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Injury occurrences at a Mass Gathering Event

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Abstract

Objective: This study identifies injuries that arise at a public event in an environment where multiple industries, service providers and patrons are present simultaneously.
Method: A prospective survey method was used to collect data relating to injuries occurring at the event. The event was the Royal Adelaide Show, a 9-day agricultural and horticultural show hosted in a capital city in Australia during 2002. All patients who presented to St John Volunteers for treatment were the population for this study with the sample population being people who sustained an injury at the event.

Results: Crowd attendance over the nine days was 622,234. A total of 1028 patients presented for treatment with 265 (26%) being the result of injury. It was observed that minor wounds were the most common injury treated (18%), followed closely by lacerations (17%). The majority of injuries occurring at the event were minor in nature. There were 42 persons injured while working at the event. Of these, 9 (21%) required transfer to hospital by ambulance.

Conclusions: At the event studied, there were a number of injuries occurring that required treatment/management. On average, there was one worker transported to hospital by ambulance each day of the event. There may be a role for more formalised injury surveillance at mass gathering events to assess and monitor injury trends to both patrons and workers in this dynamic setting.

Introduction

Public health and safety is of prime concern for event organisers and emergency services involved in the preparation of major events where the public gathers. “Large public events are referred to as mass gatherings”.[1] St John Ambulance, South Australia Incorporated (St John) is the sole provider of first line health care at public events in South Australia and has extensive experience in providing a first aid service at both mass gathering and smaller events. A component of the role in the provision of first aid services is in preventative health care. A significant public event for St John is the Royal Adelaide Show, an annual 9-day agricultural and horticultural show. A post hoc review of casualty reports from the Royal Adelaide Show

during a seven-year period suggested that injured workers accounted for 2-3% of patient presentations to St John and no estimate of injured patrons was possible.

The present study was designed to review the incidence of injury occurring at the Royal Adelaide Show (RAS), as a component of the overall workload. It was planned to further document the nature of the injuries and, where possible, the etiology. The aim was to establish a detailed description of injuries occurring at this mass gathering event as a prelude to determining if there was a need for more formal injury surveillance to identify and potentially prevent injuries during the event. A component of the study was to specifically examine the incidence and nature of injuries to workers at the event, given the unique occurrence of multiple industries having activity in a unique environment for a brief period.

Background

There is an increasing body of literature relating to Mass Gathering Medicine. Mass gathering medicine,[2] as a specialty, has focused on the types of patient presentations that occur at public events, best clinical practice and the type of medical resources that should be provided. A number of literature reviews on mass gathering medicine have been undertaken.[2,3,4] Salient lessons have been learned from mass gatherings where significant problems have arisen including Bradford Stadium fire in 1985, Hillsborough Stadium crowd crush in 1989 and excessive heat at the 'Guns N' Roses' Victorian concert in 1993.[5] The goal of mass gathering medical care is described as the provision of onsite medical care in addition to preserving the normal ability of associated emergency services including ambulance services and emergency departments.[2] The definition of mass gatherings is widely discussed in the literature with measures including attendance greater than 1,000[3] and others citing more than 25,000.[1]

A number of factors have been identified that impact on the number of patient presentations[2, 6] but the significance of each factor varies. There is an emerging discussion on ways to measure workload and the subsequent evaluation of these impacting factors. Most commonly, usage rates are described including patient presentation rate and transport to hospital rate.[1,7,8] However, despite an increasing literature examining single events and similar events held in different environments, the measures used to assess workload have remained simplistic. There has been no previous attempt to separate out presentations occurring as a result of injury at an event versus presentations due to ill health. This differentiation carries important implications not just for service provision, but also for injury prevention and consideration of indemnity risk.

Injury monitoring at public events has traditionally consisted of industry specific reporting to WorkCover Corporation and worksite safety monitored by government regulators such as Workplace Services. The information that is available focuses on outcomes of the injury or causative factors e.g. injuries that resulted in presentations to the emergency department, admissions to hospital; workers compensation claims; or death.[9] Other injury surveillance data focuses on specific injury type (e.g. spinal injuries) or mechanisms of injury (e.g. traffic accidents, weapons or water hazards). There has been no system of monitoring all injuries that occur in community based settings where multiple industries are present. "Injury surveillance data provides an important framework for all our prevention activities and serves as the cornerstone for evaluating the impact of these efforts",[10] however there is limited information available on injury surveillance systems at mass gathering events.

There continues to be a need for more detailed analysis of patient presentation patterns at mass gatherings and the appropriate services to support the work. This project was designed to

explore in more detail the nature of patient presentations in particular those presenting for treatment for injuries that occurred on-site of a major event.

Method

The RAS is an agricultural and horticultural show combining sideshows, animal showcasing, product displays and food outlets. The average annual attendance figures for the nine days over the past seven years (1996-2002) have been 616,000 patrons with St John treating more than 1,000 patients annually during this period.[11] The event is hosted in a purpose built, expansive and bounded showground with a highly mobile crowd. The showground supports a mix of indoor and outdoor displays and commences at 9:00 am until 11:00 pm. St John has provided the medical service at the RAS for more than 100 years. Primarily a first aid service it revolves around a fixed medical centre staffed by a registered nurse and first responders, supported by numerous foot patrols, a secondary small first aid post and a centralized communications system. Patients may therefore present to the main medical centre, the first aid post, or to foot patrols. Minor ailments or injuries are generally handled directly with only more significant cases being sent to the main medical centre. Occasionally, more acute cases may be transferred to hospital via ambulance without attending the main medical centre.

Medical information on all patients presenting to St John at the event is routinely collected on a casualty report. This includes demographic details, primary diagnosis or main reason for presentation and treatment details. The sample group for the current study was all patients presenting as the result of an injury. The patients recruited to the study were those who had a primary problem related to an injury. Due to the minor (and relatively common) nature of blister and uncomplicated splinter injuries, and the minimal potential impact on injury compensation claims, these patients were not enrolled. They were, alternatively, classed as non-injuries.

Patients were assessed and treated as per usual St John guidelines, before being identified to a researcher for potential recruitment to the study. A researcher was stationed at the main medical centre for the purpose of collecting additional data from patients identified as having presented as the result of an injury. Information was collected prospectively to improve the quality of information collected. In addition to the information collected on the casualty report a specially designed data collection tool was completed detailing the nature of the injury, timing, location at the event and circumstances surrounding the injury. Where the patient was working at the event, additional employment details were collected, including past experience and duration and extent of training.

Relevant information collected on casualty reports, and the additional data recorded on the data collection tool were collated on an electronic database (Microsoft Excel 2000), which de-identified the patient's personal information. A statistician from Biometrics SA of the Adelaide University performed data analyses.

Ethical clearance was sought and approved by The Research Ethics Committee, St John Ambulance Australia. The submission covered mechanisms for confidentiality, protecting participants and management of the data.

Results

The number of patients that presented to St John for treatment, including visitors and people who were working in some capacity for the 2002 RAS event was 1028. These were then

separated into those who presented with an injury and those who presented as a result of a medical problem or illness. The demographic data regarding all patients treated and those treated as a result of injury are presented in Table 1.

Table 1: Demographics for patients treated at the 2002 Royal Adelaide Show.

	Treated n (%)	**Injured n (%)**
Number	1028 (100)	329 (32)
M:F	388:640	135:194
Mean Age	26 years (range 2month–86years)	26 years (range 2 years – 75years)
Worker	69 (7)	44 (13)
Transport to Hospital	48 (5)	16 (5)

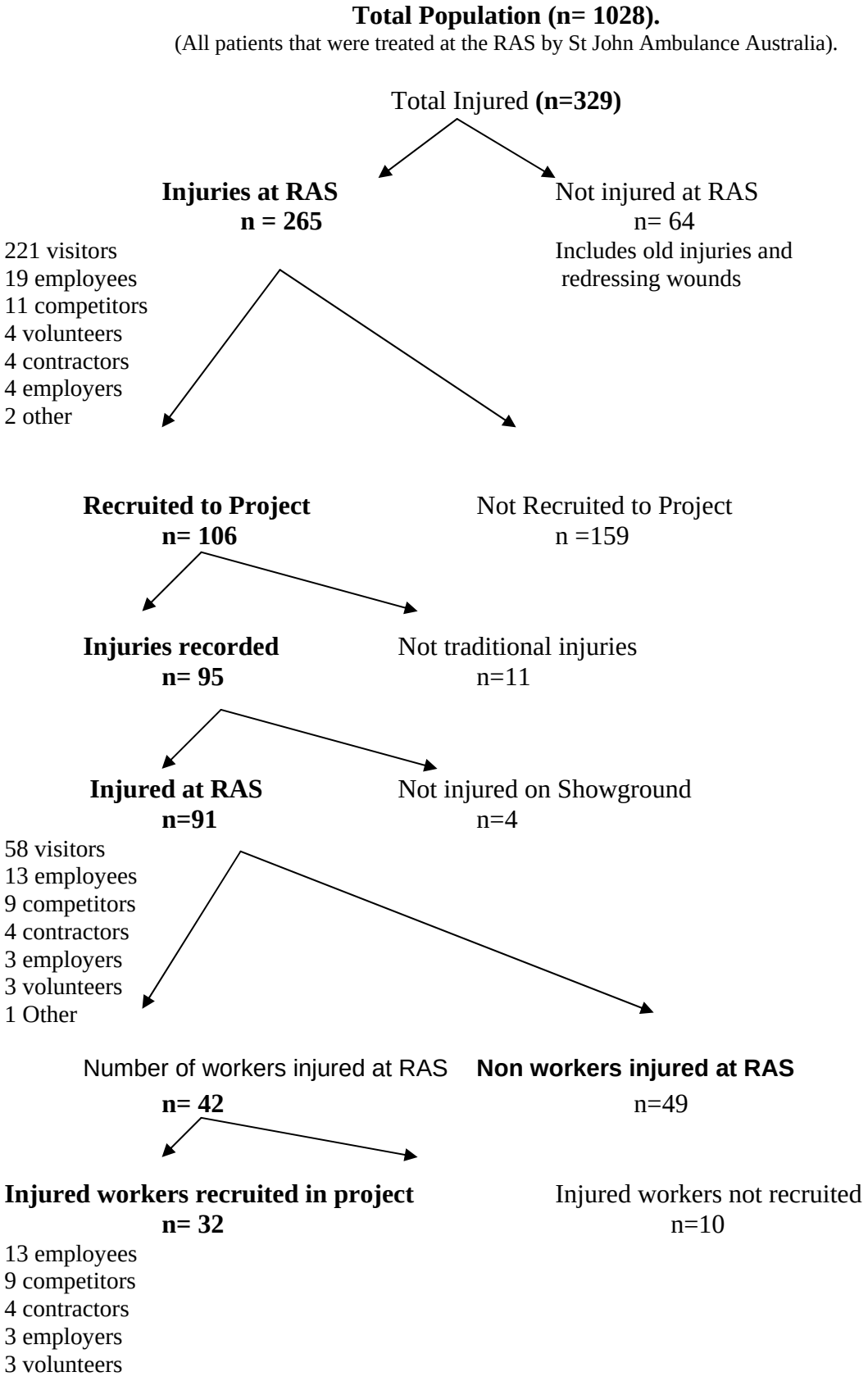
The total attendance at the event and the number of patients treated was comparable to average workloads in the past seven years, although there was an unexpected increase in the number of patients needing transport to hospital as presented in Table 2.

Table 2: Casualties treated and Ambulance transfers

Year	**Attendance**	**Casualties Treated**	**Ambulance Transfers**
1995	637996	1021	Not Available
1996	651733	1272	14
1997	608456	1030	16
1998	631947	1021	29
1999	623372	1192	28
2000	577341	867	23
2001	585559	1014	17
2002	622234	1028	48

From the total number of patients treated, 329 (32% of total population) presented as a result of an injury. Of these 265 (26% of total population) patients injured themselves at the event and 64 (6.2%) of patients were injured elsewhere. Figure 1 provides an illustrative view of the sample population and sub groups.

Figure 1: Injury at Royal Adelaide Show 2002 - Overview of data analysis.



Of the patients who were injured at the event (n=265), 40% (109) consented to provide more specific details about the presentation. The participation rate arose from the nature of the

presentations. At most times during the event there was only one person present to collect the data, while multiple presentations would occur within a short space of time. Secondly, patrons were often keen to return to the event and did not wish to participate. Thirdly, some patients with injuries on site were treated by mobile foot patrols away from the main medical post.

Primary Diagnosis

The primary diagnosis was recorded according to established criteria used by St John. The nature and number of patients are detailed in Table 3. Severity of injury is an ill-defined concept. St John uses two methods for recording patient presentations, a short generic notation documenting management of the patient (OB11) and a more detailed documentation that includes a record of vital signs, etc and acts as a form of referral to definitive care (OB12). In the present study, severity of injury was determined by the use of either OB11 or OB12 to document management of the patient by first aid personnel. There were 46% of injuries regarded as minor and were recorded on an OB11. Of the significant (OB12) injuries that occurred, 13 (5%) resulted in immediate transfer to hospital by ambulance.

Table 3: Nature and cause of injuries occurring on Showground

Cause of injury	Number of Patients (%)
Wound/Laceration injury	73 (27)
Fall	37 (14)
Ride/amusement related	32 (12)
Animal related injury	17 (6)
Eye	25 (9)
Sports related	7 (3)
Burn	16 (6)
Apparent Assault	3 (1)
Moving Vehicle	2 (1)
Other injury	18 (7)
Unknown	35 (13)

The location of the injury on the body was also recorded. Eye and hand injuries were the most common body site recorded. The mechanism of injury was documented in 230/265 (87%) of cases. Open wounds and lacerations were deemed to have occurred via a sharp instrument/object and the mechanism was not further defined in this study. This type of injury was the most common and accounted for 27% of all injury presentations.

Ride/amusement related injury included sprain and strains from sideshow rides and wounds from various games. Eye injuries included foreign bodies (n=13), ash from fireworks (n=6), chemical irritation (n=2) and unspecified irritation (n=4). Burn injuries were caused by hot fluids (n=6), friction (n=4), hot surfaces (n=3), or were related to cooking (n=2) and chemicals (n=1).

Although reliable information regarding crowd demographics is not available, we were interested to assess the proportion of injuries that occurred in persons working at the event and potentially, therefore, eligible to be captured by routine injury surveillance methods. As expected, visitors were the largest group of injured patients, representing 83% (n=221) of all injured persons treated; followed by employees (7.2%), competitors (4.2%), and equal numbers of volunteers, contractors and employers (1.5% each).

There were 42 patients injured at the Show, who were classified as workers including employees, employers, contractors, competitors and volunteers. The duties of the volunteers injured on the Showground were volunteer guides, and volunteer first aid providers. These were included in the worker category due to the requirements of the Occupational Health, Safety and Welfare Act of SA, 1986,[12] where the definition of employee includes volunteer workers.

There were 10 patients who were workers who were not enrolled in the study. These patients either presented to a mobile foot patrol for treatment or the data collector was not informed of the presentation at a first aid post. Of this group, 2 patients (chemical burn and multiple trauma) were transferred to hospital and this limited the opportunity to recruit them to the study. The other eight patients had minor injuries.
The 32 injured patients who were recruited to the study represented 3.1% of the total population treated by St John Ambulance volunteers. In this sub-group, lacerations were the most common injury (12 out of 32), followed by soft tissue damage (5), crush injuries (3), eye irritations (3) and other (9).

Work experience and the time the patient had been working at the RAS were also examined. It was found that most accidents occurred when beginning work at the RAS. Experience levels of the patients varied between none to 41 years experience with a mean of just over five years. Most injuries were detected within a range of 0-50 days experience with most workers exposed to training before the start of the event. Of those injured and working at the Show, more than half had previously worked at the RAS.

Discussion

Providers of medical services at mass gathering events have an important role in the identification and reporting of injuries that occur on the showground both from a medico legal and a risk management view point. Prior to this study there has been no attempt to quantify the number of injuries that occur on site at a mass gathering event.

This study provides a description of the types and causes of injuries that occur at a mass gathering event including workers who have been injured. Injuries occurring at the RAS represent 26% of the first aid workload for this event. This is a considerable component and higher than that anticipated at the outset of the project. This is partly the reason why only 42% of eligible patients were recruited to the study. The workload at the 2002 event was similar to previous years and occurred in the setting of a similar crowd attendance. The number of patients transported to hospital was substantially higher than in previous years. While this may have indicated an increase in the severity of injury occurring, it could equally indicate an alteration in the threshold for recommending hospital care. Given the current indemnity situation, the later explanation would appear more plausible. Nevertheless, it is noteworthy that as a work site with multiple industries, injuries at the RAS resulted in the transfer of injured workers to hospital, by ambulance, at an average rate of one case per day.

At the RAS a diverse array of injuries and illnesses are treated. Mean daily patient rates and annual crowd attendance figures in 2002 were similar to the previous seven years. As predicted, minor wounds resulted in the highest injury type, followed by lacerations, eye irritations, abrasions, sprains and strains. Strains and sprains have been the highest recorded injury/disease reported in workplace settings, [13,14] followed by bruise/contusion and cuts/lacerations.[13] Eye irritations followed by lacerations to the hand were the most common injury. Causes of lacerations were varied. However most were attributed to contact with sharp objects (knife, metal edges) and being hit by a moving object (machinery, vehicles, and

displays). There were a number of sprains and strains resulting from falls from uneven surfaces (pavement, kerbs or climbing up stairs). The large injury presentation caused by falls is consistent with other models reporting falls, [14] accounting for 28% injured patients requiring admission to hospital. Whilst other data on workplace injury report the trunk as being the most commonly injured body area,[13,14] this was not the case for the RAS. Excluding the head, (influenced by the number of headaches treated) hands and then joints were injured most frequently, with shoulder and upper limb injuries most commonly resulting in hospital admission. This has also been reported previously.[15]

Injuries involving cattle and farm animals occurred frequently and included soft tissue injury, fractures, bruising/contusion and sprains/strains. This may be exacerbated at the Showground due to the crowds, confined spaces and other design issues. A theme in the descriptions of how injuries occurred suggested that some of these injuries occurred as a result of restraining animals and pulling them towards their destinations. This has not been quantified. The amusement rides and amusement activities also were reoccurring causes of injuries.

Mass gatherings involve multiple employers and service providers working together for a brief period in an unfamiliar environment. Medical service providers at mass gatherings have an important role in the identification of injured patrons/workers at public events. This goes hand in hand with reporting injuries to those responsible for the event as well as government regulatory authorities, for example Workplace Services in South Australia, to initiate hazard rectification. Traditional methods for identifying injured workers and patrons may fail to capture instances of workplace injury and, due to the often-diverse nature of industries represented may not be able to be quantified or analysed.

Limitation

With only one data collection researcher present at the event, a number of potential subjects were not recruited to the study. Additionally, given the size of the event and opportunity for patients to present to foot patrols and a first aid post, a significant number of recruitment opportunities were missed. Nevertheless, by virtue of this mechanism, the majority of presentations not recruited were minor (OB11) in nature. It is likely that there are a proportion of persons who become sick or injured whilst at the RAS and do not present to St John first responders. Such instances may occur due to relatively minor occurrences or due to a decision to leave the event and obtain help externally. As such, our figures are likely to under-estimate the true incidence of injury. Furthermore, because workers are required to be present at the event and may not have the freedom to leave, they are more likely to present to St John as the only treatment option available. As such, workers may be artificially over-represented in our figures.

Cross analysis of predisposing factors such as age, weather, time of day was not undertaken nor was an estimate of the number of workers present at the event available. This would have been a useful statistic for comparing the injury rate of workers versus the injury rate for the patrons. The mechanism used to distinguish minor injuries from more significant ones was crude. Nevertheless, similar simplistic descriptors are often used in such settings, eg time of treatment.[8]

Conclusion

During the 2002 Royal Adelaide Show, a comprehensive description of patient presentation for injuries was undertaken. From a total of 1028 patients treated, there were 265 who presented for

injuries that occurred on the Showground with 42 of these affecting persons working at the event. Of these workers, nine were subsequently transported to hospital by ambulance for further treatment/assessment. This study has demonstrated there is an injury burden arising from mass gathering events that have an impact on the medical service both pre-hospital and to a lesser degree at hospitals. This suggests that there is a role for strategies to be put in place to reduce injuries that occur at mass gatherings. Approaches that may be useful include management of risk and public education. Given that this mass gathering event spans a nine-day period, ongoing 'live' surveillance of injury type, causes and location may assist in identifying and modifying at-risk environments. Providers of medical services at mass gatherings may need to take a lead in ensuring coordination of service providers to ensure injury prevention is an important part of event planning.

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