9]. It is important to understand that the risk of injury appears less on the cycle path itself but this is countered by the increased risk at road junctions, particularly where the cycle path crosses road traffic. QISU data cannot confirm this finding locally because, although we know most severe injuries and deaths occur on roads, we cannot identify whether the cyclist entered the road from a path. However, Queensland has many path-road intersections that would be improved with staggered lights at intersections allowing cyclists to move off first and tunnels and crossings keeping cyclists and motorists separate. Cycle path safety would also appear to improve with adequate lighting, vision around corners and single direction paths.

Studies in Australia and overseas involving both children and adult riders have found crash rates 2-10 higher for footpath cyclists[9] [10] [11] [12] [13] [14] [15]. This may reflect poor footpath surfaces and hazards at points where motorists and cyclists cross paths ie driveways and intersections. The Toronto Bicycle/Motor-Vehicle Collision study of 2572 car/bike collisions found that 30% of cyclists were riding on the footpath immediately prior to their collision[16]. Another study of bicycle/motor vehicle collisions in California found that bicyclists who rode on a footpath had an almost 2 times greater risk of colliding with a car than those who rode on the roadway[14]. The incidence of footpath injuries in QISU data suggests that this issue needs to be studied in Queensland.

PREVENTION

Most prevention centres on education, helmet wearing and separation strategies. To reduce the most serious injuries, changing the built environment and separating cyclists from motor vehicle traffic is the most likely to succeed. Bicycle paths have the potential to reduce serious injury in cyclists, but only if these paths can be unidirectional and completely separated from other traffic (vehicular and pedestrian). Maintenance of the pathway and the enforcement of 'road rules' on the bicycle path will further ensure that bicycle injury is reduced. Using existing footpaths should not automatically be assumed to reduce cause injury.

Education is promoted as an important strategy. There is some evidence that educational interventions can improve safe riding behaviour and knowledge but there is little evidence that this translates into a reduction in injury[17] [18]. An evaluation of the BikeEd program in Melbourne found that it can produce harmful effects in some children if it serves as an encouragement for children to try skills they are unable to execute[19]. Unfortunately, other studies of injury programs have shown that there is little correlation between changes in knowledge and reported behaviour on the one hand, and actual changes in observed behaviour and risk of injuries on the other.

Children under the age of 10 years have limited peripheral vision and are poor judges of the speed of approaching vehicles. These factors make them particularly vulnerable when cycling alone on a road way. This is supported by a recent study from Norway that found that delaying a child's age of cycling debut reduces the chance of injury within their first 12 months of cycling[20]. To negotiate roads safely before this age children need adult supervision. Suggestions that it is safer to ride on the footpath are misguided. Children should be taught to treat the bicycle as a vehicle and should not ride on roadways without supervision until they are able to know and understand the road rules. They should be taught to dismount and cross at controlled intersections.

Riding a bicycle that is the wrong size makes it more difficult to handle safely. In children, particularly, a bicycle is not something to 'grow into'. A bicycle is the right size if the child can have their feet flat on the ground when sitting on the bike seat. If a child cannot control a bicycle because it is too big they are at an increased risk of injury, including handle bar injury.

Helmets are a proven protective measure to reduce injury in cyclists. Helmets must fit properly to effect proper protection. When buying a helmet, ensure it has the tick for Standards Australia. Foam pads should be used to ensure the helmet doesn't move around on the head. The front of the helmet should sit no higher than 2 finger widths above the eyebrows. The chin strap should be tight enough to pull down if the mouth is opened.

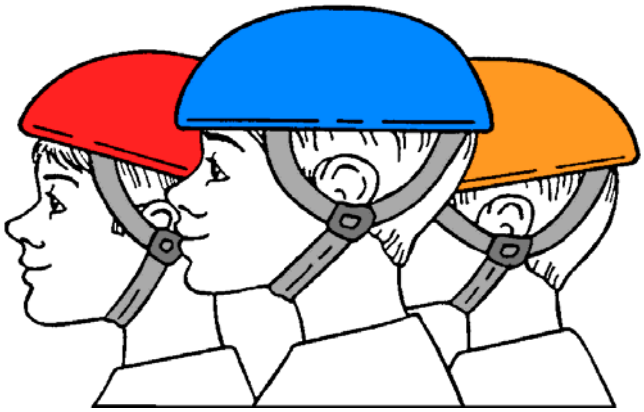
As in pedestrian injury, lower speed limits on suburban roadways will give drivers more time to react to cyclists and, should a collision occur, injuries to cyclists will be less severe than in circumstances where speed limits are higher.

SUMMARY

To reduce injury in cyclists a multi-pronged approach is required. Environmental modification where cyclists are separated from other road users and pedestrians, enforcement of the helmet legislation and road rules, including speed limits and education of safe ways and places to ride will need to be combined for any significant differences in morbidity and mortality in Queensland cyclists.

RESOURCES

Queensland Transport, Safe Cycling - http://www.transport.qld.gov.au/qt/LTASinfo.nsf/index/cycling_safe
Australian Bicycle Council - http://www.abc.dotars.gov.au/
Our Brisbane, Active and Healthy, Cycling - http://www.ourbrisbane.com/activeandhealthy/sport/track/cycling/
Brisbane Bicycle Touring Association - http://www.bbta.org/index.php
Bicycle Federation of Australia - http://www.bfa.asn.au/default.htm
Bicycle Queensland - http://www.bq.org.au/



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QISU collects and analyses data from emergency department injury presentations. Participating hospitals represent three distinct areas of Queensland. QISU publications and data are available on request for research, prevention and education activities.

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