

Differences in Medical Care Usage between Two Mass-Gathering Sporting Events

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Abbreviations:

MUR: medical usage rate
PPTT: patients per 10,000
PRF: patient report form

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Abstract

Background: Event planning for mass gatherings involves the utilization of methods that prospectively can predict medical resource use. However, there is growing recognition that historical data for a specific event can help to accurately forecast medical requirements. This study was designed to investigate the differences in medical usage rates between two popular mass-gathering sports events in the UK: rugby matches and horse races.

Methods: A retrospective study of all attendee consultations with the on-site medical teams at the Leicester Tigers Rugby Football Club and the Leicester Racecourse from September 2008 through August 2009 was undertaken. Patient demographics, medical usage rates, level of care, as well as professional input and the effects of alcohol use were recorded.

Results: Medical usage rates were higher at the Leicester Racecourse ($P < .01$), although the demographics of the patients were similar and included 24% children and 16% staff. There was no difference in level of care required between the two venues with the majority of cases being minor, although a higher proportion of casualties at the Leicester Tigers event were seen by a health care professional compared with the Leicester Racecourse ($P < .001$). Alcohol was a contributing factor in only 5% of consultations.

Conclusions: These two major sporting venues had similar attendance requirements for medical treatment that are comparable to other mass-gathering sports events. High levels of staff and pediatric presentations may have an impact on human resource planning for events on a larger scale, and the separation of treatment areas may help to minimize the number of unnecessary or opportunistic reviews by the on-site health care professionals.

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Introduction

During the past 40 years, there have been three disasters involving crowds at sporting events in the United Kingdom (UK); all have occurred at British football grounds. Sixty-six fatalities occurred at an event in Ibrox Park in 1971, 40 fatalities occurred at an event at Bradford City in 1985, and most recently, 95 fatalities occurred in the Hillsborough Stadium disaster in 1989. As a result of these tragic events and the subsequent inquiries, substantial changes have been made in the requirements for the provision of safety, including medical coverage at football grounds.¹⁻³ A core recommendation of the Gibson Report³ concerned the provision of suitably trained and equipped doctors. Although there has been some concern that the implementation of these recommendations had been relatively slow,⁴ there now is evidence that a number of sporting organizations, in addition to the Football Association, have taken positive steps to ensure that adequate skills and resources are available at mass-gathering events in the UK.⁵⁻⁸

Planning for mass gatherings involves the utilization of methods that prospectively can predict medical resource use.⁹ However, when predicting such medical resource use for mass gatherings in the UK, the majority of studies have focused on single events with little information about potential patient demographics or volumes.^{5,6} There are several predictive models to estimate medical needs that take into account important factors such as weather, event type and duration, location and boundaries, crowd density, and the availability of drugs and alcohol,^{10,11} but there is a growing recognition that good historical data for a specific event or type of event can help to forecast medical requirements.^{10,12}

In the UK and abroad, the majority of literature on the resource requirements to manage adequately the number and variety of potential patient presentations at

mass-gathering events has focused on football matches. The total number of spectators for the English Premier League matches in the 2009/2010 season was nearly 13 million.¹³ After football, horse racing is the second most popular sporting event in the UK, with 5.7 million attendances across the 61 racecourse venues.¹⁴ Premiership rugby events follow with total attendances of 1.9 million during the 2009/2010 season.¹⁵ There is evidence that the characteristics of crowds at football matches are different from those at either horse races or rugby matches,^{16,17} and therefore, the nature of medical usage also is likely to be different.

This study was designed to investigate and gain insight into the nature of crowd attendances at two popular mass-gathering, sports events in the UK.

Methods

Standardized patient report forms (PRFs) were used to document every consultation with the on-site medical team at two mass-gathering sports venues—the Leicester Tigers Rugby Football Club and the Leicester Racecourse—over a 12-month period from September 2008 through August 2009. Anonymous data were collated by medical personnel directly involved in patient care with the express permission of the local Clinical Governance Officer for St. John Ambulance.

Data recorded on the PRF included: event details, patient demographics (including general practitioner's details), presenting complaint, medical history, primary survey, examination findings, recorded observations, treatment administered (including any medication prescribed), disposition of patient upon release from on-site medical care, and a section for additional notes. In addition to the clinical information on the PRF, information also was recorded relating to alcohol intake prior to seeking medical care. No formal laboratory measurements were undertaken; information was obtained through patient and/or bystander interviews during the history as well as physical signs of alcohol intoxication during the examination. An assessment of whether alcohol contributed to the presentation was made and recorded at the time of consultation by the leading health care provider.

The PRFs were completed at the time of consultation by a first aid assistant, nurse, paramedic, or doctor for all members of the public who were treated by any member of the on-site medical team. Consultations as a result of injuries sustained to sportsmen and sportswomen (e.g., jockeys and rugby players) were not included in the final analysis. In the event that a member of the public was transported directly to hospital without being assessed in the on-site medical facilities, a PRF was completed in addition to the records required by the National Health Service (NHS) ambulance service to ensure completeness of the database.

In order to maintain consistency with other published literature, medical usage rate (MUR) was reported as a rate in patients per 10,000 (PPTT), which was calculated by dividing the number of individuals seeking medical care by the total attendance for that event and multiplying by 10,000.^{18,19}

Level of care was determined using the treatment categories used by Milsten et al.¹⁹ (1) minor care (<5 minutes as well as those presenting only for medication or bandage); (2) basic care (5–15 minutes); and (3) advanced care (>15 minutes). If complete first-aid arrival and departure times were not recorded, the treatment category was assigned based on whether the patient was discharged back to the event (minor); discharged back to the event with follow-up or discharged home (basic); or transported to hospital (advanced).

Statistical analyses were performed and graphs were produced using GraphPad Prism Software version 5.0c (GraphPad Software Inc., La Jolla, California USA). Categorical variables between the two groups were analyzed using Pearson's Chi-squared or Fisher's Exact Tests, and descriptive statistics have been utilized where appropriate. Differences in presentations between the two events were investigated using two-way analysis of variance (ANOVA); a *P* value of <.05 was considered to be statistically significant.

Results

Crowd and Casualty Attendances

During the 12-month period from September 2008 through August 2009, 15 first team premierships games were played at the Leicester Tigers' ground. The total number of crowd attendances during that time was 252,421 with a mean of 16,828 per match (range 12,132–17,498). Over this period, 47 casualties were treated by the on-site medical team, with a mean of 3.1 casualties per match (range 0–6). In comparison, during the same 12-month period, 27 racing fixtures (collections of races conducted on the same day or night) were held at the Leicester Racecourse. The total number of crowd attendances during that time was 33,962 with a mean of 1,258 per fixture (range 444–3,296). A total of 16 casualties were treated on-site, a mean of 0.6 casualties per fixture (range 0–5). Despite the high number of casualties per fixture at the rugby ground, Leicester Tigers had a casualty-to-spectator ratio of 1:5,371 vs. 1:2,122 at the Leicester Racecourse. This led to a significantly lower MUR at the Leicester Tigers compared to that at the Leicester Racecourse (1.9 vs. 4.7 PPTT respectively (*P* < .01)). This difference remained after adjustment for event duration: both venues opened their gates two hours ahead of the event with an average rugby fixture lasting 95 minutes and an average race event lasting 150 minutes.

Casualty Demographics, Level of Care, and Effects of Alcohol

The demographics of the casualties for each venue are listed in Table 1. There was no statistically significant difference in casualty age or gender for each venue, with similar numbers of pediatric patients at both. There were no statistically significant differences in the number of staff seen by a doctor at each venue, or in the number of patients with injuries or ailments unrelated to the event that they were attending.

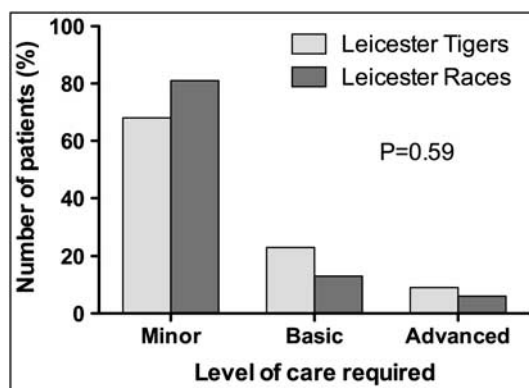
The levels of care provided to the casualties at the two venues are graphed in Figure 1. At the Leicester Tigers event, the majority (68%, *n* = 32) of casualties were categorized as "minor" and the patients were discharged back to the event. Eleven (23%) were categorized as "basic" including 2% (*n* = 1) who returned for a planned review requested by the on-site doctor; 9% (*n* = 3) were advised to seek further medical aid should the need arise; and 15% (*n* = 7) were advised to go home directly from the event with or without appropriate follow-up. Four casualties (9%) were categorized as "advanced" and were transported directly to hospital via the on-site paramedic ambulances.

Similarly, at the Leicester Racecourse, the majority (94%, *n* = 13) of casualties were minor and discharged back to the event, with 13% of patients (*n* = 2) either requiring follow-up (*n* = 1), or discharged home (*n* = 1). One patient (6%) was transported to the local Accident and Emergency Department for further assessment. Although there was a statistically significant difference between the level of care required at each location (*P* < .0001), with the majority of those treated only needing minor interventions, there was no statistically significant difference in the levels of care needed between the rugby and racecourse events (*P* = .59).

	Leicester Tigers mean (SD) or n (%)	Leicester Racecourse mean (SD) or n (%)	P Value
Age (years)	36.1 (21.5)	39.9 (27.8)	.58
Male gender percent (n)	22 (47)	9 (56)	.57
Patient group			
Adult spectator	36 (77)	12 (75)	.89
Pediatrics (under 16 years)	11 (23)	4 (25)	.92
Staff	9 (19)	2 (13)	.71
Opportunistic (non-emergent)	8 (17)	1 (6)	.43

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Table 1. Demographic Information for Patients Seen at both the Leicester Tigers and the Leicester Racecourse



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Figure 1. Percentages of Patients Requiring Minor, Basic, or Advanced Care at Both the Leicester Tigers and the Leicester Racecourse

A summary of injury and illness profiles that presented at each venue is provided in Table 2. Conditions that were chronic or unrelated to the Leicester Tigers event consisted of: one flu-like illness; two gastrointestinal complaints; two headaches; one ongoing dizziness; one chronic conjunctivitis; one soft-tissue injury; and a forgotten inhaler. At the Leicester Racecourse, the conditions consisted of a soft-tissue injury sustained the previous day. There was a statistically significant difference in variation between the types of presentations that occurred at the two different types of events ($P = .02$). However, if presentations unrelated to the events were excluded from the analysis (Table 2), this variation no longer was statistically significant ($P = .1$).

Only 4% ($n = 2$) of presentations at the Leicester Tigers and 6% ($n = 1$) of the presentations at the Leicester Racecourse were recorded as having alcohol as a definite contributing factor to the presenting complaint: a person experiencing a seizure that necessitated transport to hospital; and two persons with falls, one of whom required on-site suturing. There was no statistically significant difference in the numbers of presentations linked to alcohol between the two venues ($P = .75$).

Use of Skills Within the On-Site Medical Teams

Three-quarters of the casualties at the Leicester Racecourse event were seen by one member of the on-site medical team (75%, $n = 12$) compared to 51% ($n = 24$) at the Leicester Tigers

event, although this did not reach statistical significance ($P = .09$). Therefore, the remaining casualties were seen by two or more members of the medical team. Members of the voluntary ambulance service were involved in casualty care in the majority of cases (76%, $n = 36$, and 87.5%, $n = 14$ at the Leicester Tigers and Racecourse events respectively; $P = .87$). At the Leicester Tigers event, 17% ($n = 8$) of the patients were seen by volunteers only, 23% ($n = 11$) by health care professionals (doctor, nurse, or paramedic) only, and 60% ($n = 28$) were attended to by both. At the Leicester Racecourse event, 63% ($n = 10$) of patients were seen by volunteers only, 13% ($n = 2$) by health care professionals only, and the remaining 24% ($n = 4$) were attended to by both. Health care professionals were involved in the assessment or treatment of a statistically significant higher number of casualties at the Leicester Tigers event compared to the Leicester Racecourse event (83%, $n = 39$ vs. 37.5%, $n = 6$; $P < .001$). Significantly higher numbers of patients at the Leicester Tigers event than the Leicester Racecourse event were seen by the on-site nurse (59%, $n = 27$ vs. 13%, $n = 2$; $P < .002$) or doctor (47%, $n = 22$ vs. 19%, $n = 3$; $P < .05$). This is summarized in Figure 2.

Discussion

To the authors' knowledge, this is the first paper that has examined the differences between attendance behavior of crowds at two separate mass-gathering events (excluding football) within the UK.

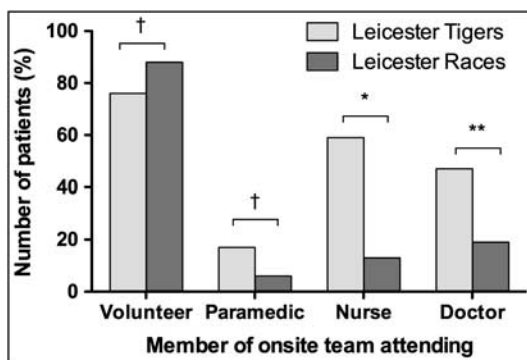
The Leicester Tigers events had a significantly lower medical usage rate (MUR) than did the Leicester Racecourse events, even after adjustment for the duration of each event. Intuitively it might be expected that the higher crowd density at the Leicester Tigers Rugby Football Club would lead to increased medical needs at that venue. However, there is evidence that absolute number of patient presentations tends to decrease with increased numbers of public in attendance.²⁰ Thus, the findings showing higher MURs for the less-well-attended Leicester Racecourse events are in keeping with the current literature. The MURs for sports events, in general, vary significantly. Data from the United States have estimated medical usage rates for college football and professional baseball at 3 and 4 PPTT, respectively,^{18,19} and a study of Scottish Premier League football matches indicate medical usage rates of 0.95 PPTT.⁵ Data from the current study are similar to that of other studies.

There was no difference in either the type of patients or the level of care required between the two events; however,

Presentation	Leicester Tigers		Leicester Racecourse	
	Patients n (%)	Patients related to event n (%)	Patients n (%)	Patients related to event n (%)
Anxiety	1 (2)	1 (100)	1 (6)	1 (100)
Burns/scalds	5 (11)	5 (100)	2 (12)	2 (100)
Ear, nose & throat	4 (9)	4 (100)	2 (12)	2 (100)
Flu symptoms	1 (2)	0 (0)	–	–
Gastrointestinal	2 (4)	0 (0)	–	–
Headache	2 (4)	0 (0)	–	–
Laceration	8 (17)	8 (100)	5 (31)	5 (100)
Ophthalmological	3 (6)	2 (67)	2 (12)	2 (100)
Respiratory	1 (2)	0 (0)	–	–
Seizure	1 (2)	1 (100)	–	–
Soft tissue injury/bruising	10 (21)	9 (90)	2 (12)	1 (50)
Sting/rash	2 (4)	2 (100)	1 (6)	1 (100)
Syncope	7 (15)	6 (86)	1 (6)	1 (100)
Total patients	47	38	16	15

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Table 2. Detailed Summary of Injury and Illness Profiles at Each Event



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Figure 2. Percentages of Patients Seen by the Different Members of the On-Site Medical Team at Both the Leicester Tigers and the Leicester Racecourse †*P* = not significant, **P* < .002, ***P* < .05

approximately one-quarter of those requiring medical attention were children, and almost one-fifth were employed staff members. It has been estimated that respiratory illnesses, minor injuries (cuts, abrasions, and strains), heat-related injuries, and minor problems (headache, blisters, sunburn) could comprise up to 75% of patient presentations at the London Olympic Games in 2012,²¹ this is in keeping with data from this study regarding the presentations treated at the two events. There will be nearly 11 million tickets available for the three weeks of the Olympic and Paralympic games in 2012. Based on estimates of an average 1%–2% of the attendees seeking medical assistance during that

period,¹⁰ the total number of people requiring care could be as high as 220,000. Putting this into context, Pennine Acute Hospitals NHS Trust, the busiest Emergency Department in England, saw just over 267,000 people over a period of 12 months between 2008 and 2009.²² In addition, taking into account data from this study showing that a significant proportion of event staff also seek medical advice, this number may be even higher.

The observation that a quarter of those seeking care were children is similar to those encountered within the hospital environment, where the average number of pediatric consultations in Accident and Emergency is also about 25%.²³ At events where a mix of family members is expected, and the crowd size is anticipated to be large, such as the London 2012 Olympics, there is an argument that the attendance of medical staff with training and experience in caring for children would be appropriate.

Despite the fact that alcohol was freely available at both locations, only a small proportion of the presentations was linked to alcohol intake, with no difference noted between the two sports venues. Alcohol and the incidence of alcohol-related presentations at sporting events have been the subjects of both media attention and research. Alcohol has been linked with aggression, and could play a role in violent behavior at football matches in comparison to rugby matches, where this does not seem to be the case.¹⁷ Despite its lack of availability within the grounds and the fact that intoxicated members of the public are not admitted, alcohol contributed in some way to 24.4% of the casualties seen at Glasgow Celtic Football Club over a 12-month period, and had a substantial effect on the workload of the on-site medical team.⁵ A prospective study in the United States has shown that the level of alcohol use by patrons is higher than that

recorded in the first-aid stations where 41% of tested patrons at three major league baseball games tested positive for alcohol, 11% being legally intoxicated (blood alcohol level of $\geq 0.08\%$).²⁴ It is questionable whether banning alcohol at events has any significant impact on the MUR.²⁵ Even though alcohol usage data from the current study were subjective (and hence, may be slightly under-representative), the relationship between casualties and alcohol are likely to be multi-factorial in nature, and not related to the availability of alcohol on site.

It is worth noting that the provision of medical services at each event was similar with one medical room, doctor, and nurse available to the public, and two paramedic ambulance crews and the requisite number of first-aid responders in attendance. Despite this, a greater percentage of the casualties at the Leicester Tigers event were evaluated by a doctor or a nurse compared to those cared for at the Leicester Races. This occurred despite the fact that there was no difference in the severity of cases between the two events. This could be due to a number of different factors. First, the first-aid facilities for the public at the race course are staffed only by members of the voluntary aid services; the doctor or nurse is based separately in the jockeys' medical room and only available for support and advice if requested. This is in contrast to the Leicester Tigers ground where facilities are shared within one medical room, so the access to the medical and nursing staff is much easier. Secondly, the presence of the doctor at the Leicester Tigers is more high-profile compared to that at the racecourse where there is an acceptance that the doctor is there to treat the riders. Evidence suggests that the public's knowledge of the presence of trained medical personnel on-site could cause an increase in the number of attendees who seek

advice regarding long-term medical issues.¹¹ This is consistent with data from the current study, which show a significant variation in presentations between the events as a result of opportunistic use of the on-site medical services at the Leicester Tiger's ground. Although these contacts represent legitimate medical issues, they neither are appropriate for assessment and advice by lay staff, nor the type of condition for which the medical team is there to address. Such situations can, at times, cause a burden on resources that are required to address emergency needs. With these factors in mind, separating areas for specific triage and treatment categories may help to reduce the burden of inappropriate patient requests for the medical staff, and ensure the most effective use of on-site resources.

Conclusion

Two major sporting venues, the Leicester Tigers Rugby Club and the Leicester Racecourse, have similar attendances for medical treatment, and also are comparable to other mass-gathering sports events. High levels of both staff and pediatric presentations may have an impact on human resource planning for events on a larger scale. The separation of treatment areas may help to minimize the number of unnecessary or opportunistic presentations to the on-site health care professionals.

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