

Rodeo Trauma: Outcome Data from 10 Years of Injuries

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ABSTRACT

Introduction. There are few data addressing rodeo injury outcomes, though injury incidence has been well described. The purpose of this study was to describe rodeo-related injury patterns and outcomes.

Methods. A 10-year retrospective case series was performed of patients injured in rodeo events and who were treated at an ACS-verified level I trauma center. Data regarding demographics, injury characteristics, and outcomes were summarized.

Results. Seventy patients were identified. Half were injured by direct contact with rodeo stock and 34 by falls. Head injuries were most common, occurring in 38 (54.3%). Twenty injuries (28.6%) required surgery. Sixty-nine patients (98.6%) were discharged to home. There was one death.

Conclusions. Head injuries were the most common injury among this cohort. Apart from one fatality, immediate outcomes after injury were good, with most patients dismissed home. Improved data collection at the time of admission may help to evaluate the success of current safety equipment use. *Kans J Med* 2022;15:208-211

INTRODUCTION

The sport of rodeo has evolved from the specialized skill set that vaqueros and cowboys developed while working cattle in the late 1800s. Many rodeos are sanctioned by organizations such as the Professional Rodeo Cowboys Association and National Intercollegiate Rodeo Association (NIRA). The NIRA has guidelines related to the use of protective equipment.¹ Professional events include timed calf roping, team roping, and barrel racing. Rough stock events, which typically are associated with more injuries, include bull riding, steer wrestling, saddle bronc riding, and bareback bronc riding.

Given the dangerous nature of rodeo events and the proximity of the athletes to the animals with which they interact, it is not surprising that competitors often are injured severely from the tremendous force exerted by the massive livestock. Serious head injuries have been shown to occur in rodeo athletes at a rate of up to 15 per 1,000 rides.² Other athletes, such as professional football players, suffer serious head injuries at a rate of 5.8 per 100,000 players. In addition, a study by Savage, et al.³ demonstrated that the average ground reaction force produced by the hind hooves of a large bull is 106.3 kN. In comparison, the force

produced by an Olympic boxer delivering a straight punch is 3.4 kN.⁴

Independent of the rodeo event type (contact or non-contact), the potential for injury requiring medical intervention is high for rodeo athletes. Meyers and Laurent⁵ found bull riding was responsible for the greatest proportion of rodeo injuries, accounting for 28 - 50% of all rodeo-related injuries. Subsequent injury rates included: saddle bronc and bareback riding events (20 - 23%), calf roping (3 - 12%), steer wrestling (8%), team roping (1 - 4%), and barrel racing (0 - 3%).

Rodeo injuries presenting as traumas tended to include the most severe. However, decisions by injured rodeo athletes to seek medical treatment often were influenced adversely by stoicism, perceptions of peer pressure, and a tradition of machismo or the desire to continue participating.⁵ To improve outcomes among this reticent group of patients, injuries often were triaged at the rodeo, allowing many to be managed on an outpatient or non-emergent basis. The availability of arena-side medical attention has improved health care access at the professional level where incidence rates of 1.47 to 1.66 per 100 competitive exposures have been demonstrated.^{6,7} When looking only at the bull riding event, Butterwick et al.⁶ found an injury incidence of 3.22 injuries per 100 competitive exposures. Injury rates per 100 competitor exposures for other events included: 2.45 for bareback riding, 1.75 for saddle bronc riding, 0.92 for steer wrestling, 0.18 for calf roping, and 0.15 for ladies' barrel racing.

Stigma regarding style and tradition may affect the usage rates of protective gear designed to prevent or minimize the severity of injury including helmets and vests.⁵ Research to improve preventative equipment design has been focused on advancements in function and reliability with a focus on maximizing the biomechanical needs of these athletes in a manner which does not jeopardize the rodeo tradition.

Despite the availability of data related to rodeo injury, there was a paucity of literature which addressed injury outcomes. The purpose of the presented study was to conduct a 10-year retrospective review of rodeo-related injuries and outcomes of patients admitted to a Level I trauma center.

METHODS

A retrospective case series was conducted of all patients who sustained injuries from participation in rodeo-related events. Patients were treated at an American College of Surgeon-verified level I trauma center over a 10-year period between January 1, 2000 and December 31, 2009. Potentially eligible patients were identified through query of the trauma registry and a review of the medical records. Data collected included: patient demographics (e.g., age, gender), trauma activation level, mechanism of injury (i.e., competitor came into contact with rodeo stock or arena infrastructure, competitor fell from animal), type of rodeo event if available, type of protective equipment worn (usage included in the history and physical), injury type, Injury Severity Score (ISS), need for operative or procedural intervention, elapsed time from injury to presentation, radiological results, level of care required (i.e., intensive care unit or nursing unit), length of stay, complications, use of alcohol or drugs, disposition (i.e., home, rehabilitation, skilled nursing facility), and mortality.

Data were collected, organized, and summarized using SPSS release 19.0 (IBM® Corp, Somers, New York). This study was approved for

implementation by the Institutional Review Board of Via Christi Hospitals Wichita, Inc, Wichita, KS.

RESULTS

Seventy patients injured while participating in rodeo events were evaluated and treated at the institution as a trauma team activation. Patient demographics, injury mechanism, injury severity, and trauma activation data are shown in Table 1. The majority of these patients were male (77.1%) with an average age of 29.8 years and mean ISS of 8.0. One-half were injured by direct contact with rodeo stock (i.e., collision with an animal, being stepped on, gored). Nearly one-half (48.6%) were injured by falls from animals. Most were evaluated as level II trauma activations (84.3%).

Table 1. Demographics, mechanism of injury, injury severity, and hospital stay information for patients injured while participating in rodeo events.

Parameter	Number (%)
Number of patients	70 (100%)
Age (years)*	29.8 ± 15.8 (5 - 75)
Male	54 (77.1%)
Mechanism of injury	
Contact with rodeo stock (i.e., collision, rolled on, gored)	35 (50.0%)
Falls from animals	34 (48.6%)
Struck by gate	1 (1.4%)
Admission level	
Level I	5 (7.1%)
Level II	59 (84.3%)
Consult, or non-trauma service	6 (8.6%)
Injury Severity Score (ISS)**	7.0 (4 - 10)

*Mean ± SD (range); **Median (IQR).

Classification of injuries by location is presented in Table 2. Head injuries were most common, occurring in 38 patients (54.3%), 10 (26.3%) of whom sustained intracranial hemorrhage. Thoracic injuries were the next most common (n = 11, 15.7%), followed by extremity fractures (22.9%). Upper and lower extremity fractures occurred in seven (10.0%) and nine patients (12.9%), respectively. Twenty injuries (28.6%) required surgical intervention and included four for head, two for thoracolumbar spine, one for cervical spine, one for abdominal, three for upper extremity, and nine for lower extremity. There were 11 non-surgical thoracic injuries (eight patients with rib fractures, six with pneumothorax (five treated with thoracostomy tube), two with clavicular fractures, and two with pulmonary contusions).

There were three pelvic fractures that were non-surgical, and three intraabdominal injuries. A splenic laceration and a liver laceration were managed conservatively, while a pancreatic injury required distal pancreatectomy. The patient with the pancreatic injury was managed initially at an outside facility where a computed tomography (CT) scan done at the time of admission failed to demonstrate the pancreatic injury. A repeat CT scan done 72 hours after injury demonstrated pancreatic transection and prompted transfer to the trauma center. Distal pancreatectomy was performed with temporary abdominal closure. He was closed the following day following a second-look

Table 2. Injury characteristics and patterns for patients injured while participating in rodeo events.

Body Region	Number of Patients with Injuries (%)	Number of Patients Requiring Surgery (%)
Head	38 (54.3%)	4 (5.7%)
Spine	7 (10.0%)	3 (4.3%)
Thoracic	11 (15.7%)	0 (0.0%)
Abdominal	3 (4.3%)	1 (1.4%)
Pelvic	3 (4.3%)	0 (0.0%)
Extremities (upper)	7 (10.0%)	3 (4.3%)
Extremities (lower)	9 (12.9%)	9 (12.9%)

laparotomy. The patient was doing well at clinical follow-up.

Data regarding the use of protective equipment were lacking in all but nine patients. Of these, seven wore protective equipment. Two wore a helmet, two a helmet with mask, one a helmet and mouthguard, one a helmet and a vest, and one wore a vest only. No information was available for the other 61 patients.

Abuse of alcohol or drugs did not appear to play a large role in these injuries. A blood alcohol level was performed on 11 of the 70 patients (15.7%). Six of the 11 tested positive for alcohol, but only three tested above the legal driving limit for the state of Kansas (80 mg/dL). The mean blood alcohol level for these 11 patients was 60 ± 90.4 mg/dL (range = 0 to 276 mg/dL). Ten patients (14.3%) underwent drug toxicology screening. Five tested negative. Two tested positive for opiates but already had been given opiates by health care personnel prior to their test. One tested positive for opiates, benzodiazepines, and barbiturates, though this patient had been administered opiates and benzodiazepines by first responders. Two tested positive for benzodiazepines with no record of administration by health care personnel.

Data regarding patient hospitalization and disposition are detailed in Table 3. Nearly one-quarter of patients (22.9%) required admission to the intensive care unit with an average length of stay of 1.9 days. Three patients required mechanical ventilation. The mean hospital length of stay was 2.0 days, but the majority (n = 40, 57.1%) had a hospital length of stay of one day. All but one patient sustained non-fatal injuries. Each was discharged to home, with none requiring inpatient rehabilitation or long-term care. There was one death (1.4%); the patient who died was thrown from a horse and the horse rolled over his torso and head, crushing his skull. There was no documentation of protective equipment use. He suffered a severe brain injury as well as numerous facial fractures. The patient succumbed to his injuries approximately 12 hours after admission.

Table 3. Hospitalization and discharge data for patients injured while participating in rodeo events.

Parameter	Number (%)
Number of patients	70 (100%)
Intensive care unit admission	16 (22.9%)
Intensive care unit length of stay (d)	1.9 ± 1.1 (1 - 4)*
Required mechanical ventilation	3 (4.3%)
Hospital length of stay (d)	2.0 ± 1.7 (1 - 11)*
Disposition	
Home	69 (98.6%)
Death	1 (1.4%)

*Mean ± SD (range)

DISCUSSION

This study examined injury patterns and outcomes of rodeo participants treated at a level I trauma center and represented a cross-section of the severely injured patients initially evaluated by arena-side providers then transferred to the medical center for definitive care. Injury patterns have been described by several investigators who collected information while providing arena-side medical care for rodeo participants.^{5,6,8-10} Contusions, strains, and concussions were the most common injuries described previously (42%, 16%, and 11%, respectively); for roughstock events, injury to exposure potential has been demonstrated to be as high as 6:1.¹⁰ Additionally, craniofacial trauma for bull riding injuries ranging from low grade concussions to head injuries and neck injuries represented 0.087 per 100 of injuries, while concussions represented 0.34 per 100 injuries.¹¹ These studies afforded an excellent understanding of the breadth and severity of the injuries sustained during rodeos, but outcome data regarding these injuries were not available.

Head injuries were the most common injury in this study, where over half of the patients sustained a traumatic brain injury. Incidence of head injury, which included both concussion, as well as traumatic brain injury, was higher than previous reports with incidence of cranial trauma of 11 - 14%.⁵ The higher head injury reported in the current study may be a result of only receiving the more severely injured riders being transported to our level I trauma center. Other specific injuries typical among this population, such as digit amputation, especially thumb amputations, were not prevalent in our population.¹² In addition, although tendon and ligamentous injuries occurred frequently, the current study demonstrated a single patient with ligamentous knee injury that required surgery. Though more severely injured, our patients achieved excellent outcomes, with none requiring inpatient rehabilitation, and included only one fatality. Aside from the lack of contusions and sprains seen in other studies, our distribution of injuries seemed consistent with previous studies of rodeo-related injuries.

Sanctioned rodeo events often require use of protective equipment for athletes,^{1,2} however, claims related to efficacy and lower injury incidence rates are largely unsupported in literature and remain

controversial. Information regarding the use of safety equipment or training among our population was missing for most of the patients. Efforts to reduce injury by wearing protective vests have been adopted by rodeo sanctioning organizations, though few data are available to prove they significantly reduce the incidence of catastrophic thoracic injury.¹³ Utilization of protective thoracic vests over the past 20 years was believed to have reduced the severity of compression thoracic injury by dispersing and absorbing the impact of a traumatic blow.¹⁴ This belief was based on anecdotal evidence, and did little to dispel the controversy surrounding whether vests provide adequate protection, since deaths still were reported when vests are used.¹³ There are no known manufacturing safety standards for vests or design improvements.

Protective helmets, on the other hand, have been shown to reduce the incidence of head injuries, lowering incidence of head injury from 1.54% per ride (11 head injuries per 713 rides) to 0.80% per ride (28 head injuries per 3,518 rides).¹⁵ Moreover, concussions and loss of consciousness occurred less frequently in those who wore helmets compared to those who did not (44% vs. 61% and 39% vs. 59%, respectively).¹⁶ The current study demonstrated 30 of 70 patients (42.9%) sustained a head injury over a 10 year time period. It is unknown how many of these patients were wearing protective head gear at the time of their injury. Although rodeo athletes have been slower to adopt the use of helmets, encouragingly their use has increased in recent years.¹⁶ Additionally, neck rolls, various orthotics, face masks, and conditioning programs have been suggested as potential methods to reduce injury.

Limitations. This study suffered for all the limitations inherent to any retrospective review. As all three types of sanctioned and non-sanctioned rodeo competitions (rodeo, ranch rodeo, and charreada) were common in Kansas, one aim of this study was to compare injury patterns between the three. However, this retrospective review failed to be able to identify the types of rodeos in which injured athletes had participated, therefore did not yield the capability to compare the three types of rodeo competitions. Additionally, information on use of protective gear was very limited. Another limitation was not having the data to capture an injury rate in relation to competitive exposures. This study also was limited to those who visited one specific hospital. Because of various reasons, such as patients going to a different hospital and the feeling of machismo, some injuries likely have been missed, leaving this study with a less than full picture of the scope of injuries that occur at the rodeo.

CONCLUSIONS

For athletes competing in rodeos, head injuries were the most common injury, followed by thoracic, then extremity injuries, a pattern which may be influenced by current recommendations regarding protective equipment use. Current standards for protective head and neck gear use seemed reasonable considering these data; however, information regarding protective gear was limited. With limited numbers, prospective studies with a focus toward safety equipment use are recommended to determine the effectiveness of this equipment if and when their use becomes more prevalent.

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