Quad bike injuries in Waikato, New Zealand: an institutional review from 2007–2011

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Abstract

Background: The aim of this study was to assess the burden of all-terrain vehicle (ATV) injuries within the Waikato region of New Zealand.

Methods: From the local database of 13,400 trauma patients, 101 patients with ATV-related injury or death were identified. We analysed data on demographics, location and mechanism of accident, helmet use, length of hospital stay, injury severity score and type of injury. Only admissions to Waikato Hospital trauma centre between February 2007 and March 2011 were included.

Results: A total of 84% of patients were male, 16% were female. The mean age was 38.8 years (range 4–82). Twelve per cent of patients were within the paediatric age range (<16 years). No age group was at particular risk for an ATV injury. An increase in ATV injuries year-on-year within the Waikato area was found. A large number of head injuries were found. Helmet compliance was low. Injury severity score was significantly higher in Maori than in NZ Europeans (mean 16.8 versus 10.0 (P = 0.04)) and was comparable between children and adults as well as men and women. Our results display a 42% rise in admission incidence from 2009 to 2010, resulting in increased hospital bed occupancy. If the current trend of a growing number of quad bike accidents was to continue, this could amount to a cost of NZ$1,467,344 in 2012 from ATV injuries in Waikato hospital alone.

Conclusions: Quad bike injuries are an increasing burden on Waikato health care. The best strategy to tackle this epidemic needs to be further debated.

Introduction

The Waikato region is the fifth largest region by land area within New Zealand, covering around 35,000 km² of the North Island. Within this area, rural farming and agriculture remains central to the community and is still the regions’ main employer with around 23,000 farmers in Waikato. All-terrain vehicles (ATVs) travel on three or four low-pressure tires with a seat that is straddled by the operator, along with handlebars for steering control. Over 95% of ATVs in New Zealand have four wheels so the term ‘quad bike’ and ‘ATV’ are essentially synonymous.

Over recent years, the Waikato region’s farming industry safety has come under close scrutiny. In July 2007 the Department of Labour began investigating the increasing number of work-related ATV accidents occurring within the region’s farms. In a 12-month period (July 2007–June 2008), four quad bike deaths occurred within the Waikato and Bay of Plenty regions alone, with a fifth death occurring within the Waikato region in July 2008. Over 50% of injuries and fatalities associated with quad bikes are sustained by farmers. Concern has been raised by several organizations including the Royal Australasian College of Surgeons who have called for tighter regulations of quad bike use. Recent Australian hospital data suggest that up to 11% of all farm injuries are the result of ATV accidents. The underlying instability of quad bikes is cited as the main factor in the accidents, leading to rollover of the vehicle in 39% of cases and serious head injuries in 24% of cases.

Over one-third of farm fatalities in New Zealand involve quad bikes, with quad bike accidents accounting for a further one-third of all workplace fatalities involving children. Research suggests that children under the age of 16 are at a greater risk of injury or fatality than adults, when operating a quad bike, due to not possessing the physical size, strength or coordination to safely operate a quad bike. This is particularly evident when operating an adult quad...
bike, which can weigh over 500 lbs and achieve speeds up to 70 mph. The disparity in size puts the child at risk, with arm length to reach grip throttles and leg length for breaking often compromised.6,7

A comprehensive New Zealand review of ATV injuries in 643 paediatric cases found that serious fractures/dislocations and soft tissue injuries accounted for the majority of injuries (57.7% and 55.5% of cases, respectively),8 which is consistent with the international literature on paediatric ATV injuries.8,9 On the other hand, six children (3%) in the review remained disabled and 16 (7%) died. The majority were under 12 years of age.8 In New Zealand, it is generally recommended that children under 12 years of age never ride an adult quad bike, although formal guidelines are missing; this highlights the need for tighter regulation.

The Waikato region has a mixed urban and rural demographic profile that is similar to New Zealand as a whole.1 The primary goal of the current study was to highlight the severity and nature of quad bike injuries. We also hope to identify risk factors for – and groups vulnerable to – serious injury. This information can then be used by the appropriate agencies to aid them in producing preventative and educational strategies.

Methods

Data collection

Patients admitted to Waikato Hospital (a provisional level I trauma centre) with quad bike-related injuries were identified retrospectively from prospectively collected data in the Waikato Hospital trauma registry over a 4-year period (from February 2007 to March 2011). Data on demographic profile, location and mechanism of injury and helmet use were analysed. Length of hospital stay (LOS), injury severity score (ISS) and type of injuries sustained were used as markers of the burden of injury. Although the Waikato region is much larger than Hamilton city, only admissions to the Waikato hospital trauma centre in Hamilton were included due to the lack of a complete trauma database within minor rural hospitals.

Statistics

Descriptive data and charts were used to demonstrate demographic data. Means (standard deviation) and medians (range) were calculated where appropriate. Non-parametric methods (Mann–Whitney U-test) were used to analyse the data.

Literature search

In PubMed, we selected interesting articles using the search terms ‘ATV’, ‘quad bike’ and ‘injury’. From the reference lists of the articles that were found, other interesting articles were selected and included in our literature review.

Results

Demographic details, length of hospital stay and ISS are set out in Table 1. The mean age was 38.8 years with an age range of 4–82 years. Twelve per cent of patients were within the paediatric age range (<16 years of age) with the majority of patients, more or less, evenly spread over the decades between 16–55 years of age (Fig. 1).

A breakdown of the paediatric patients is shown in Figure 2. The majority of patients were employed (47%) (Fig. 3). The mean length of stay was 7.4 days, giving a total of 751 days of bed occupancy. One patient (1%) died of a traumatic brain injury 13 days after admission. In Waikato hospital more ATV-related injuries were seen every year, resulting in increased hospital bed occupancy (Fig. 4). With an average cost for treatment and rehabilitation of NZ$19 497 per trauma patient,10 costs for 2010 alone could have been over NZ$721 000 for quad bike-related injuries within Waikato hospital. Unfortunately, helmet use was recorded for only 46 patients (46%), although registration in the database was better in 2010. Therefore, we can only say that a significant number of patients did not wear a helmet (at least 49% in 2010) (Fig. 5). This is a very important issue since the head was injured in 17% of all patients suffering quad bike-related injuries (Fig. 6); it was the single most injured body region in patients with an ISS > 15: 29% of these patients had a head

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ISS, injury severity score; NZ, New Zealand.
injury. Other injured body regions in patients with ISS > 15 were the face (10%), chest (16%), abdomen (8%), spine (14%), upper and lower extremity (15% resp. 7%). Figure 7 shows the injury pattern of the 12 patients <16 years of age. Surprisingly, these young patients mainly had extremity injuries. Four of them were passengers; the others were driving the bike themselves, with the youngest driver of a mini quad bike being only 5 years old. We do not have information on supervision of the paediatric patients. Two of the children were Maori, the others NZ European. Children <16 years of age and adults had comparable ISS (mean 9.8 versus 11.0 (P = 0.49)) as had men and women (P = 0.39). The mechanism of injury was a rollover (25%), collision (20%) or a fall off the vehicle (55%). Looking only at the ISS > 15 group, rollovers (37%) and collisions (26%) were more common. Data on the specific kinds of quad bikes driven by patients were not collected so we cannot indicate if any make or kind is more prone to accidents than another. Maori had significantly higher ISS than NZ Europeans: mean 16.8 versus 10.0 (P = 0.04). The majority of quad bike injuries occurred within the rural setting, with 57% of all quad bike injuries occurring on farms. Other places of injury were: at home (5%), during recreation/sport (11%), on a street (8%) or other/unknown (19%).

Discussion

This is the first study to investigate the burden of quad bike-related injuries in the Waikato region of New Zealand. It highlights areas of concern including increasing incidence of these injuries and bad helmet compliance within the research population.

Since the introduction of ATVs, in the early 1980s, studies have highlighted their dangers. Children under 16 years of age are at disproportionate risk of quad bike injury, with children suffering approximately 37% of all injuries (head, chest and limb injuries being cited in the majority of cases) and 38% of all reported fatalities between 1985 and 2001.7,8,11 This is in contrast to the results found within this study, which highlights that over a 4-year period the majority of patients within the Waikato were more or less evenly spread over the 16–55 years of age categories with only 12% of patients under 16 years of age (Fig. 1). This suggests that the burden of ATV-related accidents currently affects a much wider population within rural New Zealand. We cannot explain the lower incidence of injury to the paediatric population found in the present study. Possibly, knowledge about the dangers of quad bike use by children is trickling down to the community, with parents preventing their children from riding these vehicles, providing adequate protection measures, or more adequately supervising their children.

As expected, rollovers and collisions were associated with a higher ISS than simple falls off the vehicle. Collisions might be prevented by minimizing the amount of time spent on roads when driving a quad bike and by making sure that adequate lighting is in place when driving in the dark.

Despite increased research and media coverage regarding quad bike-related accidents our study reveals that increasing numbers of

Fig. 2. Breakdown of the paediatric patients (<16 years of age).

Fig. 3. Employment status.

Fig. 4. Number of patients with all-terrain vehicle (ATV) injuries admitted to Waikato hospital. Total days of hospital bed occupancy related to ATV injuries in Waikato hospital.
patients are being admitted to Waikato hospital following quad bike accidents. A staggering 42% rise between 2009 and 2010 was found, resulting in increased hospital bed occupancy (Fig. 4); this is a worrying and costly trend. If the growing number of quad bike accidents was to continue in 2012, this could amount to costs for treatment and rehabilitation of NZ$1467 344 in Waikato hospital alone.10 Looking at our data, we cannot explain the rise in the number of quad bike-related injuries. For example, we did not find a relation with a specific geographical area.

In patients with an ISS > 15 head injuries make up 29% of all injuries recorded, although this is not the case for our paediatric population (Fig. 7). Unfortunately helmet use was only recorded in the database for 46% (Fig. 5) of patients. Recording was better in 2010 and showed that helmet compliance among quad bike riders was bad with at least 49% of patients not wearing a helmet. Rogers showed that the use of a helmet was associated with a 42% fatality risk reduction and a 64% head injury likelihood reduction.11 This resulted in an overall risk reduction of about 15% through the simple precaution of wearing a helmet.11 Other authors have demonstrated that ISS is lower in patients wearing helmets.12 Although our study was unable to accurately quantify compliance and injury patterns related to helmet use, we can only encourage wearing a helmet when riding a quad bike. The perceived low helmet compliance among quad bike users seen within this study has unfortunately been demonstrated in many studies, both in New Zealand and abroad. Keenan and Bratton investigated helmet compliance in Pennsylvania – which has laws requiring a helmet to be worn – and in North Carolina, which does not. Both states demonstrated low helmet use (Pennsylvania: 35.8%, North Carolina: 16.7%).13 In New Zealand it is not compulsory to wear a helmet if operating an ATV on a farm, but helmet use is currently highly recommended through many
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References


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Safety organizations. There seems to be an underlying resistance to helmet use with the choice to actively not wear a helmet a behaviourual consideration. How behavioural modification is best delivered and augmented is a matter of debate between education through improved safety awareness and legislation.

Education versus legislation

Within New Zealand there is no current guideline specifically governing the use of quad bikes on private farmland or the use of children riding quad bikes. Operating quad bikes in a working capacity is regulated with regard to health and safety legislation.14 There is no single sphere of legislation (child welfare or land transport) that encompasses both adult and child safety.14 The monitoring of rural compliance to legislative practice would be difficult to achieve as the distribution of New Zealand’s farms and the resources required to monitor and implement quad bike-specific regulations would prove to be impractical.14 Legislation would be seen to focus on prosecution rather than safety awareness and as such detract from the ultimate goal of safety promotion and minimizing the risk to both adults and children. A more favoured route may be the strategy of increasing quad bike safety awareness through the engagement of rural communities in education programmes and safety campaigns.14 Highlighting the dangers of incorrect ATV use and making farmers more aware of their own safety could lead to the modification of current attitudes and behaviour. This was shown by a recent trial of an ATV safety education video in an American hunter education programme.15 The response must be broad: that is, awareness, information sharing, education and liaison with appropriate injury prevention agencies such as the New Zealand Accident Compensation Corporation. This is essential before any form of legislation could be successfully implemented.

Limitations of this study

This was a single-centre, retrospective review of prospectively collected data that ultimately relied on accurate coding, accurate description and accurate clinical history of all ATV-related accidents and associated injuries. Therefore the study gives a key insight but underestimates the burden of quad bike accidents within the whole Waikato region.

Conclusions

In recent years, there has been a worrying increase in the number of ATV injuries within the Waikato region, New Zealand. Children and adults were evenly affected in the present study. Helmet compliance was low accounting for a large number of head injuries. This clear evidence of an increase in serious quad bike injuries should spark renewed interest in the issue. Enforcement of regulations and/or better delivery of safety education could possibly help reduce this increasing burden on New Zealand’s health services. How to exactly tackle this epidemic is a contentious issue that needs to be further debated.