



Six-year retrospective study of bull-riding injuries in central Queensland

Ryan Livingston, Lidia Koval, Leah Livingston, Neil Scholes

Rockhampton General Hospital, Rockhampton QLD Australia

RESEARCH

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Corresponding Author:

Ryan Livingston
25 Forest Rd, Cashmere, Qld 4500
Email: drryanlivingston@hotmail.co.uk

Abstract

Background

Bull riding is an increasingly popular and growing professional sport in Australia. This is the first national study that investigates bull riding-related injuries.

Method

A six-year retrospective study of patients admitted to Rockhampton Base Hospital with acute injuries sustained whilst bull riding. Patients were identified from the Rockhampton Hospital international coding system and surgical audit excel databases. Supporting information was found from patient chart review.

Results

Thirty-eight patients were admitted during the study. Injuries increased from 2008. The most common injuries were to limbs (52%), chest (15%) and brain (10%). Life-threatening injuries were all caused by a direct kick or trampling by the bull; 5% of patients needed air transfer to Brisbane, and 10% to Rockhampton for their acute care. The only complication was infection of open wounds. The average hospital stay was 2.2 (range= 1-5, SD= 1.1) days and 64% of patients required operative intervention.

Conclusion

Patients that had been kicked or trampled should be identified as having potentially life-threatening injuries, and transferred for review at an appropriate facility. Due to the high risk of infection all contaminated wounds should be washed out formally and receive antibiotics. Protective equipment should be encouraged among riders.

Key Words

Bull riding, rodeo, bull injury, rodeo injury.

What this study adds:

1. First study on bull-riding injuries in Australia.
2. Outlines range of injuries and complications from bull riding in Queensland.
3. Identifies potential mechanisms for severe injury that require imaging and medical assessment.

Background

The origins of the American rodeo can be traced back to the early 1700s.¹ In Australia bull riding origins date back some 150 years.¹ In the early days, rough riders, outlaw buck jumpers and horse breakers tested their skills in informal matches.²

Part of the thrill comes from watching professional bull riders match their riding skills, intuition, and courage against animals 15 times their weight. Bucking bulls typically range from between 700–1200kg and are bred purely to buck. In competitive bull riding, the rider holds a length of braided rope wrapped around the bull's midsection with one hand. The rope is not tied in any way; only the force of the rider's grip on the rope keeps the rider on the bull. Riders must remain on the bull for eight seconds, during which their free hand cannot touch the bull, themselves, or the rope.³

Protective equipment in bull riding consists of a flak vest, a helmet and a mouthguard. A helmet and a vest are mandatory for participants younger than 18 years of age, but after that the choice of protective gear is voluntary. Most riders wear a protective vest, but many are resistant to wearing a helmet.¹⁷ Until recently, the rodeo-specific helmet did not exist, and helmets were simply a modified version of helmets worn in other sports like hockey or lacrosse.³ Unsurprisingly, bull riding also has the highest rate of injury of any rodeo sport, with the incidence of injury at 32.2 injuries per 1000 competitor-exposures.⁴ Riders are prone to soft tissue, chest, abdomen and limb injuries when hitting the ground after dismounting or being thrown from a bull; in addition, they are at risk of being stomped on or trampled by an animal. The incidence of head injuries is second only to shoulder and knee injuries,⁴ yet faceguards and helmets are rarely mandated in competitive bull-riding events. Bull riders have the highest incidence of injury but other rodeo participants who are at



the arena and in close proximity to the bull, such as ropers, bullfighters and rodeo clowns, are also at risk (the personal opinion of the authors after observing the rodeo).

Despite the increasing popularity of the sport, there is limited medical research investigating rodeo injuries and none from Australia. This study was prompted by the authors' concern about the number of serious injuries incurred by bull riders within our catchment area.

Figure 1: Thirteen-year-old boy treated with a pneumothorax



Method

This investigation of bull-riding injuries is a six-year retrospective study. The information about the number of competitors in rodeo nationwide and in Queensland was provided by the Australian Professional Rodeo Association.

Inclusion criteria were any patients who sustained an injury at the rodeo and were admitted to Rockhampton General Hospital between 1 November 2004 and 1 November 2010. This information was extracted from the Surgical Department Audit (Microsoft Excel database) and from the International Classification of Disease coding system (Version 10). Exclusion criteria were any rodeo-related injuries that did not become an inpatient at Rockhampton Base Hospital. Collected data was entered into a Microsoft Excel spreadsheet for descriptive analysis of injury type, site and frequency.

Results

The average age of bull riders injured was 21.3 years (range= 12-47 years, SD= 6.13) and the results showed a proportional distribution of youth injuries (11 riders) to adult injuries (27 riders). It is impossible to know the exact number of bull rides in the area over the course of the study but conservative estimates would be greater than 5000. This equates approximately to less than 1 in 130 rides

requiring hospital admission. There were an increased number of hospital admissions after 2008 (Figure 2). All (n=38) of the recorded injuries occurred in males. Fractures were the most common injury type (n=24). Injuries occasionally involved multiple regions of the body (n = 2), with limbs constituting 52% (n=21) of all injuries. Chest injuries followed with a 15% (n=6) injury rate, and brain trauma at 12% (n=5). Other injuries included paraphimosis, splenic trauma, four pneumothoraces and one facial artery transection. The areas least affected were the spine, abdomen and genitalia (Figure 3). There were no mortalities recorded during the study period. Twenty-five riders required operative intervention (64%) and 13 riders were treated non-operatively (34%).

Figure 2: Annual number of bull riding injuries admitted to hospital since 2004.

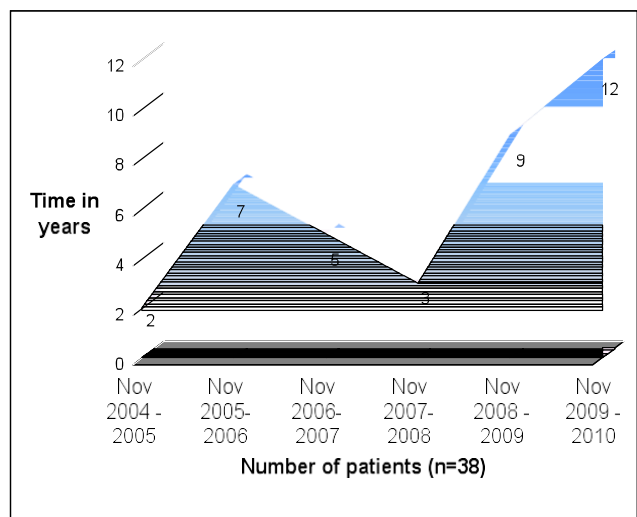
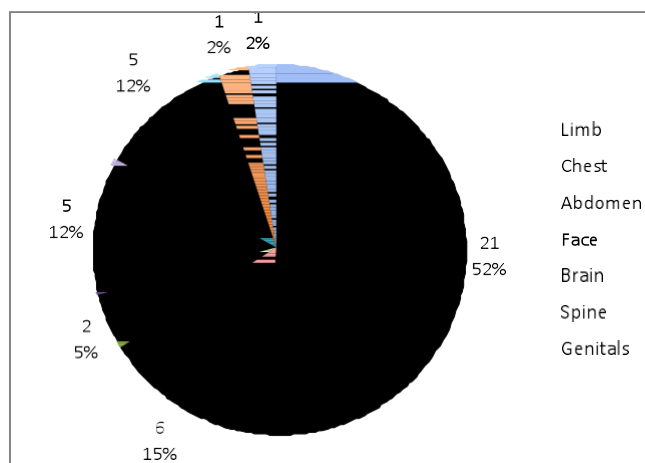


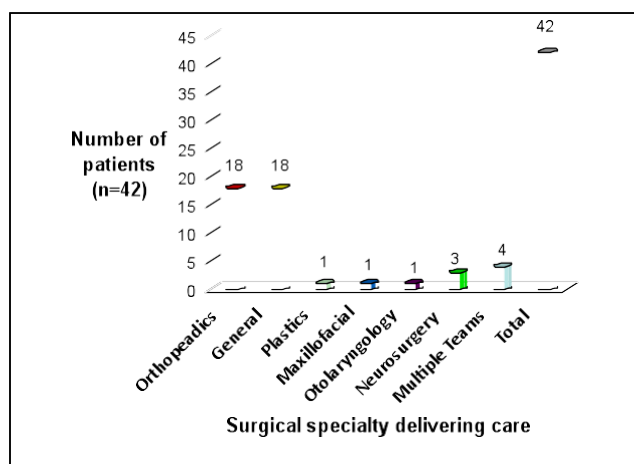
Figure 3: Chart to show number of injuries to different body regions



Four riders required transport by the Royal Flying Doctor Service (10%) and a further two needed transfer to a

tertiary centre for specialist treatment (5%). During the study period, one rider had more than one admission to hospital for bull-riding trauma. The average number of days spent in hospital were 2.2 (min =1, max=5, SD=1.1). Orthopaedics and general surgery were responsible for the majority of the admissions, with 36% (18 patients) each (Figure 4). The only reported complication was infection, three riders with open soft tissue injuries requiring debridement and intravenous antibiotics (43%). All study participants wore safety vests at the time of injury, but only nine of the adult riders wore protective helmets (33%).

Figure 4: Number of admitted patients treated by surgical specialties



Discussion

Bull riding has become an increasingly popular sport among rodeo riders with 2956 bull riding events in the 2009 Australian professional rodeo season. The increased participation in the bull-riding events is mirrored by the increase of bull riding-related injury presentations to the hospital in the 2008 season and onwards compared to pre-2008 statistics. Rodeo bull riding has been reported as the most dangerous sporting activity of the modern era,⁵ and the incidence of injury associated with bull riding has been shown to be two times higher than other major rodeo events, such as bareback bronc riding, steer or calf wrestling or barrel racing.⁶ One of the larger North American cohort studies reported 94 injuries out of 3882 individual exposures or a composite injury rate of 2.3 per 100 competitive exposures.⁷ Our data shows 38 hospital admissions from bull-related injuries over a six-year period, which is actually less than the numbers reported in other studies. This may be attributed to a substantial number of injuries that are not treated in a hospital setting, with riders either presenting to their local medical centre, or failing to report their injuries altogether. This suggestion has been corroborated by preliminary survey data of rodeo riders that the authors have been collecting as a follow-up to this study.

Our data identified limb injuries in 21 people (52%) as the most frequent injury site. These injuries usually resulted from a fall or being caught in the strapping. According to research papers from Canada and America, knee injury is the most common type of injury among bull riders, followed by a head injury.⁷ In this study, head injury was the third most common injury, and only one knee injury was recorded. The infection rate for open wounds was 50% even with toileting and antibiotics, which is not surprising considering the potential for contamination in a bull arena. This complication often required the patient to remain in hospital for several days longer than expected. With the evidence collated in this study, it is now standard practice in the hospital to wash out all open wounds caused by bull riding in the operating theatre, and administer 24 hours of IV antibiotics prior to discharge.

It must be noted that riders are educated in safe dismounting techniques, but given the nature of the animal they are riding, it is not always possible in practice. Arguably, the most dangerous situation is getting 'hung-up', where a rider who loses control of the ride, is unable to free his riding hand from the rope or catches his spurs in the saddle and cannot dismount from the bull. 'Hang-ups' are extremely dangerous and can prove deadly.⁵ However, even after a cowboy frees himself from the rope, he is still at risk of grave injury, both from the impact of a high-speed fall and from the unrestrained bull. Distraction by the rodeo clown and containment of the bull by the pick-up rider are paramount. One article recommends that a rider, who has lost control of his ride and is accelerating towards the ground, shields the vulnerable areas of the body by putting his hands over his head and curling into a ball.⁸ Other strategies that may help absorb a potential hit from an attacking bull include minimising the impact of a fall by falling on the side, and crawling away from the bull instead of running.⁸

Standard protective wear for the rodeo bull riders include a vest, chaps, helmet and a mouthguard. Full protective gear is mandatory for participants aged 18 years and younger. For mature riders, protective equipment is optional. Most cowboys wear a vest and chaps, but many omit the helmet and the mouthguard.

A bull rider's vest resembles a military style Kevlar vest, and is intended to dissipate the impact of direct hits to the torso. Worldwide, there has been significant technological advancement in bull riders' vest design, with a move away from Kevlar to high-density foams and Spectra Shield ballistic materials. The Spectra Shield™ vest is made of



unidirectional layers of fibres that are held together by resins, and claims to be 10 times stronger than steel. A bull rider's helmet resembles a hockey helmet, consisting of a foam liner and titanium face guard. The efficacy and reliability of helmets has been the basis of several papers, most concluding that protective headwear decreases the incidence of head injuries.⁹⁻¹¹ Helmets are unpopular among bull riders because of their negative effect on performance and on the image of the cowboy.¹⁷ According to one recent study, 69% of cowboys never wear a helmet;⁵ in our study, only 54% wore one. However, modern cowboys are better educated about the dangers of head injuries, and are more likely to wear a helmet, especially designated bull-riding helmets such as BullTough□, which are lightweight and allow for the chin tuck position without distraction of the bottom bar.⁶ The increasing popularity of bull riding and injuries, associated with it, has prompted many rodeo associations to re-evaluate their rules for protective gear, and it may become mandatory in the future.

In our study, all head injuries occurred in patients wearing helmets. Interestingly, the 18 riders who failed to wear helmets did not report any head injuries (47%). One potential explanation for this discrepancy might be that a helmet gives a rider a false sense of confidence making him more susceptible to head injury. Nevertheless, according to the previous studies, wearing a helmet appears to diminish the severity of such injuries.⁶

The results of this study have shown that protective gear does not eliminate the risk of injury despite improvements in protective wear design, which can be explained by the mechanism of injury. In this study, the cause of a severe injury was not a fall from the bull, but a result of the animal kicking or trampling the rider. The injuries that occurred by this mechanism included pneumothorax, splenic laceration and intra-cranial bleed. In cases where injury is suspected but not proven, transport to the nearest appropriate treating facility for further evaluation and close observation is warranted, as some serious injuries, such as splenic rupture, may have delayed the onset of symptoms. The remote areas where rodeo events are often held, present a unique challenge because administration of treatment is often delayed by transport to the treating facility. Four injured bull riders in our study required the assistance of retrieval teams (10%), and two people needed an urgent transfer to a tertiary centre for specialist review (5%).

In most sports, conditioning and experience would normally help decrease the likelihood of injury. This has not been shown to be the case with bull riders.¹²⁻¹⁴ One paper

showed that an experienced rider is even more susceptible to injury than a novice.¹⁴ However, the most experienced competitors also usually ride the most aggressive bulls, whereas in amateur rodeos the bulls are allocated to riders randomly and not according to the length of riding experience. An alternative interpretation of this finding is that the unpredictability of the sport is such that even the most seasoned and physically fit competitors cannot predict the behaviour of the bull and prevent injury.

It is believed that the true incidence of bull riding injury is under-reported.¹⁶

Conclusion

The majority of rodeo and bull-riding research has been undertaken in North America and Canada. To date, we are unaware of any research that has been carried out regarding bull-riding injuries and admission to hospital in Australia. This study emphasises the observation that bull riding is a dangerous sport where a small proportion of participants can suffer life-threatening injuries requiring immediate medical attention. One of the most noteworthy findings of this study is that the most serious injuries were due to being kicked or trampled by the bull, which has not been previously highlighted. The reluctance of cowboys to wear protective equipment,¹⁷ combined with the regulating bodies not enforcing use of helmets, can have serious consequences, particularly in the rural rodeos, where transportation to the medical facility is often delayed.

Our research suggests that any rider kicked or trampled in the chest or abdomen, and riders with open wounds should be transported to a hospital for evaluation. Other injuries can be treated locally or with a specialist review as an outpatient. Australia has seen advancement in its ability to give medical assessment and advice through the use of electronic communication and teleconferencing systems for regional and remote areas. Utilising and improving these systems could prove useful in these settings, assisting the assessment process and enhancing optimal patient care.

Head injuries were common but none in our study ended in permanent injury or death. However, riders who sustain trauma to the head should be assessed for the need for computer tomography and follow standard head injury protocol. All of the riders with a head injury were managed at Rockhampton Hospital due to the availability of medical imaging.

Protective equipment for limbs could be trialled for efficacy in their ability to reduce the incidence of limb injury. To date there are only a limited number of products specifically



designed for bull riders to wear that assist in the protection of limbs such as knee guards and elbow pads. However, according to an informal survey of the cowboys, there is a resistance for many riders to wear extra protective wear. Further education in injury prevention may benefit riders as well as further research into hand release systems to reduce the risk of the rider being 'hung up'.

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PEER REVIEW

Not commissioned. Externally peer reviewed

CONFLICTS OF INTEREST

We the authors declare that we have no competing interests when conducting this research.

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ETHICS COMMITTEE APPROVAL

The research was approved by the Central Queensland Human Research Ethics Committee (ref: HREC 11/QCQ/34).